

Biodiversity Development Assessment Report

Lot 46 & 47 DP751395 Miles Street Yamba:
Proposed Subdivision



PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 0488 677 666

PO Box 229
Lismore NSW 2480
T 02 6621 6677

info@geolink.net.au

Prepared for: Garrard Building Pty Ltd
© GeoLINK, 2021

Certification

I certify this BDAR (Case 14715) has been prepared in accordance with requirements of the on the basis of the requirements of (and information provided under) the biodiversity assessment method 2020 as at 07/06/2021.



Ian Colvin
Biodiversity Accredited Assessor (BAAS18055)

Date: 07/06/2021

NOTE: This BDAR must be submitted must be within 14 days of the date shown on the finalised credit report generated using the BAM Calculator (refer to Appendix H).

UPR	Description	Date Issued	Issued By
3041-1058	First Issue	04/06/2021	ILC
3041-1079	Final Issue	07/06/2021	ILC

Table of Contents

1.	Introduction	6
1.1	Overview	6
1.2	Background and Approvals	6
1.3	Site Description	8
1.4	Proposed Development	8
1.5	Previous Biodiversity Assessments	12
1.6	Information Sources	12
1.7	Personnel	13
1.8	Report Scope and Limitations	13
2.	Landscape Features	17
2.1	Bioregion and Mitchell Landscape	17
2.2	Native Vegetation Extent	17
2.3	Cleared Areas	17
2.4	Water Features	17
2.5	Connectivity	18
2.6	Geology and Soils	18
2.7	Site Components	18
3.	Native Vegetation	25
3.1	Vegetation in the locality	25
3.2	Vegetation at the site	25
3.2.1	Methodology	25
3.2.2	Plant Community Types	27
3.2.3	Threatened ecological communities	32
3.2.4	Vegetation integrity	33
4.	Threatened Species	35
4.1	Introduction	35
4.2	Assessment of Habitat Suitability	36
4.3	Ecosystem Credit Species	36
4.4	Species Credit Species	36
4.5	Habitat Surveys	37
4.5.1	Introduction	37
4.5.2	Methodology	38
4.5.3	Survey results	41
4.5.4	SAIL Entities	42
4.6	Summary	42
5.	Impact Assessment	47

5.1	Introduction	47
5.2	Avoiding and minimising impacts	47
5.3	Impact summary	48
5.3.1	Direct Impacts	48
5.3.2	Indirect Impacts	49
5.3.3	Prescribed Impacts	51
5.4	Credit requirements	52
6.	Mitigation	53
6.1	Mitigation	53
6.2	Compensation	54
7.	Other Statutory Considerations	55
7.1	State Environmental Planning Policy (Koala Habitat Protection) 2021	55
7.2	Environment Protection and Biodiversity Conservation Act 1999	59

Illustrations

Illustration 1.1	Location Map	14
Illustration 1.2	Site Plan	15
Illustration 1.3	Proposed Development	16
Illustration 2.1	IBRA Landscape	19
Illustration 2.2	Native Vegetation Extent	20
Illustration 2.3	Water Features	21
Illustration 2.4	Connectivity	22
Illustration 2.5	Geology and Soils	23
Illustration 2.6	Acid Sulfate Soils	24
Illustration 3.1	Plant Community Types	34
Illustration 4.1	Survey Effort	43
Illustration 4.2	Threatened Flora Habitat	45
Illustration 4.3	Threatened Fauna Habitat	46
Illustration 5.1	Biodiversity Impacts	50
Illustration 7.1	BioNET Records within 2.5 km of the Site	57

Tables

Table 3.1	PCT Selection	28
Table 3.2	Plant Community Types	30
Table 3.3	Plot Data Summary	33
Table 4.1	Final List of Candidate Species Credit Species	37
Table 4.2	Summary of Field Assessment	37
Table 4.3	Summary of targeted fauna survey	40
Table 4.4	Species Credit Species Impacted by the Proposal	42
Table 4.5	Myotis Habitat Loss within Foraging Habitat	43
Table 5.1	Vegetation impacts	49
Table 5.2	Prescribed impacts	51

<u>Table 5.3</u>	<u>Credit Requirements.....</u>	<u>52</u>
<u>Table 6.1</u>	<u>Mitigation measures</u>	<u>53</u>
<u>Table 7.1</u>	<u>Koala Assessment Report</u>	<u>58</u>

Figures

<u>Figure 1.1</u>	<u>Approved filling and vegetation removal area as per DA2018/0553</u>	<u>7</u>
<u>Figure 1.2</u>	<u>Asset Protection Zones</u>	<u>9</u>
<u>Figure 1.3</u>	<u>Detail of Proposed Eastern Swale</u>	<u>11</u>
<u>Figure 1.4</u>	<u>Design of Proposed Eastern Swale</u>	<u>11</u>
<u>Figure 4.1</u>	<u>Myotis Foraging Habitat within the Development Area</u>	<u>43</u>
<u>Figure 5.1</u>	<u>Initial development proposal (September 2018)</u>	<u>47</u>

Appendices

- Appendix A Approved Consents**
- Appendix B Proposed Development**
- Appendix C Plot Data**
- Appendix D Assessment of Habitat Suitability – Ecosystem Credit Species**
- Appendix E Assessment of Habitat Suitability – Species Credit Species**
- Appendix F Fauna Inventory**
- Appendix G SAI Assessment**
- Appendix H BAM Calculator Outputs**

Executive Summary

This Biodiversity Development Assessment Report (BDAR) has been prepared for Garrard Building Pty Ltd with regard to the future subdivision and development of Lot 46 & 47 DP751395 Miles Street, Yamba. The BDAR is required due to native vegetation removal exceeding the thresholds in the Biodiversity Offsets Scheme (BOS). On this basis, this BDAR has been prepared to address the requirements of the *Biodiversity Conservation Act 2016* (BC Act) and Biodiversity Assessment Method (BAM) 2020.

The site comprises historically cleared and disturbed grazing land which has been substantially filled under recent development applications/modifications. Vegetation occurs as fragmented and scattered areas in various stages of maturity and modification.

Field assessment identified five Plant Community Types (PCTs) at the site:

- PCT 837 Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
- PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
- PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
- PCT 1235 Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
- PCT 780 Coastal floodplain sedgelands, rushlands, and forblands of the North Coast.

As the site is not part of an alluvial soil landscape, no threatened ecological communities (TECs) occur.

The proposed development will affect small areas of all five PCTs, with the majority of better quality native vegetation retained within undeveloped (residual) land.

Two threatened flora species were recorded at the site:

- *Rotala* (*Rotala tripartita*)
- Spider Orchid (*Dendrobium tetragonum* var. *melaleucaphilum*).

Threatened flora habitat will not be impacted by the development.

No threatened fauna were recorded.

Following input of plot data into the BAM-C, lists of threatened species with potential to occur at the site were generated. Assessments of habitat suitability for 'ecosystem credit species' (predicted threatened species) and 'species credit species' (candidate threatened species) were completed. As required under the BAM, targeted surveys for candidate threatened flora species with potential to occur at the site were undertaken in accordance with relevant survey guidelines. Targeted survey for threatened fauna species was not completed, rather, those species for which suitable habitat occurs were accepted as being present.

Following the input of field data into the BAM-C, credit requirements were determined as follows:

PCT/species	Credit requirements
Ecosystem credits	
780	6
837 (Zone 1)	11
837 (Zone 2)	23
837 (Zone 3)	1
1064	7
1227	1
1235	5
Sub-total	54
Species credits	
Southern Myotis	47
TOTAL	101

Other relevant statutory matters addressed in this BDAR include:

- State Environmental Planning Policy (Koala Habitat Protection) 2021: A Koala Assessment Report has been completed and core Koala habitat does not occur at the site.
- *Environment Protection and Biodiversity Conservation Act 1999*: under the bilateral agreement between the NSW State Government and federal Government, no further consideration of the Act is required.

1. Introduction

1.1 Overview

This *Biodiversity Development Assessment Report* (BDAR) has been prepared for Garrard Building Pty Ltd with regard to the future subdivision and development of Lot 46 & 47 DP751395 Miles Street, Yamba ('the site'). The BDAR is required to support a Statement of Environmental Effects (SEE) for a development application submitted to Clarence Valley Council (CVC).

The BDAR is required due to the proposed development of the site exceeding clearing thresholds in the Biodiversity Offsets Scheme (BOS) established in the *Biodiversity Conservation Act 2016* (BC Act). A minimum lot size (MLS) is not prescribed for the site in the Clarence Valley Local Environmental Plan 2011. In these instances the MLS is taken to be the size of the site itself. Collectively the site (as two lots) covers ~ 42.7 ha. However, where multiple lots are subject to a development, the MLS is based on the smallest size of any of the lots (ie. the lots are not considered in combination). Each of the subject lots are the same size (~ 21.3 ha) and so the BOS clearing threshold is 0.5 ha. The proposed development will exceed this clearing threshold.

Details of the project are summarised below:

Site details	Lots 46 & 46 DP751395 Miles Street Yamba
LGA	Clarence Valley Council (CVC)
Area	~42.7 ha within the West Yamba Urban Release Area (WYURA)
Zoning	R1 General Residential - Clarence Valley Local Environmental Plan 2011 (CVLEP)
Min. Lot size	Not prescribed
Future development type	Residential subdivision

Illustration 1.1 shows the site location and **Illustration 1.2** shows the site itself.

1.2 Background and Approvals

The site has been subject to several development applications and approvals over the past few years, and GeoLINK has completed a BDAR for Lot 46 which was submitted to CVC and then withdrawn. Recent approvals for the site include:

1. DA2018/0553 provided consent for filling works in the north of the site over an area of 12 ha as modified by MOD2019/0019 (granted 30 April 2019). These works have been completed. DA2018/0553 also allows for the removal of trees and vegetation within a designated development area as per a Biodiversity Assessment by GeoLINK (2018). Consent condition 7 allows for the removal of native vegetation within this designated area and tree removal has largely been completed. A financial offset required for all permitted tree removal has been paid

2. DA2019/0492 provided consent for the additional filling of 20,000m³ of land within Lot 46. These works have commenced but have not been completed. Similarly, this BDAR does not apply to this additional area where filling has been approved.
3. A condition of consent for DA2019/0492 required the preparation of a Vegetation Management Plan (VMP) for a Controlled Activity Approval (CAA) under the *Water Management Act 2000* (WM Act). The VMP was prepared by GeoLINK (August 2020) and submitted to the Natural Resources Access Regulator (NRAR). The CAA (and supporting VMP) were approved by NRAR on 23 December 2020.

Stamped approval plans are provided at **Appendix A**.



Figure 1.1 Approved filling and vegetation removal area as per DA2018/0553

1.3 Site Description

The site comprises agricultural land which has been historically cleared and modified with part of the site formerly supporting sugar cane production. The site has been under a grazing management regime for many years, with stock still maintained at the site. The majority of the northern portion of Lot 46 has been filled as permitted under DA2018/0553 and DA2019/0492; all vegetation has been removed within this area (refer **Illustration 1.2**).

The balance of the site is mostly improved pasture, with several scattered patches of native vegetation occurring in the south of Lot 46 and more extensive areas of vegetation in the east of Lot 47. Two dwellings and a dam occur at Lot 47. No infrastructure occurs within Lot 46.

In the south of Lot 46 a narrow, forked drainage line occurs and appears to receive surface flows funnelled down the eastern side of Carrs Drive (refer to **Illustration 1.2**). One branch of the drainage line flows into a small wetland within an isolated patch of swamp sclerophyll forest before draining surface flow into adjacent land to the south (second order stream). A minor watercourse (first order stream) branches off to the east and terminates within the site.

Within Lot 47 a constructed drainage line occurs in the north-east corner and receives surface run off from Golding Street and flows into a substantial wetland area which drains to the south. This area is identified as a floodway in the *West Yamba Urban Release Area Flood Impact Assessment* (BMT WBM 2018) and is also referenced in the Residential Zones Development Control Plan 2011 (Figure X1.3). An additional constructed drain directs water to the small dam. Both drains are relics of land modification completed as part of historic sugar cane farming in this portion of the site.

While estuarine systems occur in close proximity to the site, no estuarine waters enter the site.

1.4 Proposed Development

The proposed development comprises a residential subdivision of 310 lots over an area of approximately 28.2 ha (refer **Illustration 1.3**). The proposal includes two constructed stormwater detention basins:

- Eastern detention basin (approximately 4725 m²; proposed Lot 902) with 1:6 batters and maintained as a grassed area with open space/passive recreation potential. This basin discharges to an area of residue land (identified as a floodway in the Clarence Residential Zones Development Control Plan (2011). This land will be maintained in its current state.
- Western detention basin (proposed Lot 901) with same features and potential as eastern basin plus attached second order stream with vegetated buffers totalling 40 m width from streambanks as approved by the natural resources access regulator (NRAR) under controlled activity approval 30 CX 324288/AO 24687.

The development will require the removal of all native vegetation within the development footprint to allow filling which has previously been approved over 12 ha of the site and is nearing completion.

Vehicle access to the site will be from two intersections with Miles Street (as yet unformed).

The proposal excludes two substantial portions of the site from residential development:

- The eastern portion of Lot 47 (proposed Lot 903) has been excluded from the proposal as it forms a strategic floodway as identified in the Residential Zones Development Control Plan (2011). It is intended that this land is dedicated to Council in its current state and requested that the land be zoned for environmental protection.
- The south-western portion of Lot 46 will be retained in ownership by the proponent as proposed Lot 900.

Detailed subdivision plans are provided at **Appendix B**.

Bushfire Provisions

A *Bushfire Risk Management Plan* (BushfireSafe Aust 2021) has been prepared for the proposal. The Plan notes the following:

- A minimum 25 metre Asset Protection Zone (APZ) along the forest vegetation adjacent to the southwestern margins of the site and a minimum 9 metre APZ from the remnant and riparian vegetation areas is prescribed (refer **Figure 1.1**).
- Where proposed lots 280 - 291 occur in the north-east of the proposal occur proximate to remnant vegetation, an APZ of 9 metres will apply within the rear of the allotments only. No APZs are located within residue land (proposed Lot 903); refer **Figure 1.1**.
- The development has been designed with a 21 metre wide perimeter road along the bushfire hazard interface.

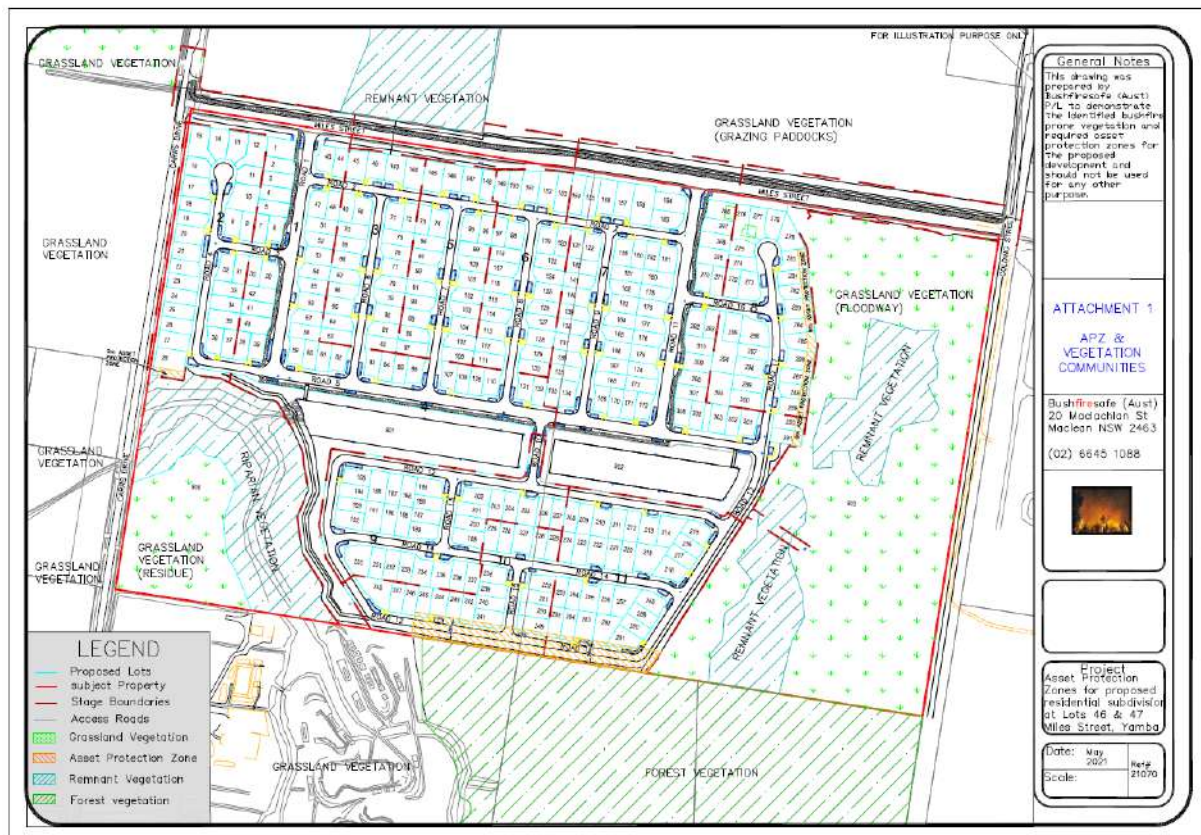


Figure 1.2 Asset Protection Zones

Stormwater Management

Stormwater quality will be managed by bioretention street pods located within the internal road reserves which will treat stormwater before discharging to one of two constructed detention basins (the eastern basin).

Stormwater quantity will be managed by the two detention basins with the eastern basin discharging via a grass swale into the floodway and the western basin discharging into the second order stream. The stormwater outlet for the eastern basin consists of both pipe (1x450mm RCP) and weir flow. As the invert of the basin and subsequent downstream invert of the pipe outlet is quite low (0.8m AHD), construction of a shallow swale is required to outlet this pipe within the floodway. The swale will be approximately 60 m from the piped outlet (refer **Figure 1.3**) and have a 2.5 m base. The swale has been designed as grassed/vegetated and will convey approximately 0.5m³/s. **Figure 1.4** shows the preliminary design of the proposed swale.

Regarding the timing of flows within the floodway – depending on the event, critical storms (i.e. with the highest flows) have a duration between 3-6 hours, meaning the storm peak flow will generally be reached after about 3 hours from the onset of the storm. Based on 1D modelling, the floodway flows generally subside after around 10 hours from the onset of the storm.

Water quality objectives will be met through the utilisation of bioretention street pods to treat stormwater prior to discharge into the eastern stormwater basin. The stormwater basin will provide detention of flows, thereby ensuring that the peak flows leaving the site in the post-development situation do not exceed the peak flows in the pre-development situation, for a range of storm events. Based on comparison pre and post development hydrographs, the frequency and duration of flows entering the receiving environment will also be similar to the pre-development situation due to the attenuation of flows in the bioretention street pods and the stormwater basin.

On this basis, the hydrology of the greater receiving environments is unlikely to be altered.

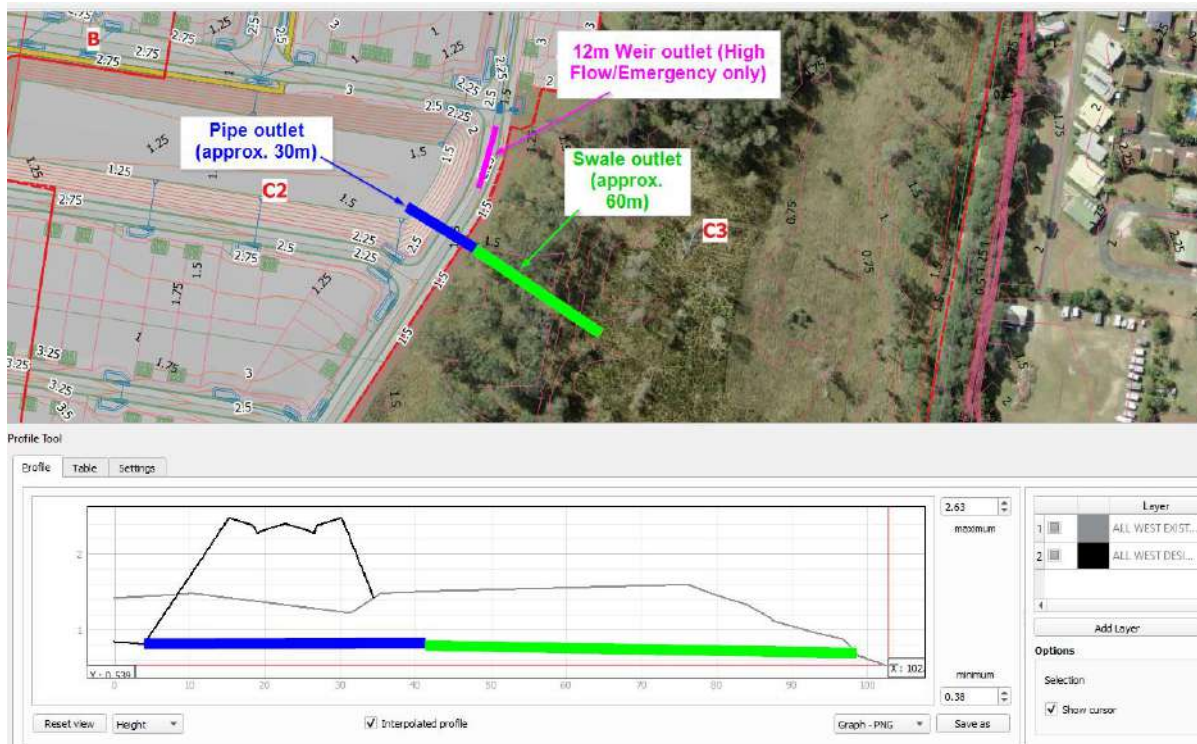


Figure 1.3 Detail of Proposed Eastern Swale

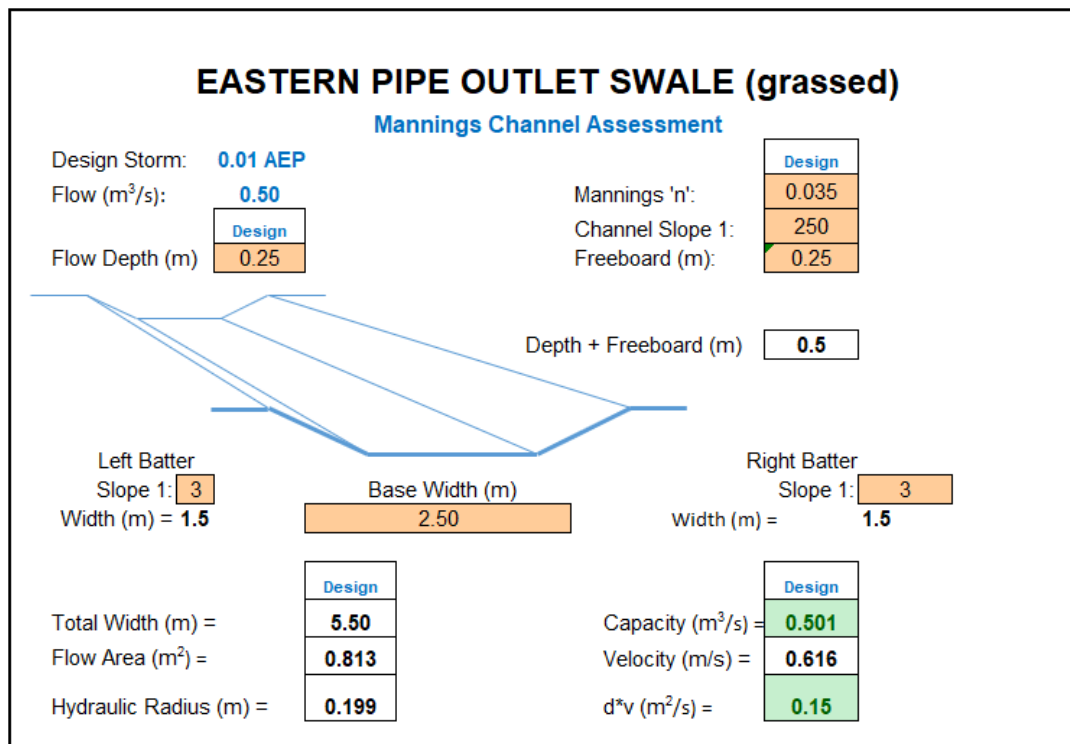


Figure 1.4 Design of Proposed Eastern Swale

1.5 Previous Biodiversity Assessments

GeoLINK has completed biodiversity assessments at the site over several years. A summary of assessments is provided below:

- July/August 2018: site reconnaissance and 8 x vegetation integrity plots completed for all of site BDAR.
- July 2018: BAR prepared and submitted to CVC for filling of grassland areas at the site.
- October 2019 - February 2019: targeted survey for BDAR.
- All of site BDAR put on hold, following initial targeted surveys and recording population of the threatened herb *Rotala tripartita*.
- March - July 2019: Revised scope - BDAR prepared for Lot 46 only and submitted to CVC. Development application withdrawn following feedback from NRAR regarding filling of watercourses.
- September 2019 - February 2021: Additional fieldwork and reporting for a BAR for Lot 46 due to reduced development (to accommodate NRAR advice).
- March 2021: revised scope - BDAR resurrected for all of site (Lots 46 & 47) with revised layout (this report). Further field assessment and vegetation integrity plots completed.

During the entire period of assessment the site has been surveyed on numerous occasions, with the most significant findings being the recording of two threatened flora species - *Rotala tripartita* and Spider Orchid (*Dendrobium tetragonum* var. *melaleucaphilum*, formerly known as *Dendrobium melaleucaphilum*). Recording of these biodiversity constraints early in the assessment process has led to a refinement of development concepts for the site over time (refer to **Section 5.2**).

1.6 Information Sources

Data and resources used or consulted in this assessment include:

- The Biodiversity Assessment Method (DPIE 2020)
- The Biodiversity Assessment Method Operational Manual – Stage 1 (DPIE 2020)
- The Biodiversity Assessment Method Operational Manual – Stage 2 (EES 2019a)
- BioNet Vegetation Classification
- BioNet Threatened Biodiversity Data Collection (TBDC)
- Biodiversity Assessment Method Calculator
- BioNet Threatened Species Profiles
- PlantNET NSW
- Biodiversity Offsets and Agreement Management System (BOAMS).

Spatial data used in this report has included data from the following sources:

- NSW Department of Finance and Services (via Six Maps)
- NSW Native Vegetation Extent v1.2
- IBRA Regions and Subregions (OEH 2016)
- NSW (Mitchell) Landscapes - Version 3.1 (OEH 2016)
- Directory of Important Wetlands in Australia (Department of the Environment and Energy)
- Fauna Corridors for North East NSW (OEH 2010)
- Acid Sulfate Soils Risk map (DPIE 2020/eSPADE)
- Nearmap (aerial imagery).

Other reports and documents reviewed for this BDAR have included:

- An ecological constraint assessment of the site by James Warren & Associates (2010).
- An approved BDAR completed for a nearby site (Lot 1 DP568545) on Cars Drive by GHD (2018) on behalf of Mavid Developments Gold Coast Pty Ltd.

1.7 Personnel

This BDAR was prepared by accredited assessors Ian Colvin (BAAS18055) with fieldwork assistance and peer review by David Havilah (BAAS 18129). All content and fieldwork are in accordance with the Biodiversity Assessment Method (BAM) 2020.

1.8 Report Scope and Limitations

This BDAR has been prepared based on field assessment and use of the BAM Calculator (BAM-C) and is based on the assumption that all native vegetation at the site would be removed for any future development of the site. Biodiversity credits were generated by utilising the BAM-C, which is established and managed by NSW Environment, Energy and Science (EES). GeoLINK has entered data in the BAM-C in good faith and any errors or deficiencies in the calculator results are attributed to EES.



GDA 1994 MGA Zone 56

LEGEND

- | | |
|---|---|
| The site | SEPP Coastal wetland |
| 1500 m buffer | Proximity area for SEPP Coastal wetland |

0 0.55 Km



GeoLINK
environmental management and design

Biodiversity Development Assessment Report
Lots 46 & 47 DP751395 Miles Street Yamba
3041-1060

Locality Plan - Illustration 1.1

Information shown is for illustrative purposes only
 Drawn by: AB Checked by: RE Reviewed by: ILC
 Source of base data: ESRI World Imagery
 Date: 29/03/2021
 Revision: A



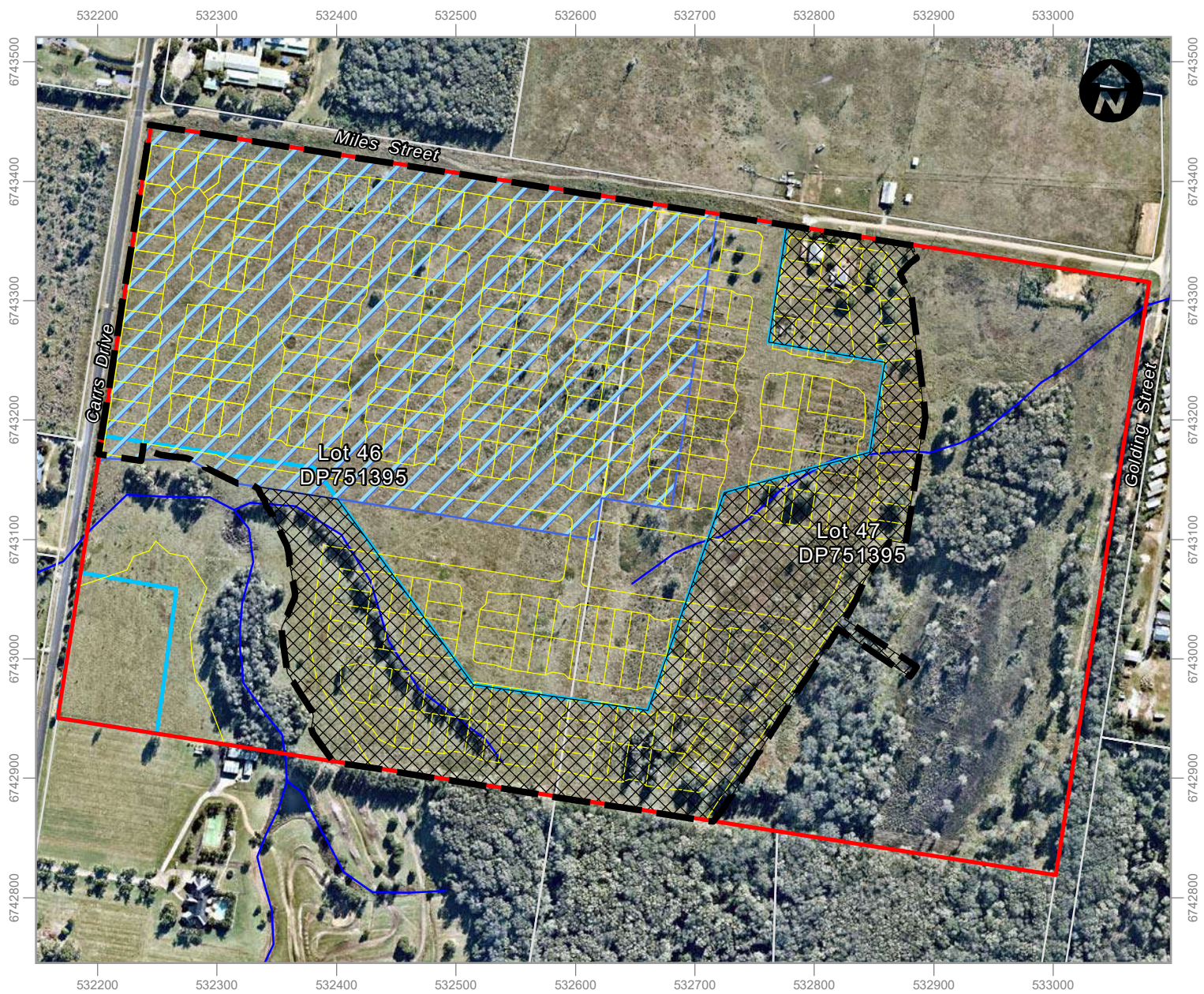
GDA 1994 MGA Zone 56

LEGEND

- The site
- Cadastre
- Watercourse

0 90 Metres

Site Plan - Illustration 1.2



GDA 1994 MGA Zone 56

LEGEND

- | | | | | | |
|--|-------------------------------|--|--|--|--------------------------|
| | The site | | Consolidated fill (previous approval) | | Watercourse |
| | Cadastre | | Approved development area 2018 (DA2018/0553) | | Proposed lot subdivision |
| | Development area | | | | |
| | Land impacted by the proposal | | | | |

0 100 Metres

Proposed Development - Illustration 1.3

2. Landscape Features

2.1 Bioregion and Mitchell Landscape

The site occurs within the Clarence Lowlands (Interim Biogeographic Regionalisation for Australia [IBRA]) subregion of the South Eastern Queensland IBRA bioregion. At a local level, the site forms part of the 'Clarence- Richmond Barriers and Beaches' Mitchell Landscape (DECC 2008a). The site's position within the IBRA and Mitchell landscapes is shown at **Illustration 2.1**.

2.2 Native Vegetation Extent

As per the BAM 2020 methodology (Section 4.3.2) a buffer of 1500 metres was established around the site and a calculation of native vegetation cover was derived using native vegetation mapping (NSW Native Vegetation Extent v1.2 2017) summing values of 'tree cover' and 'tree cover matrix' values. Approximately 480 ha of native vegetation was identified within 1500 m of the site, therefore a native vegetation cover of 41.6% applies.

Percent native vegetation cover is shown at **Illustration 2.2**.

2.3 Cleared Areas

As shown by **Illustration 2.2**, much of the study area comprises cleared vegetation occupied by urban areas, roads, open space and infrastructure. Of the ~42.7 ha of the site, approximately 29.4 ha (68.76%) comprises fill or pasture, where former areas of vegetation have been cleared for agriculture or development.

2.4 Water Features

In the south of Lot 46 a narrow, forked drainage line occurs and appears to receive surface flows funnelled down the eastern side of Carrs Drive (refer to **Illustration 1.2**). One branch of the drainage line flows into a small wetland within an isolated patch of swamp sclerophyll forest before draining surface flow into adjacent land to the south (second order stream). A minor watercourse (first order stream) branches off the east and terminates within the site.

Within Lot 47 a drainage line occurs in the north-east corner and receives surface run off from Golding Street and flows into a substantial wetland area which drains to the south. This area is identified as a floodway in the *West Yamba Urban Release Area Flood Impact Assessment* (BMT WBM 2018).

A small reach of the Oyster Channel, a branch of the Clarence River occurs approximately 720 m west of the site. Oyster Channel is an estuarine system and terminates in Wooloweyah Lagoon ('Lake Wooloweyah'), a significant estuarine lake which lies approximately 1.5 km south of the site. While estuarine systems occur in close proximity to the site, no estuarine waters enter the site.

Illustration 2.3 shows the location of water features at and in proximity to the site.

2.5 Connectivity

The site has poor connectivity to the north east and west largely due to adjacent cleared agricultural land (to the north), Carrs Drive and small landholdings (to the west) and Yamba Water Holiday Park (to the east). The site has good connectivity to the south and south-east where it adjoins private land which supports extensive areas of swamp forest, extending south to the foreshore of Wooloweyah Lagoon and south-east to Angourie Road.

The site occurs within the Iluka-Yuraygir Regional Corridor which also connects with the Tyndale Swamp Regional Corridor as per Scotts (2003). Together these modelled corridors connect north to the Clarence River (and beyond) and south to Yuraygir National Park. A coarse polygon of 'key habitat' is mapped in the south-east of the site (where vegetation is retained); key habitat is also extensively mapped across adjacent areas of contiguous forest cover to the south, south-east and south-west.

Illustration 2.4 shows the connectivity of the site in a local context.

2.6 Geology and Soils

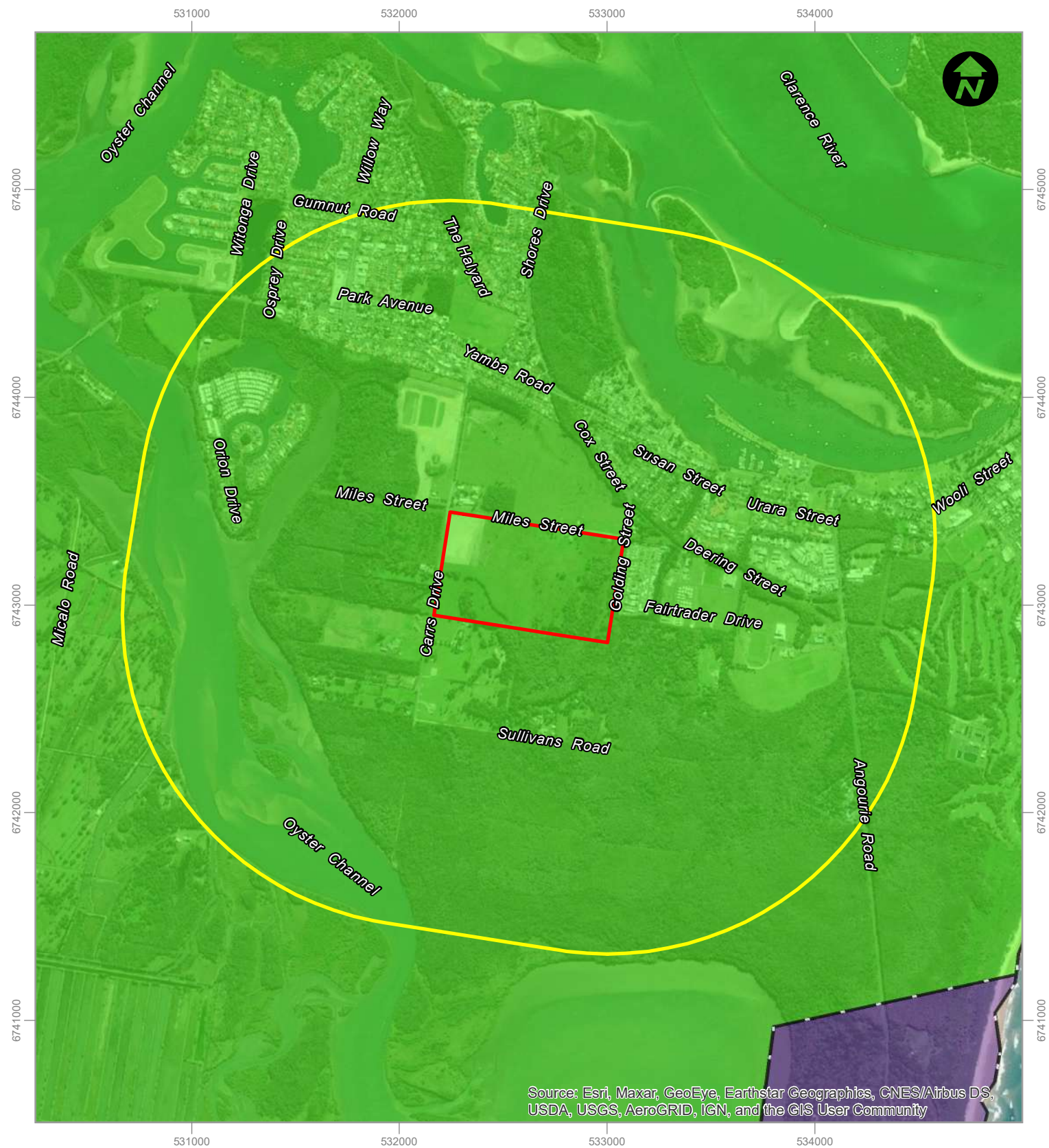
The site is located on Quaternary sand sheets within the Bundjalung Dunefield and the Clarence Estuarine Plain Morand (2001). Soil mapping (Morand 2001) indicates the site lies within the Iluka soil landscape, characterised by deep (>200 cm), well-drained Aeric Podzols (Humus Podzols) and deep (>200 cm), poorly drained Aquic/Semiaquic Podzols (Humus Podzols). These are acid highly erodible non-cohesive spoils with very low waterholding capacity and high permeability.

Soil and geological mapping for the site and surrounds is shown at **Illustration 2.5**.

Acid sulphate soil (ASS) risk mapping (eSpade) shows the site as having a low probability of ASS, with ASS likely >3 m below ground surface (refer to **Illustration 2.6**).

2.7 Site Components

The site contains two dwellings, a constructed dam, a dividing boundary fence between the lots and substantial areas of consolidated fill within Lot 46 (as per DA2018/0553 and DA2019/0492).



531000

532000

533000

534000

GDA 1994 MGA Zone 56

LEGEND

- The site
- 1500 m buffer

- IBRA Bioregion boundary
- IBRA Subregion**
 - Clarence Lowlands
 - Yuraygir

0 490 Metres

IBRA Landscapes - Illustration 2.1



LEGEND

- The site
- Native vegetation extent
- 1500 m buffer

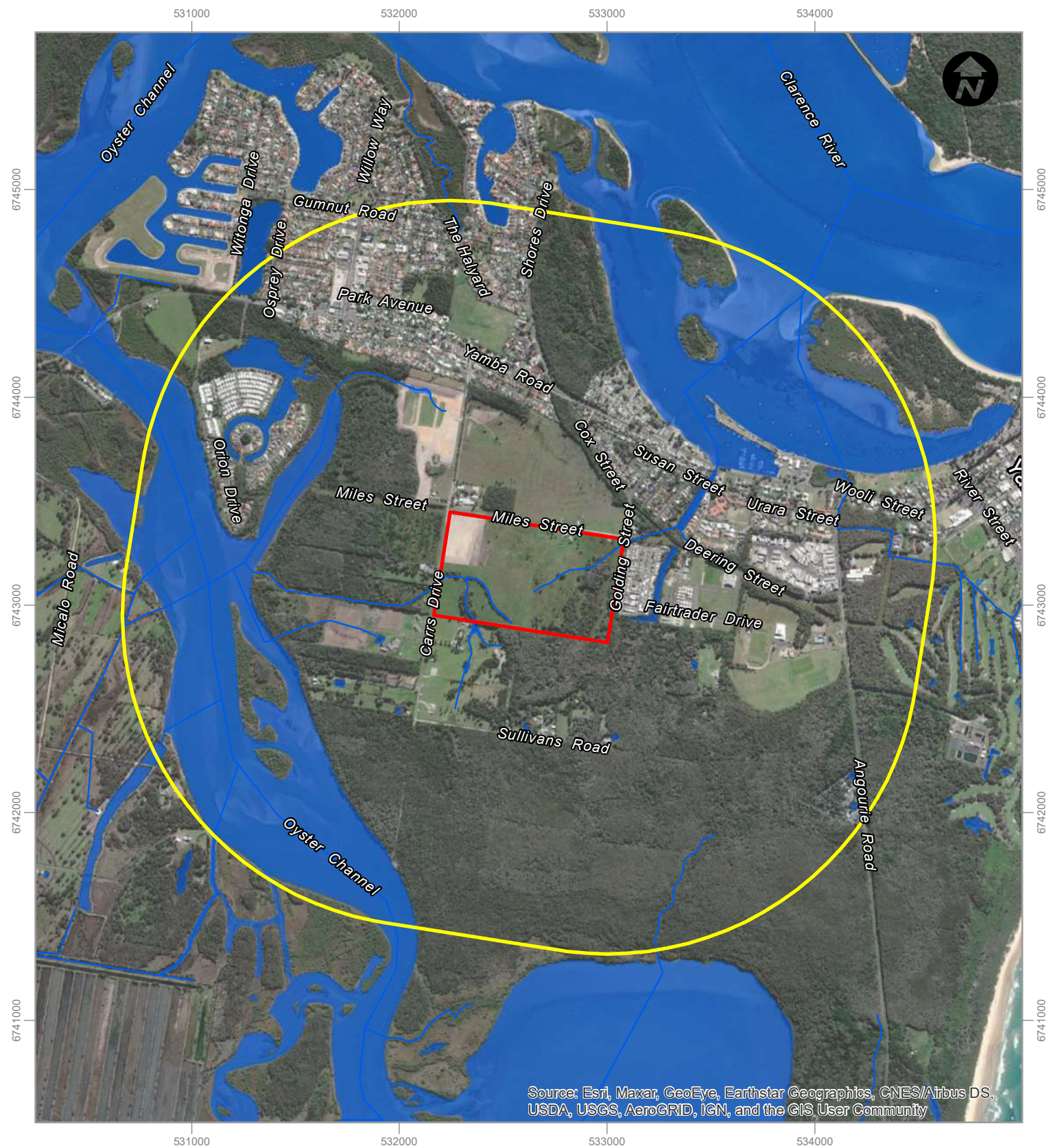
0 490 Metres

GeoLINK
environmental management and design

Biodiversity Development Assessment Report
Lots 46 & 47 DP751395 Miles Street Yamba
3041-1063

Native Vegetation Extent - Illustration 2.2

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: ILC
Source of base data: ESRI World Imagery
Date: 29/03/2021
Revision: A



LEGEND

- The site
- 1500 m buffer
- Water body
- Watercourse

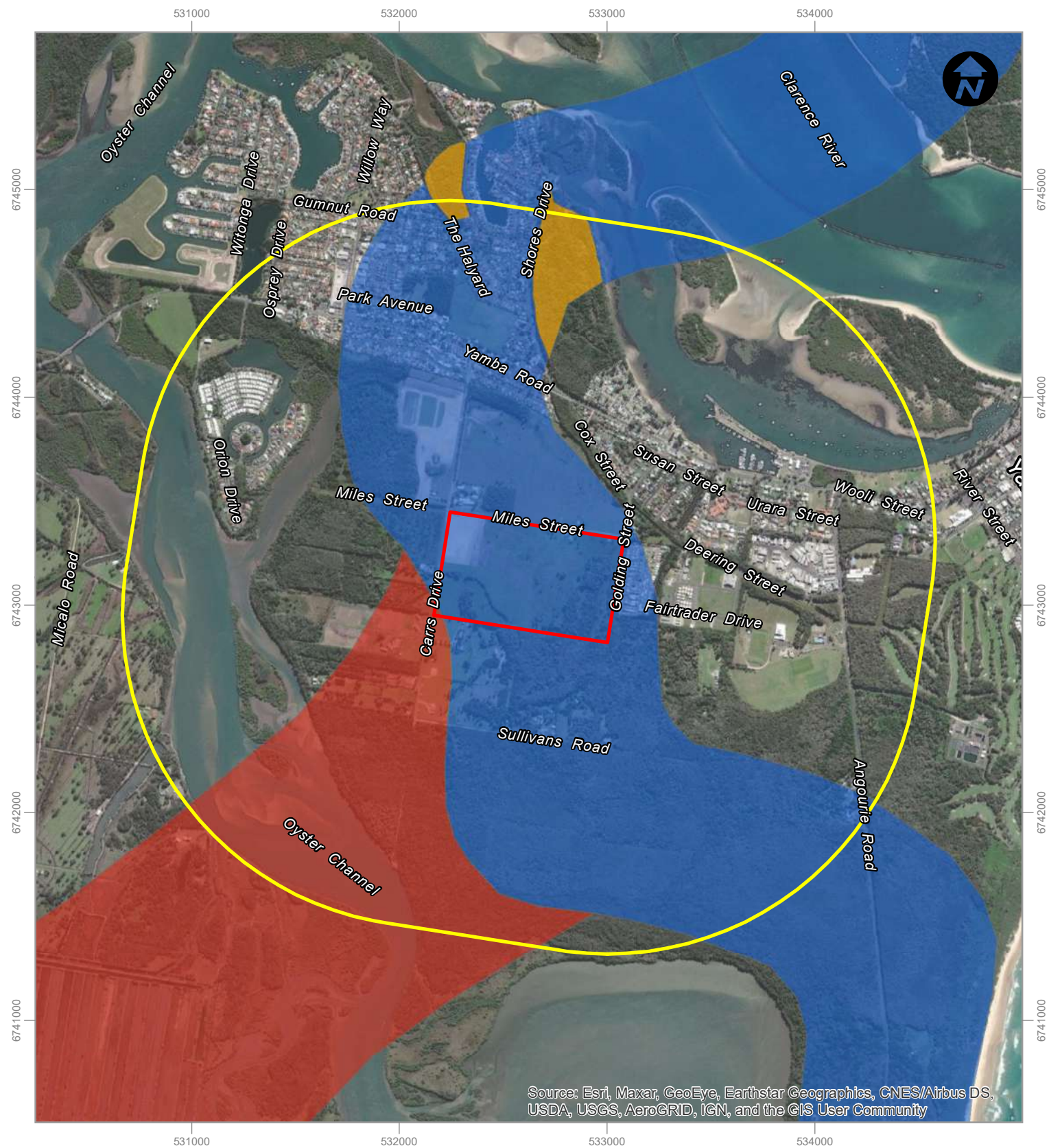
0 490 Metres

GeoLINK
environmental management and design

Biodiversity Development Assessment Report
Lots 46 & 47 DP751395 Miles Street Yamba
3041-1064

Water Features - Illustration 2.3

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: ILC
Source of base data: ESRI World Imagery
Date: 29/03/2021
Revision: A



GDA 1994 MGA Zone 56

LEGEND

- The site
- 1500 m buffer

Fauna Corridor Name, Class, Focal Species

- Clarence NR, regional, no focal species
- Iluka-Yuray, regional, Northern Long-eared Bat
- Tyndale swamp, regional, Yellow-bellied Glider/Rufous Bettong

0 490 Metres

GeoLINK
environmental management and design

Biodiversity Development Assessment Report
Lots 46 & 47 DP751395 Miles Street Yamba
3041-1065

Connectivity - Illustration 2.4

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: ILC
Source of base data: ESRI World Imagery
Date: 29/03/2021
Revision: A



GDA 1994 MGA Zone 56

LEGEND

- The site
- 1500 m buffer

Soil Landscape

- | | |
|--|---|
| Angel Beach | Iluka variant a |
| Angel Beach variant a | Palmers Island variant b |
| Angourie | Romiaka |
| Disturbed Terrain | Romiaka variant a |
| Disturbed Terrain variant a | Water |
| Gulmarrad variant b | Weapons Range |
| Iluka | Weapons Range variant a |

0 490 Metres

Geology and Soils - Illustration 2.5



LEGEND

- The site
- 1500 m buffer

0 490 Metres

GeoLINK
environmental management and design

Biodiversity Development Assessment Report
Lots 46 & 47 DP751395 Miles Street Yamba
3041-1067

Acid Sulfate Soils - Illustration 2.6

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: ILC
Source of base data: ESRI World Imagery
Date: 29/03/2021
Revision: A

3. Native Vegetation

3.1 Vegetation in the locality

Vegetation in the locality typically comprises swamp sclerophyll forest dominated by Broad-leaved Paperbark (*Melaleuca quinquenervia*) and/or Swamp Oak (*Casuarina glauca*). Other vegetation types in the Yamba area include littoral rainforest and wetland communities including freshwater wetlands, and estuarine vegetation including mangroves and saltmarsh.

Vegetation in the south-east of the site has good connectivity to more extensive areas of contiguous swamp forest communities to the south and east. As noted, all vegetation communities at the site are associated with freshwater systems and no marine or saline-influenced vegetation occurs.

3.2 Vegetation at the site

3.2.1 Methodology

As noted in **Section 1.5**, field assessment of the site has been completed on numerous occasions over more than two years, with vegetation integrity plots completed to sample PCTs at the site in 2018.

With the revised development footprint for the proposal, the following approach was taken:

- Utilise data from vegetation plots completed in 2018 for any PCTs affected by the proposal (plots 1, 2 & 3)
- Complete four new vegetation plots (20/04/2021; plots 4, 5, 6, 7) to address any areas not previously assessed within the development footprint.

Vegetation integrity plots are shown at **Illustration 3.1**.

Most plots utilised the BAM 2020 methodology (20 x 50 m plot), with exceptions being:

- Plot 3: plot of 100 m x 5 m to capture a narrow linear band of Swamp Oak regrowth
- Plot 6: floristic plot dimensions of 16 x 25 m (400 m²) - vegetation function scores are not relevant to wetland communities where these attributes are absent; hence the plot size is suitable
- Plot 7: plot dimensions of 25 x 40 m to capture five scattered Coast Banksia within pasture.

Plot data is provided at **Appendix C**. Photographs of the plots are provided at **Plates 3.1 - 3.7**.

Data from plots 1-3 (2018) was collated by hand for entry into the BAM-C. Plot data from 2021 (plots 4 - 7) was entered into a purpose-built spreadsheet (MS Excel) cross-linked to 'growth form' and 'HTE' spreadsheets (BioNet), formulated to collate and score data values requiring input into the BAM-C (composition condition score, structure condition score, function condition score). Spreadsheet entry and collation reduces potential for human error when entering data and ensures that score values are collated accurately. Following this, scored values were then entered into the BAM-C (Case 14715) in accordance with the BAM methodology.

Native vegetation not affected by the proposal was not entered into the BAM-C.



Plate 3.1 Plot 1 - PCT 837: Zone 1 (Lot 47)



Plate 3.2 Plot 2 - PCT 1064 (Lot 47)

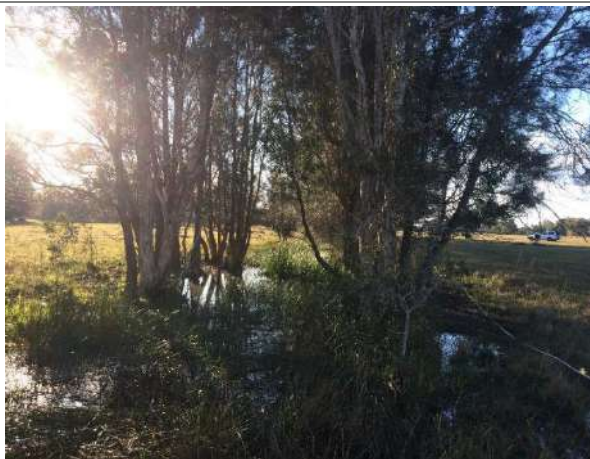


Plate 3.3 Plot 3 - PCT 1235 (Lot 46)



Plate 3.4 Plot 4 - PCT 1227 (Lot 47)



Plate 3.5 Plot 5 - PCT 837: Zone 2 (Lot 47)



Plate 3.6 Plot 6 - PCT 780 (Lot 47)



Plate 3.7 Plot 7 - PCT 837: Zone 3 (Lot 47)

3.2.2 Plant Community Types

While the site has been significantly cleared and modified, scattered areas of native vegetation occur within grazed pasture. These communities are generally disturbed from grazing, thinning and clearing and/or routine slashing. Plant community types (PCTs) as per the BioNet Vegetation Classification were interrogated for vegetation formations in the Clarence Lowlands subregion and assigned on a 'best fit' basis based on floristics and landscape occurrence.

The available choices for each PCT in the BAM-C are set out in **Table 3.1**, with selected PCTs shown in bold. Selections for vegetation communities were allocated by species based on VI plots. PCT 837 was not easily allocated due to the substantial dominance of Pink Bloodwood and low frequency of other canopy species, however Pink Bloodwood is a characteristic species of PCT 837, and so the PCT was allocated on this basis (in combination with landform etc).

For Swamp Oak regrowth, a choice between two different PCTs for Swamp Oak (PCT 1145, PCT 1235) was available. Due to (seemingly) incorrect data (eucalypt species) allocated to PCT 1145, PCT 1235 was chosen. For freshwater wetlands there were two choices (within different formations and classes - PCT 780, PCT 782). PCT 780 was selected based on landscape position, the occurrence of *Baumea* and *Eleocharis* spp. and historic aerial photography indicating these areas were formerly dominated by swamp sclerophyll forest until at least 1978 until removal in the 1980's. On this basis, the 'wet meadow' complex described by PCT 782 is not present at the site nor has it been on a historical basis.

For the two small patches of Coast Banksia at the site, assigning a PCT was not straightforward. While these patches have floristic similarities associated with coastal heath communities, the site is not associated with coastal headlands (eg. PCT 784 Coastal headland heaths of the NSW North Coast Bioregion) and no other heathland related vegetation occurs. Coast Banksia can be an infrequent element of dry sclerophyll forests near the coast (pers. obs.), and so on this basis Coast Banksia patches were assigned to PCT 837, but as a distinct vegetation zone.

Several planted Mango trees occur around the two dwellings in Lot 47; as non-native vegetation these trees are not included in the BDAR. Additionally, two planted native trees occur as landscape trees at the dwellings - Flame Tree (*Brachychiton acerifolius*) and a Plum Pine (*Podocarpus elatus*); refer

Illustration 3.1). These trees will be impacted by the proposed development and were assessed under Appendix D of BAM 2020 as they are singular isolated planted native trees which do not form a PCT.

Using the decision-making key in Appendix D of BAM 2020 it is evident that the trees were planted for horticultural/aesthetic reasons (D.1 step 5), leading to the assessment process in step D.2.

Table 3.1 PCT Selection

Plot	Dominant species	Vegetation formation and class (from BAM-C)	PCT choices in Clarence Lowlands subregion
1	Trees: <i>Corymbia intermedia</i> Shrubs: <i>Austromyrtus dulcis</i> Groundcover: <i>Imperata cylindrica</i> Other: nil	Grassy Woodlands/Coastal Valley Grassy Woodlands	<i>PCT 762: Cabbage Gum open forest or woodland on flats of the North Coast</i> <i>PCT 837: Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion</i> <i>PCT 848: Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast</i> <i>PCT 971: Narrow-leaved Red Gum woodlands of the lowlands of the North Coast</i>
2	Trees: <i>Melaleuca quinquenervia</i> , <i>Casuarina glauca</i> Shrubs: <i>Callistemon salignus</i> Groundcover: <i>Baumea juncea</i> Other: <i>Parsonsia straminea</i> , <i>Maclura cochinchinensis</i>	Forested Wetlands/Coastal Swamp Forests	<i>PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion</i> <i>PCT1227: Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i> <i>PCT 1230: Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion</i>
3	Trees: <i>Casuarina glauca</i> , <i>Melaleuca quinquenervia</i> Shrubs: nil Groundcover: <i>Schoneplectiella mucronata</i> , <i>Cynodon dactylon</i> , <i>Eleocharis acuta</i> Other: nil	Forested Wetlands/Coastal Floodplain Wetlands	<i>PCT 780: Coastal floodplain sedgelands, rushlands, and forblands of the North Coast</i> <i>PCT 1145: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i> <i>PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i>
4	Trees: nil Shrubs: <i>Lophostemon confertus</i> Groundcover: <i>Cenchrus clandestinum*</i> , <i>Sacciolepis indica</i> , <i>Cyperus polystachyos</i> Other: nil	Forested Wetlands/Coastal Swamp Forests	<i>PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion</i> <i>PCT1227: Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i> <i>PCT 1230: Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion</i>
5	Trees: nil Shrubs: nil	Grassy Woodlands/Coastal Valley Grassy Woodlands	As for Plot 3

Plot	Dominant species	Vegetation formation and class (from BAM-C)	PCT choices in Clarence Lowlands subregion
	Groundcover: <i>Cenchrus clandestinum</i> *, <i>Imperata cylindrica</i> , <i>Cynodon dactylon</i> , <i>Pteridium esculentum</i> , pasture grasses Other: nil		Note: this is a derived form of PCT 837 (formerly cleared forest with occasionally Blady Grass and Bracken) and represents Zone 2 of PCT 837.
6	Trees: nil Shrubs: nil Groundcover: <i>Eleocharis philippinensis</i> , <i>Philydrum lanuginosum</i> , <i>Baumea rubiginosa</i> Other: nil	Forested Wetlands/Coastal Floodplain Wetlands	PCT 780: Coastal floodplain sedgeland, rushlands, and forblands of the North Coast <i>PCT 1145: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i> <i>PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i>
		Freshwater Wetlands/Coastal Freshwater Lagoons	<i>PCT 782: Coastal freshwater meadows and forblands of lagoons and wetlands</i> <i>PCT 1808: Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline</i> <i>PCT 1911: Red-fruit Saw-sedge - Baumea - Coral Fern shrubby sedgeland on the margins of freshwater coastal lagoons along the New South Wales coastline</i>
7	Trees: <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> Shrubs: nil Groundcover: <i>Cuphea carthagenensis</i> *, <i>Cenchrus clandestinum</i> * Other: nil	Grassy Woodlands/Coastal Valley Grassy Woodlands	<i>PCT 762: Cabbage Gum open forest or woodland on flats of the North Coast</i> PCT 837: Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion <i>PCT 848: Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast</i> <i>PCT 971: Narrow-leaved Red Gum woodlands of the lowlands of the North Coast</i>

*selection in bold indicates PCT used in the BAM-C

Plant Community Types over the entire site are described in **Table 3.2** and mapped at **Illustration 3.1**. Patch class sizes have been allocated to each PCT based on aerial mapping and in accordance with Section 4.3.2 of the BAM and Section 3.3.3 of the Operation Manual 2020 (Stage 1).

Illustration 3.1 demonstrates that the majority of PCTs at the site are not within the proposed development footprint.

Table 3.2 Plant Community Types

Plant Community Type	Comments & Patch Size #	Area (ha)	Affected by proposal?
<i>PCT 837: Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion</i> Zone 1: Open woodland dominated by Pink Bloodwood (<i>Corymbia intermedia</i>). Midstorey absent. Groundcover slashed/grazed Blady Grass (<i>Imperata cylindrica</i>), pasture grasses. Zone 2 (derived): formerly cleared areas with Blady Grass, Bracken and other herbs in the ground layer in addition to pasture grasses (Kikuyu). Zone 3 (derived): Isolated regrowth Coast Banksia (<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>) within pasture.	Zone 1: Highly modified disjunct area with widely scattered trees. Zone 2: derived grassland where trees have been cleared. Zone 3: Two small patches of Coast Banksia (5 in each). Patch size class: ≥100 ha	Zone 1: 2.72 Zone 2: 1.94 Zone 3: 0.06	Zone 1 - yes (0.42 ha) Zone 2 - yes (1.59 ha) Zone 3 - yes (0.02 ha)
<i>PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion</i> Zone 1: Dominated by Broad-leaved Paperbark (<i>Melaleuca quinquenervia</i>) with occasional Swamp Oak (<i>Casuarina glauca</i>). Midstorey sparse - occasional Cheese Tree (<i>Glochidion</i> sp.). Groundcover sparse or with Bare Twigrush (<i>Machaerina juncea</i>). Zone 2: Regrowth of Prickly Paperbark (<i>M. styphelioides</i>) +/- Broad-leaved Paperbark within sedgeland of <i>Machaerina rubiginosa</i>, <i>M. juncea</i> and <i>M. articulata</i>.	Zone 1: Good condition in established patches – some cattle disturbance. Zone 2: regeneration within formerly cleared areas. Minor regrowth along fencelines in the south of Lot 47 Zone 2: post-clearing regrowth; disturbed by cattle Patch size class: ≥100 ha	Zone 1: 2.56 Zone 2: 3.13	Zone 1 - yes (0.16 ha) Zone 2 - yes (0.02 ha)
<i>PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (derived)</i> Dominated by Swamp Oak, with infrequent Broad-leaved Paperbark. Midstorey absent. Groundcover of Couch (<i>Cynodon dactylon</i>) and Bare Twigrush. Central drain of mixed aquatic species: <i>Baumea articulata</i>, <i>Eleocharis acuta</i>, <i>Enydra woollsii</i>, <i>Philydrum lanuginosum</i>, <i>Schoneplectiella mucronata</i>.	Narrow linear regrowth along drainage line. High edge to core ratio, low species diversity. Patch size class: ≥100 ha	0.35	Yes (0.33 ha)
<i>PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion</i> Zone 1: regrowth of Swamp Box with agricultural weeds and grasses (<i>Setaria sphacelata</i>*, <i>Melinis repens</i>*, <i>Macropitium atropurpureum</i>*) in filled area. Zone 2: minor regeneration of Swamp Box within formerly cleared land.	Zone 1: regrowth around a small area of filled land. Zone 2: post-slashing regeneration. Patch size class: ≥100 ha	Zone 1: 0.23 Zone 2: 0.09	Zone 1 - no Zone 2 - yes (0.09 ha)

Plant Community Type	Comments & Patch Size #	Area (ha)	Affected by proposal?
PCT 780: Coastal floodplain sedgeland, rushland, and forblands of the North Coast Disturbed ephemeral wetland (slashed, grazed). Trees and shrubs absent. Typical species: <i>Baumea rubiginosa</i>, <i>B. articulata</i>, <i>Eleocharis phillippinensis</i>, <i>Philydrum lanuginosum</i>, <i>Persicaria strigosa</i>, <i>Juncus usitatus</i>. <i>Cuphea</i>* (<i>Cuphea carthagenensis</i>) is a common weed species.	Small disjunct disturbed patches associated with low-lying and drainage areas - cattle disturbance. Patch size class: ≥100 ha	2.33	Yes (0.34 ha)
TOTAL		13.42	2.96

* Exotic species

Refer to Section 5.3.2 of BAM 2020

3.2.3 Threatened ecological communities

3.2.3.1 Biodiversity Conservation Act 2016

Native vegetation at the site is floristically characteristic of four threatened ecological communities (TECs) associated with alluvial floodplains listed in the BC Act:

- Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (floristically analogous with PCT 837 and PCT 1227).
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (floristically analogous with PCT 1064).
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (floristically analogous with PCT 1235).
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (floristically analogous with PCT 780).

However, the site occurs within an aeolian landscape characterised by Quaternary sand sheets (as part of the Iluka soil landscape); refer to **Section 2.6** and **Illustration 2.5**. As the site does not occur on an alluvial landscape, none of these TECs apply.

While DPIE/BCD have expressed some concern about the interpretation by consultants regarding TECs based on landform and soil type, the Final Determinations are clear and have been tested in the courts with regard to these matters (eg. Gales Holdings v Tweed Shire Council 2008).

It is noted that a BDAR prepared for Lot 1 DP568545 Carrs Drive (immediately west of the site) by GHD (2018) arrived at a similar conclusion regarding TECs when they do not occur on alluvial landscapes, stating:

Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion (PCT 1230) is often a component of Swamp Sclerophyll Forest on coastal floodplains, this vegetation type is unlikely to comprise an occurrence of this TEC on the subject site due its mapped occurrence on aeolian sand sheets of the Iluka Soil Landscape rather than on an alluvial Soil Landscape (Woodburn 1:100,000 Soil Landscapes, Morand 2010).

This position was accepted by Council and the development (and BDAR) approved. It would be expected a similar consistent approach would be taken with regard to TECs at the subject site.

3.2.3.2 Environment Protection and Biodiversity Conservation Act 1999

Swamp Oak forest is also listed in the EPBC Act (as the TEC *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland*) it is subject to condition thresholds, where a minimum patch size of 0.5 ha applies. The small patch of Swamp Oak at the site is <0.3 ha and hence does not meet condition thresholds as per the EPBC Act listed community.

3.2.4 Vegetation integrity

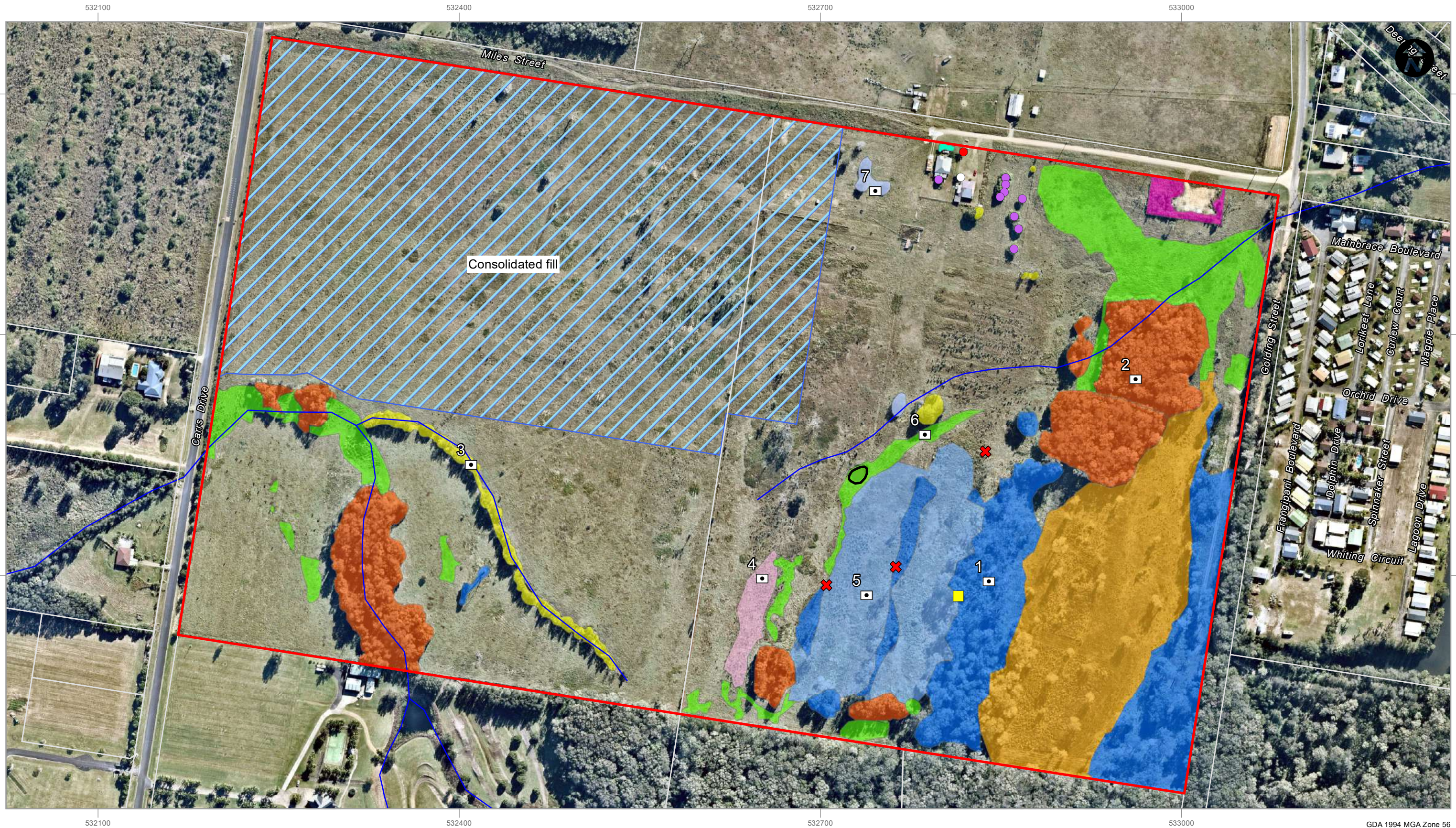
A summary of plot data as per the BAM-C is provided at **Table 3.3** (refer plot data sheets for individual details).

Table 3.3 Plot Data Summary

Plot	PCT	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score*
1	837 (Zone 1)	52.1	68.9	65.8	61.8
2	1064	94.1	80.2	100	91
3	1235	45.6	23.9	30.7	32.2
4	1227 (Zone 2)	43.6	48.7	15.1	31.7
5	837 (Zone 2)	36.8	42.8	34.1	33.6
6	780	41.3	62.4	15	33.8
7	837 (Zone 3)	11.7	25.3	17.7	17.4

*** NOTE:** As per Section 9.2.1 of BAM 2020, an offset for impacts of a proposal on PCTs is required for vegetation with a VI score of:

- a. ≥ 15 , where the PCT is representative of an EEC or a CEEC
- b. ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- c. ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.



LEGEND

- The site
- Cadastre
- Consolidated fill - all vegetation removed
- Dam
- Watercourse

- Non-native vegetation (landscaping)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 1)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 2)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 3)
- PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 1)

- PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 2)
- PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion (Zone 1)
- PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion (Zone 2)
- PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
- PCT 780: Coastal floodplain sedgelands, rushlands, and forblands of the North Coast

- Non-native Tree (Mango)
- Planted Native Vegetation (Flame Tree)
- Planted Native Vegetation (Plum Pine)
- Raptor nest
- Stag (no hollows)
- Vegetation plot



4. Threatened Species

4.1 Introduction

Following input of all plot data into the BAM Calculator, a list of threatened species with potential to occur at the site ('candidate threatened species') was generated.

The BAM Calculator sorts threatened species into two biodiversity credit classes as follows:

1. Ecosystem credit species: *Threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection, are identified in the Threatened Biodiversity Data Collection as ecosystem credit species. Targeted survey is not required for these species.*
2. Species credit species: *Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.*

The BAM provides three options for determining species presence: targeted survey, an expert report or assuming presence:

Targeted survey

The objective of the targeted survey is to identify, with a high level of confidence, the presence or absence of a species on the subject land and, if present, the abundance or area of suitable habitat (as a surrogate for abundance). The survey aims to minimise 'false-negatives' (i.e. when a species is reported as absent from a site when it is present). It can also provide additional information on habitat use and distribution of the species across the subject land.

The assessor must undertake targeted threatened species survey using a scientifically robust, fit-for-purpose and repeatable method. Surveys are to be conducted in accordance with the taxa-specific guidelines that are available. Surveys must be conducted at the optimum time for detecting the species. Optimum survey months for a species are automatically populated in the Calculator.

Expert report

An expert report may be relied upon in place of targeted surveys, in accordance with Subsection 6.5.2 of the BAM. An expert report can only be prepared by a person who, in the opinion of the Environment Agency Head, is suitable (Subsection 6.5.2 of the BAM). The expert must determine the likely presence/absence of the species, and if present, is responsible for mapping the species polygon. The expert must author the expert report. If the survey or expert report confirms that the target species is present or likely to use the potential habitat on the subject land, the species or its habitat requires further assessment.

If the survey or expert report confirms that the target species is unlikely to be present (absent), no further assessment is required.

Assuming presence

As an alternative to targeted survey or an expert report, an assessor may choose to assume species are present on the subject land. Assuming species' presence or using an expert report may be appropriate where:

- The target species is cryptic and therefore difficult to identify via survey
- The optimal survey time for the species has been missed (e.g. where the assessor would prefer that an expert report be prepared rather than wait for the appropriate survey season).

Candidate threatened species are further discussed in **Section 4.3** and **4.4**.

4.2 Assessment of Habitat Suitability

Resources at the site which are of benefit to threatened fauna species include:

- Flowering Broad-leaved Paperbark and Pink Bloodwood (nectar resources) within PCT 1064 and PCT 837.
- Four hollow-bearing trees (all Broad-leaved Paperbark) associated with PCT 1064 in the west of the site (refer to **Illustration 3.1**).
- Small areas of ephemeral wetland within disturbed pasture.
- A larger area of swamp forest/wetland in the east of the site (point of discharge for stormwater).

Due to the highly modified nature of much of the proposed development area (filled land, pasture, absence of a well-developed litter and shrub layer, no fallen logs or coarse woody debris) and the lack of hollow-bearing trees, there are few resources of significance for threatened fauna species.

As demonstrated by the results of field survey, wetland areas (PCT 780 and associated wet pasture) provide habitat for *Rotala*, with PCT 1064 providing habitat for the Spider Orchid. Suitable habitats for threatened flora within the proposed development area are generally absent.

4.3 Ecosystem Credit Species

An assessment of habitat suitability was undertaken for the list of predicted threatened species (ecosystem credit species) generated by the BAM-C (refer to **Appendix D**). Species were classified either as 'potential occurrences on-site' or 'unlikely to occur on the site'. In accordance with the BAM, ecosystem credit species can only be excluded from consideration based on existing geographic and/or habitat constraints identified in the Threatened Biodiversity Database Collection (TBDC). Based on this assessment, a final list of ecosystem credit species was generated and input into the BAM-C. As prescribed within BAM 2020, targeted survey for ecosystem credit species is not required.

4.4 Species Credit Species

An assessment of habitat suitability was undertaken for the list of candidate threatened species (species credit species) generated by the BAM-C (refer to **Appendix E**). Species were classified either as 'potential occurrences on-site' or 'unlikely to occur on the site'. Based on this assessment, a final list of candidate threatened species was generated in the BAM-C and is provided in **Table 4.1**.

Table 4.1 Final List of Candidate Species Credit Species

Scientific name	Common name
FLORA	
<i>Centranthera cochinensis</i>	Swamp Foxglove
<i>Cyperus aquatilis</i>	Water Nutgrass
<i>Dendrobium melaleucaphilum</i>	Spider Orchid
<i>Eleocharis tetraquetra</i>	Square-stemmed Spike-rush
<i>Maundia triglochoides</i>	Maundia
<i>Persicaria elatior</i>	Tall Knotweed
<i>Rotala tripartita</i>	Rotala
FAUNA	
<i>Gavicalis fasciogularis</i>	Mangrove Honeyeater
<i>Myotis macropus</i>	Southern Myotis
<i>Petalura litorea</i>	Coastal Petaltail

As prescribed within BAM 2020, targeted survey or an expert report is required for candidate threatened species unless they are assumed present on-site. Details of targeted surveys undertaken for candidate threatened species are included below in **Section 4.5**.

4.5 Habitat Surveys

4.5.1 Introduction

A summary of field assessment up to commencement of this BDAR (to support other BDARs and BARs) is provided at **Table 4.2**. Much of this information is present and discussed in the BDAR prepared for Lot 46 (GeoLINK reference 3041-1045), which was withdrawn after submission to Council.

Table 4.2 Summary of Field Assessment

Date	Site assessed	Task
26/06/2018	Lots 46 and 47	Initial assessment and stratification, VI plots, incidental fauna survey
16/07/2018	Lots 46 and 47	VI plots, incidental fauna survey
17/07/2018	Lots 46 and 47	Paddock tree survey for DA2018/0553, incidental fauna survey, GPS PCT 780 boundaries
30/10/2018	Lots 46 and 47	Targeted flora surveys, stick nest survey, bird census x 2, incidental fauna survey
31/10/2018	Lots 46 and 47	bird census x 2, incidental fauna survey
8/11/2018	Lots 46 and 47	Target flora surveys (Rotala, Maundia), incidental fauna survey
28/01/2018	Lots 46 and 47	Coastal Petaltail survey # 1, Rotala inspection, incidental fauna survey
8/02/2018	Lots 46 and 47	Coastal Petaltail survey # 2, Rotala inspection, incidental fauna survey
28/03/2019	Lot 46 only	Target flora surveys (SSSR, Swamp Foxglove, Tall Knotweed), incidental fauna survey, Rotala inspection
5/8/2020	Lot 46 only	Vegetation assessment for BAR, Rotala inspection (both lots), incidental fauna survey
30/9/2020	Lot 46 only	Vegetation assessment for VMP, Rotala inspection (both lots), incidental fauna survey
20/10/2020	Lots 46 and 47	Rotala inspection (both lots), incidental fauna survey

Date	Site assessed	Task
01/12/2020	Lots 46 and 47	Rotala inspection (both lots), incidental fauna survey
28/01/2021	Lots 46 and 47	Rotala inspection (both lots), incidental fauna survey
28/02/2021	Lots 46 and 47	Rotala inspection (both lots), incidental fauna survey
20/04/2021	Lots 46 and 47	Vegetation assessment and mapping, additional VI plots, SAT plot, wetland flora survey, incidental fauna survey

Many of the repeat site visits were completed to assess the status of Rotala at the site. Following the initial recording of a population on Lot 47 and a single plant within Lot 46 in November 2018, the species was observed as being absent within habitat areas by February 2019 and was not recorded again. A final targeted survey within Lot 46 completed 28/02/2021 to support a BAR (now replaced by this BDAR) recorded a number of scattered plants within Lot 46, but none within the former habitat areas within Lot 47.

Throughout all field assessment an extensive incidental fauna observation log has been maintained.

Additional field assessment (20/04/2021) was completed for this BDAR to fill information gaps, and included:

- Completion of additional vegetation integrity plots (4, 5, 6, 7)
- GPS mapping of patches of PCT 780 and areas of regrowth PCT 1064
- Random meander searches for Rotala (and other threatened wetland flora) within areas of PCT 780
- Incidental fauna survey
- GPS mapping of stags within the proposal footprint
- Koala SAT survey.

Details of the methodology are provided in the following sections.

4.5.2 Methodology

4.5.2.1 Targeted threatened flora

Rotala

Following initial finding of the species in November 2018 (and confirmation by the NSW Herbarium), further research was completed to determine appropriate survey times.

Rotala can be a difficult species to survey for as it is an annual or short-lived perennial responsive to rainfall and seasonal conditions. During inappropriate conditions the species lies dormant in the seed bank and is not detectable. The Threatened Biodiversity Data Collection (TBDC) prescribes a survey period for Rotala as between December and March and notes:

“Survey within about 6 months of soaking rainfall. Species will be absent above ground if the habitat remains dry for over 6 months. Short-lived perennial, easily overlooked in the field in the dense habitat that it occurs.”

The species listing in the BC Act also states:

There appear to be extreme fluctuations in abundance of the species, with plants observed to germinate prolifically and establish in large numbers after substantial rainfall. Individuals disappear above-ground during dry periods and may only persist during these times in the seed-bank.

Review of records in the BioNet database indicates *Rotala* has been recorded over various times of the year during the warmer months: January (Black Swamp), March (Shannondale, Black Swamp), April (Pillar Valley, Rappville), September (Casino), October (Pacific Highway [Devils Pulpit]), November (Shannondale, the site).

The species is also known to occur at two other sites (Mongogarrie, Dilkoon), with plants recorded in April 2021.

The established population at Lot 47 (recorded November 2018) was used as a population indicator and was inspected on the following occasions: 29/01/2019, 8/02/2019, 28/03/2019, 5/8/2020, 30/9/2020, 20/10/2020, 01/12/2020, 28/01/2021. No plants were ever recorded during these times, and it was assumed that suitable prior rainfall had not occurred to create favourable conditions for the species.

Rotala was recorded on Lot 46 outside of the development footprint on 28/01/2021 but was absent within the more substantial known habitat at Lot 47; the reasons for this are not known.

Further incidental assessment on 20/04/2021 involved a random meander through the NE corner of Lot 47 (previous *Rotala* records) and small isolated patches of PCT 780 as part of habitat mapping.

Other threatened flora

Other threatened flora were surveyed for during 2018 and 2019 using transect surveys consistent with the methodology for surveying threatened plants (DPIE 2020); individuals of Spider Orchid within Lot 47 were identified during this time and recorded by GPS.

An additional survey for Square-stemmed Spike-rush (SSSR) was completed 28 March 2019 using the same methodology as for other wetland threatened flora species (transect surveys within wetland environments). While the survey was outside the accepted target survey period for the species as per the BAM-C (January, February and December), a visit to a known population of SSSR (Epiq Estate, Lennox Head) in the week prior to survey recorded the species in seed with growth up to one metre in height. GeoLINK has monitored the SSSR population at Epiq Estate for many years and both project ecologists are familiar with the species. On this basis, the SSSR survey timing is considered adequate; in the BAM-C, surveys were ticked as being completed in February.

Swamp Foxglove and SSSR was targeted surveyed in Lot 46 in accordance with timing requirements. Further assessment within Lot 47 in April 2021 was outside the prescribed survey period, however a population north of Grafton was known to be flowering at this time (pers. data) as were SSSR at Lennox Head and hence if the species were present they would have been detectable.

Targeted survey effort is depicted at **Illustration 4.1** and summarised in **Table 4.2**. Over the total assessment period, the site has been traversed on foot by experienced assessors on numerous occasions and all areas of suitable habitat for threatened flora have been assessed.

4.5.2.2 Targeted threatened fauna

Targeted survey for threatened fauna included:

- Identification and GPS survey of hollow-bearing trees.
- Searches for raptor stick nests within PCT 837.
- Incidental observations during all fieldwork events over a period of nearly 30 months.
- Two bird census events (evening and morning)
- Two surveys for Coastal Petaltail (based on an original layout which utilised the entire site). Surveys were completed in appropriate conditions and following confirmation of the species being active at the Chaffin Creek site at Tucabia (refer to Baird and Andren 2017). Two surveyors walked parallel transects through wetland habitats with butterfly nets and binoculars. Any dragonflies observed were watched with binoculars and/or captured for identification. Surveyor David Havilah has observed the species in the hand and taken several photographs of the species and so is well-versed in identification. At the first survey shallow water was present within sedgeland and swamp areas; by the second survey no standing water was present due to hot and dry conditions. Discussion with Coastal Petaltail expert Dr Ian Baird confirmed that survey within dry conditions was adequate.
- Koala surveys, with one SAT plot assessed within Lot 47 (April 2021); as per Phillips & Callaghan 2011). SAT surveys were not suitable to complete within areas of PCT 1064 as these areas were inundated over several months in early 2021. Based on extremely low records of Koalas in the locality (refer **Section 4.5.3 & 7.1**, this effort is considered sufficient)

A summary of survey effort is shown at **Table 4.3** and depicted at **Illustration 4.1**.

Table 4.3 Summary of targeted fauna survey

Target species	Survey method	Date	Effort
Raptors	Bird census	30/10/2018, 31/10/2018	40 minutes
	Stick nest survey	17/07/2018	One hour
Other birds	Incidental survey	(refer Table 4.1)	Many hours over numerous site visits over 30 months
Coastal Petaltail	Searches of wetland communities (two people)	28/11/2018, 8/02/2019	Eight hours (total)
Koala	SAT plot x 1	20/04/2021	1 hrs

Survey for threatened fauna included incidental observations during all fieldwork (refer **Table 4.2**) during numerous site visits over a 30 month period. Other than for the Koala, Coastal Petaltail and birds, no targeted field survey for fauna was completed. Resources at the site may be used opportunistically by several threatened fauna species only and these were acknowledged in the BAM-C as ecosystem credit species and hence no surveys were required.

4.5.3 Survey results

4.5.3.1 Threatened flora

Two threatened flora species were recorded:

- **Rotala (*Rotala tripartita*):** Rotala was recorded at the site in November 2018, with an estimated 650 plants recorded. Further targeted surveys on numerous occasions failed to detect the species since this time, until a small population was detected in association with several melonhole depressions in the south-west of Lot 46 on 28/01/2021. An estimated 45 plants were recorded, the majority of which are up to 20 cm in height; only one plant was in fruit. Plants were typically within dense *Setaria*. Despite the good conditions and regular summer rain, no Rotala was recorded within Lot 47 on this same occasion where a robust population was previously recorded in 2018. Based on the known records and with the adoption of a 30m buffer around each plant (in accordance with BAM 2020), a total area of 3.28 of Rotala habitat occurs at the site.
- **Spider Orchid (*Dendrobium tetragonum* var. *melaleucaphilum*):** Several Spider Orchids were recorded in the east of Lot 47 within paperbark forest (PCT 1064) on 30 October 2018; this habitat lies outside the development area and will be retained in-situ. Based on the known records and with the adoption of a 30m buffer around each plant, a total area of 0.89 ha of Spider Orchid habitat occurs at the site.

The location of threatened flora is depicted at **Illustration 4.2**, with a 30 m buffer provided around each record to provide a species habitat polygon in accordance with BAM 2020. Neither of these species occur within the development footprint and would not be impacted by the proposal. Rotala occurs within residue land in the east which will receive stormwater flow (an indirect impact). Potential stormwater impacts on Rotala habitat are further discussed in **Section 5.3.2**.

4.5.3.2 Threatened fauna

No threatened fauna species were recorded. An inventory of all fauna records from the multiple site visits undertaken is provided at **Appendix F**.

While the site is significantly modified and cleared, native vegetation provides a range of habitat within grassland, open woodland (since cleared) and swamp sclerophyll forests, with areas of wetlands and wet pasture providing foraging habitat for a range of common wetland birds. These wetland environments also provide habitat for a range of common frog species. Connectivity to areas of adjacent swamp forest to the south and east provides linkages for arboreal mammals such as possums (ringtail, brushtail) and gliders (sugar, feathertail, squirrel). A range of microchiropteran bats may utilise the site for foraging, with flying-foxes likely to forage on flowering paperbark/bloodwood on an opportunistic basis. Eastern Grey Kangaroos utilise the site, and other ground-dwelling mammals may include species such as bandicoots and other macropods (Red-necked Wallaby, Swamp Wallaby).

Very few preferred Koala feed trees occur (two Forest Red Gum) and the site provides poor Koala habitat due to the absence of suitable habitat and the absence of recent local records in BioNet. Recent Council reporting (Clarence Valley Koalas: Sighting Data Analysis July 2020) indicates that a resident Koala population does not occur around Yamba township.

Four hollow-bearing trees (all Broad-leaved Paperbark) occur within PCT 1064 (refer to **Illustration 4.3**) outside the development footprint and will be retained in-situ. The mature Forest Red Gum (paddock tree) in the west of the site contains several termitaria, one of which supports a hollow (most likely used for nesting by Sacred Kingfishers). All hollow-bearing trees within PCT 1064 will be retained. The termitaria within the paddock tree will be removed.

While disturbed habitat for the Coastal Petaltail occurs, habitat surveys completed in accordance with required methods did not detect the species.

4.5.4 SAI Entities

Rotala is listed as an SAI entity in the Threatened Biodiversity Data Collection (TBDC).

Section 3.2 of the Operational Manual (Stage 2) notes that SAI entities must be assessed in accordance with section 10.2 of the BAM 2020, with TECs at risk of an SAI assessed as per Subsection 10.2.2 of the BAM 2020, and species assessed as per Subsection 10.2.3.

An assessment of the proposal against SAI entities was completed in accordance with the BAM and the EES (2019b) guideline: *Guidance to assist a decision-maker to determine a serious and irreversible impact* (refer to **Appendix G**).

The assessment concluded the proposed development would be unlikely to result in serious and irreversible impacts on biodiversity.

4.6 Summary

Following the potential occurrence assessment (candidate species credit species; refer **Table 4.1**) and field survey, one species was accepted in the BAM-C as being impacted by the proposal (refer **Table 4.4**).

Table 4.4 Species Credit Species Impacted by the Proposal

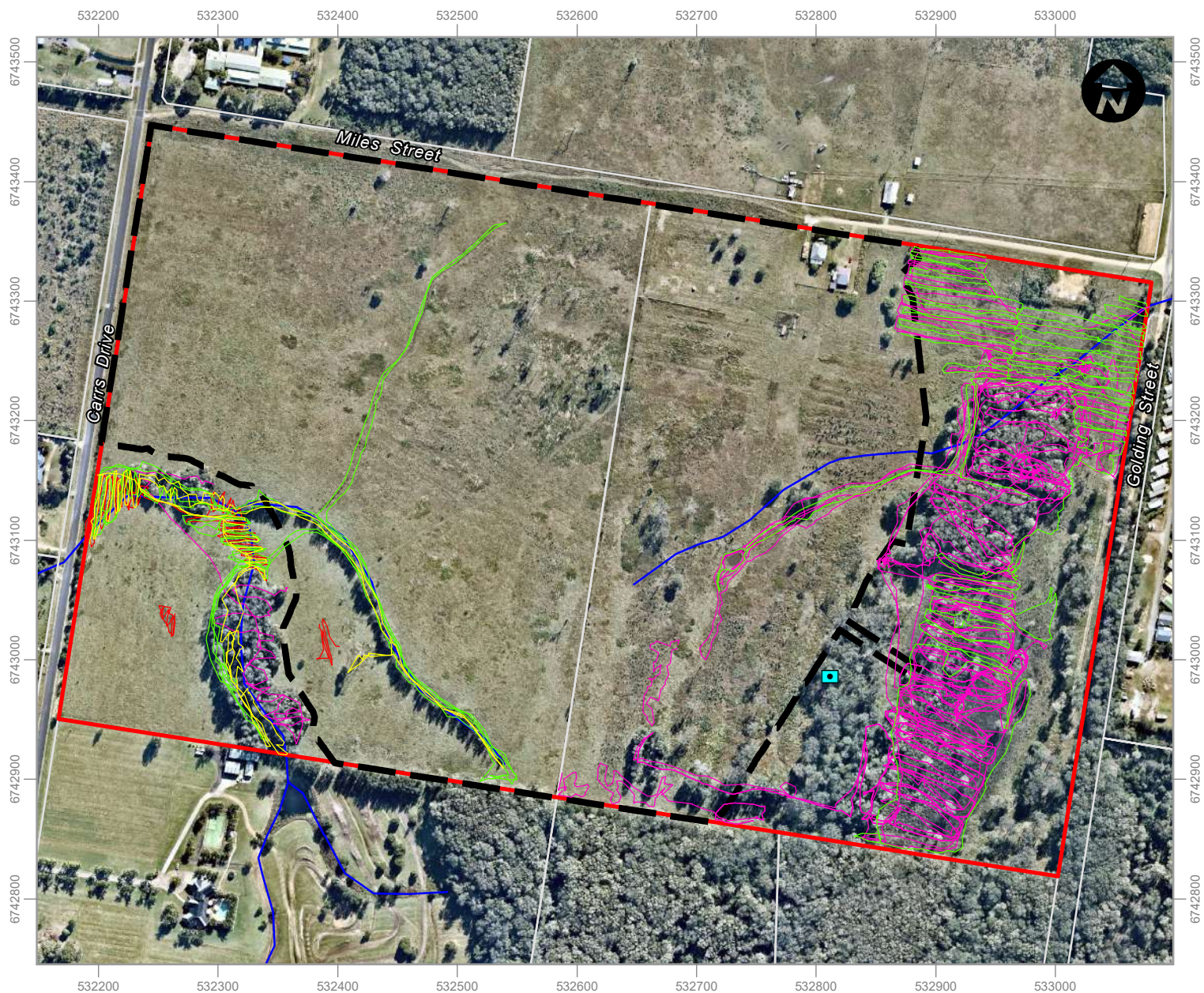
Species	Comments
<i>Myotis Macropus</i> Southern Myotis	The farm dam within Lot 47 represents potential foraging habitat for Myotis and the species was assumed present. Illustration 4.3 shows a species polygon based on advice in the TBDC “ <i>All habitat on the subject land where the subject land is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land must be mapped</i> ”. On this basis, an area of 13.49 ha of Myotis habitat occurs. However 9.15 ha of this area is within approved clearing zones from previous approvals, and part of the species polygon lies outside the development footprint. Myotis foraging habitat was therefore based on an area of approximately 4.14 ha and calculated on the basis of PCTs within this area (refer Figure 4.1). Affected PCT areas totalling 2.52 ha were entered into the BAM-C as per Table 4.5 .



Figure 4.1 Myotis Foraging Habitat within the Development Area

Table 4.5 Myotis Habitat Loss within Foraging Habitat

PCT	Area (ha)
PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 1)	0.15
PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 2)	0.02
PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion (Zone 2)	0.09
PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	0.04
PCT 780: Coastal floodplain sedgeland, rushland, and forbland of the North Coast	0.23
PCT 837: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 1)	0.40
PCT 837: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 2)	1.59
PCT 837: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 3)	0.02
TOTAL	2.52



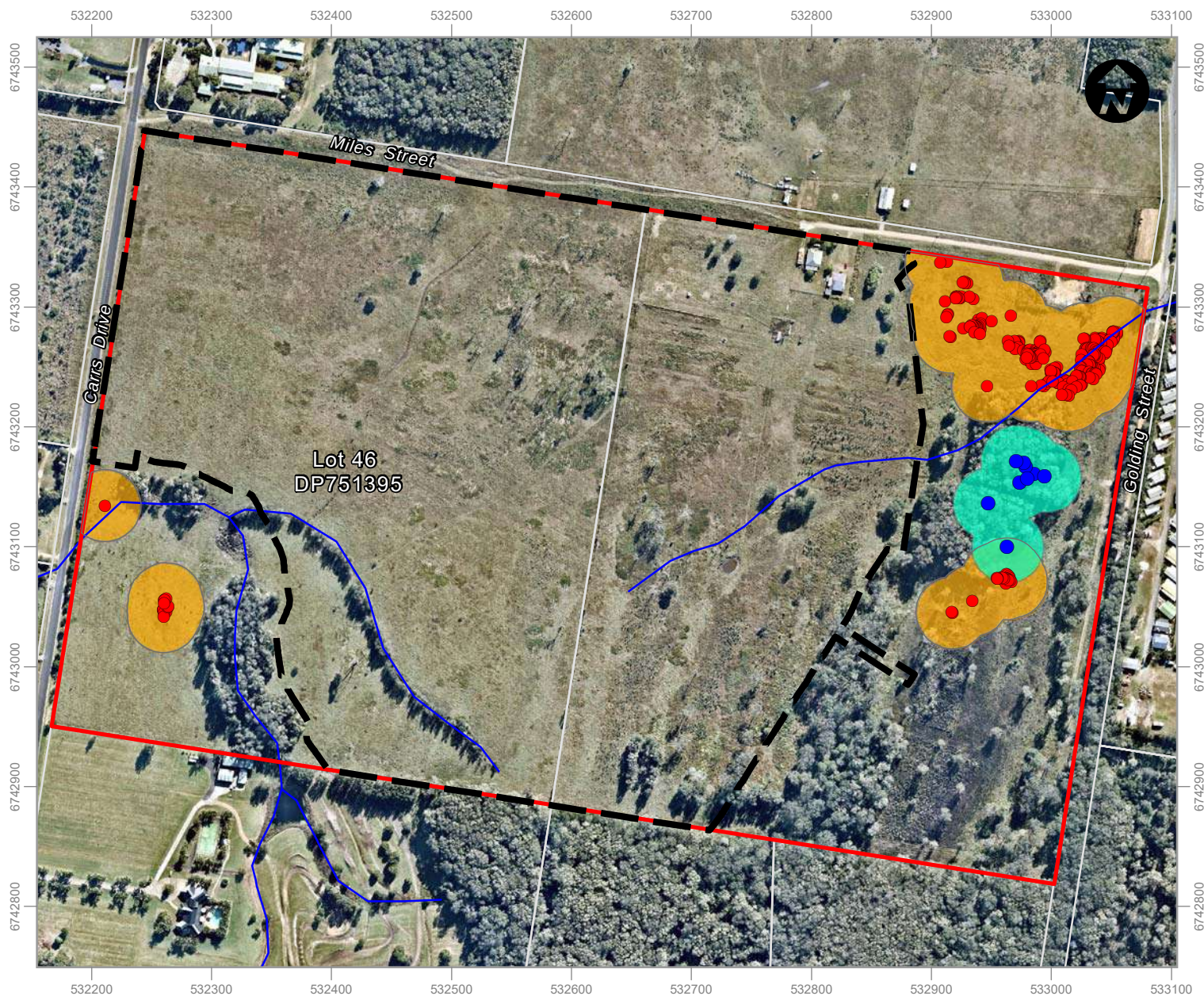
GDA 1994 MGA Zone 56

LEGEND

- The site
- Cadastre
- Development area
- Watercourse
- Targeted surveys - *Eleocharis tetraquetra*, *Centranthera cochinchinensis*, *Persicaria elatior* 28 03 2019
- Targeted surveys - *Maundia triglochinos*, *Rotala tripartita* 08 11 2018
- Targeted surveys - *Rotala tripartita* 01 12 2020
- Flora survey transect
- SAT

0 100 Metres

Survey Effort - Illustration 4.1



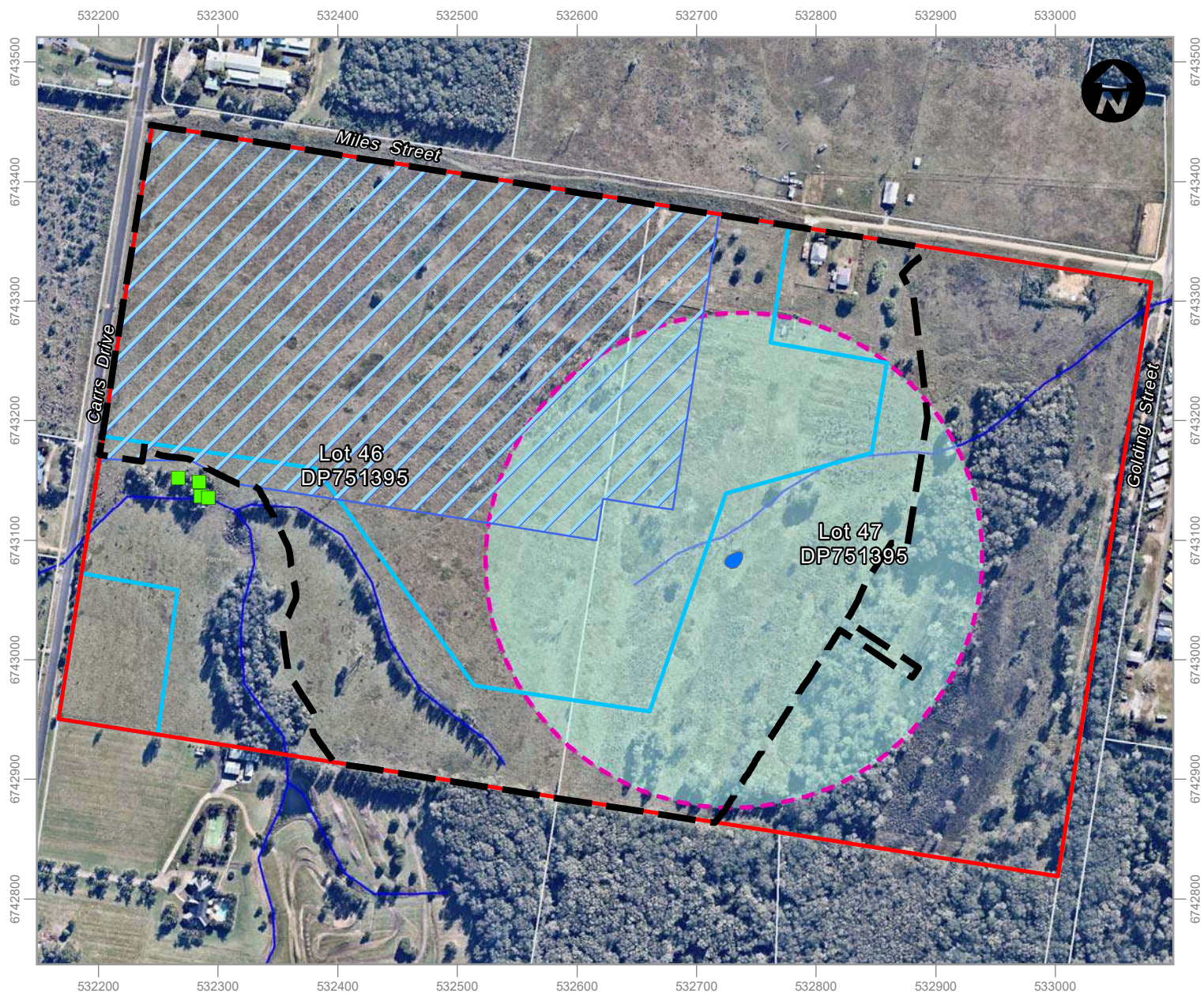
GDA 1994 MGA Zone 56

LEGEND

- | | | |
|--|--|--|
| The site | Rotala tripartita 30 m buffer | — Watercourse |
| Cadastre | Spider Orchid 30 m buffer | ● Rotala tripartita |
| Development area | | ● Spider Orchid |

0 100 Metres

Threatened Flora - Illustration 4.2



GDA 1994 MGA Zone 56

LEGEND

- The site
- Development area
- Consolidated fill (previous approval)
- Southern Myotis foraging habitat (200m buffer to water body)
- Dam
- Approved development area 2018 (DA2018/0553)
- Hollow-bearing Tree
- Watercourse

0 100 Metres

Threatened Fauna Habitat - Illustration 4.3

5. Impact Assessment

5.1 Introduction

Under the BAM 2020, the proponent must apply the key principle of avoiding or minimising the direct, indirect and prescribed impacts on biodiversity values in accordance with section 6.12 of the BC Act. As per the Stage 2 Operational Manual (DPIE 2019) the proponent and assessor must seek to avoid the impacts of a development on all biodiversity values, including:

- TECs
- All native vegetation
- Habitat for threatened species and TECs including those described as prescribed impacts
- Individuals of threatened species and populations.

The avoid and minimise principle must be applied to direct impacts, indirect impacts and prescribed impacts (as per cl. 6.1 of the BC Regulation) and is detailed in the following sections.

5.2 Avoiding and minimising impacts

The design of the proposal has changed substantially since 2018, when all vegetation over the entire site was proposed for removal (with the exception of the eastern portion where Council's floodway is proposed); refer **Figure 5.1**. Since preliminary findings and assessment (and identification of the *Rotala* population), the development area has been significantly reduced, most of which comprises filled land under previous consents, and with relatively minor loss of native vegetation/habitat. The majority of habitat at the site now falls outside the development footprint and areas of known *Rotala* and Spider Orchid habitat are retained in-situ.

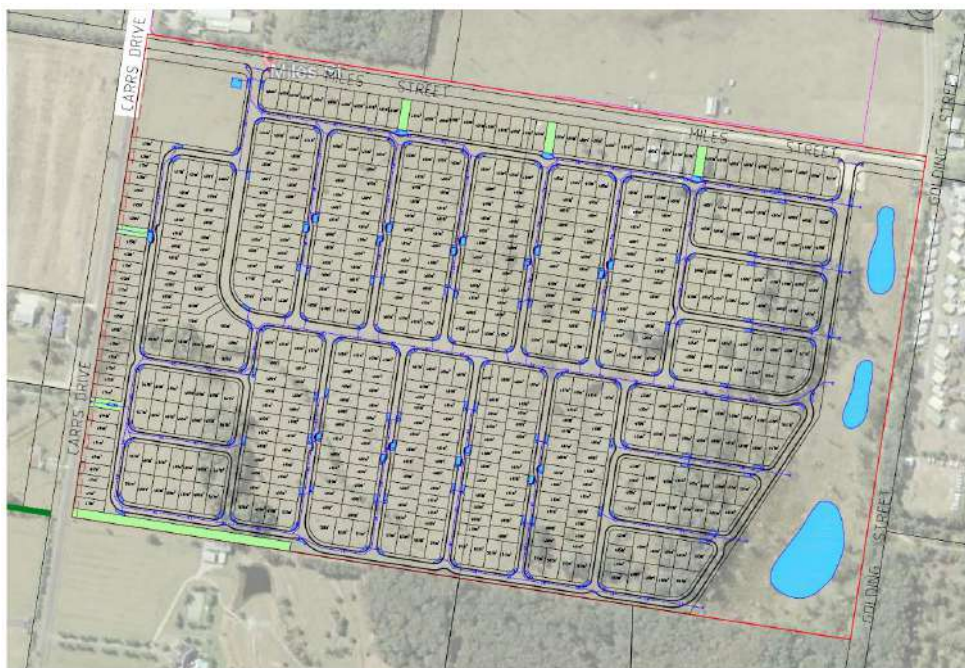


Figure 5.1 Initial development proposal (September 2018)

The larger area of residue land in the east of the site (proposed Lot 903) is proposed for dedication to Council as part of future floodway planning subject to negotiation between the landowner and Council. An alternative situation may be that some or all of proposed Lot 903 is retained in private ownership with maintenance responsibilities. There are opportunities to allow for regeneration of part of this area to improve biodiversity values (namely areas of PCT 837 and PCT 780 which have been historically modified and/or cleared).

On this basis, the proposal avoids and minimises biodiversity impacts by

- Utilising the main portion of the site for which consents for filling and vegetation removal have already been approved and land is highly disturbed/modified.
- Retaining all areas of known Rotala habitat and Spider Orchid habitat.
- Retaining larger patches of native vegetation in the east and south-west of the site.

Vegetation loss for the proposal are considered acceptable in the context of being small in area, of poor quality (or regrowth) and within highly modified habitats.

Measures for mitigation of identified biodiversity impacts (additional to the retirement of any identified credits) are further discussed in **Section 6**.

5.3 Impact summary

5.3.1 Direct Impacts

The proposal will result in direct and permanent impacts to biodiversity from construction and operation (in perpetuity) of the proposed development. As a result of filling of the development site, all native vegetation within the development footprint requires removal. As noted, previous approvals apply to the development for filling and vegetation removal (refer Section 1.2) and hence vegetation within these areas has not been included in calculations. Vegetation and biodiversity impacts are shown at **Illustration 5.1**.

Direct biodiversity impacts are likely to include

1. Loss of native vegetation. Based on **Table 5.1**, a total of 2.96 ha of native vegetation across five PCTs will be impacted by the proposal.
2. Impacts to 13.49 ha of foraging habitat for the Southern Myotis.
3. Loss of three non-hollow bearing stags.
4. Minor loss of fauna resources (based on the above).
5. Disturbance (noise, human activity, machine operations) to locally occurring urban-adapted fauna species during development and construction.

Table 5.1 Vegetation impacts

PCT	Description	Area impacted (ha)
837	Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion ZONE 1	0.42
837	Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion ZONE 2	1.59
837	Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion ZONE 3	0.02
1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion ZONE 1	0.16
1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion ZONE 2	0.02
1235	Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	0.33
780	Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	0.34
1227	Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	0.09
	TOTAL	2.96

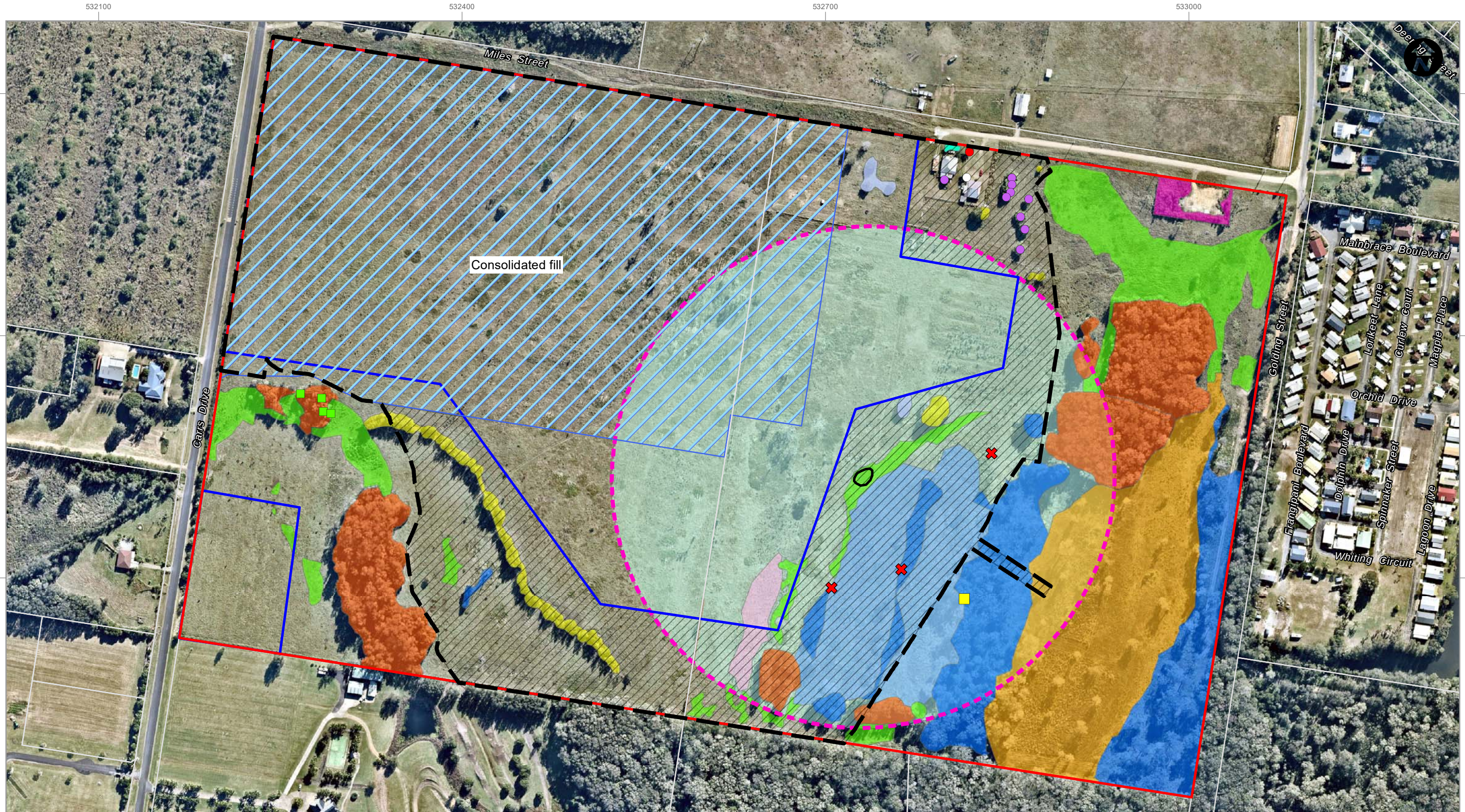
5.3.2 Indirect Impacts

Indirect impacts are development related activities not associated with clearing for the development footprint and may include matters such as increased noise, dust, light spill, weeds and pathogens and edge effects that can be reasonably attributed to the development. As the site occurs adjacent to contiguous habitats, consideration of indirect impacts is important.

Based on the construction requirements and nature of the development (residential dwellings), anticipated indirect development may include:

1. Trampling and degradation of native vegetation and threatened flora habitat within residual land by trespassing residents.
2. Increased noise and activity which may negatively affect native fauna.
3. Introduction of weed propagules to residue land from illegal dumping.
4. Ongoing disturbance to local fauna during occupation of the site from noise, light and human presence.
5. Impacts on fauna habitat from roaming domestic pets (dogs, cats).
6. Stormwater disposal negatively affecting residue vegetation at the site (and offsite).

Internal roads of the development will be low speed (50 km/hr) urban roads. While the proposal would increase traffic volumes, traffic would be moving at low speeds and risks to fauna from vehicle collision are unlikely to be significant.



LEGEND

- The site
- Cadastre
- Development area
- Approved development area 2018 (DA2018/0553)
- Consolidated fill - all vegetation removed
- Dam
- Southern Myotis foraging habitat (200m buffer to water body)
- Land impacted by the proposal

- Non-native vegetation (landscaping)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 1)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 2)
- PCT 837: Forest Red Gum Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (Zone 3)
- PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 1)

- PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (Zone 2)
- PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion (Zone 1)
- PCT 1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion (Zone 2)
- PCT 1235: Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
- PCT 780: Coastal floodplain sedgelands, rushlands, and forlands of the North Coast

- Non-native Tree (Mango)
- Planted Native Vegetation (Flame Tree)
- Planted Native Vegetation (Plum Pine)
- Raptor nest
- Stag (no hollows)
- Hollow-bearing Tree

5.3.3 Prescribed Impacts

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing vegetation, and include (as per cl. 6.1 of the BC Regulation):

- *the impacts of development on the habitat of threatened species or ecological communities associated with:*
 - *karst, caves, crevices, cliffs and other geological features of significance*
 - *rocks*
 - *human made structures*
 - *non-native vegetation*
- *the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range*
- *the impacts of development on movement of threatened species that maintains their life cycle*
- *the impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)*
- *the impacts of wind turbine strikes on protected animals*
- *the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.*

An analysis of prescribed impacts is detailed in **Table 5.2**.

Table 5.2 Prescribed impacts

Prescribed impact	Response
<i>the impacts of development on the habitat of threatened species or ecological communities associated with:</i> - <i>karst, caves, crevices, cliffs and other geological features of significance</i> - <i>rocks</i> - <i>human made structures</i> - <i>non-native vegetation</i>	The site does not support karst geology and rock features are absent within the development area. Human-made structures include two existing dwellings and outbuildings. These structures do not appear to provide habitat for any significant resident fauna such as microbats. Non-native vegetation includes established pasture grassland, occasional exotic grasses (<i>Paspalum</i>, <i>Setaria</i>, <i>Carpet Grass</i>), wetland weeds (<i>Lippia</i>, <i>Cuphea</i>) and infrequent woody weeds (<i>Lantana</i>, <i>Groundsel</i>, <i>Winter Senna</i>). None of these weed species provides any significant resources (refuge, breeding habitat, food resources) for threatened species.
<i>the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range</i>	The site as a whole has good connectivity to significant swamp sclerophyll habitats to the south-east and south. The proposal will not result in any permanent barriers which would affect any threatened species across its range.
<i>the impacts of development on movement of threatened species that maintains their life cycle</i>	No threatened fauna species are likely to be resident within the development footprint. While the proposal will remove a small area of resources (~ 2.6 ha of flowering/fruiting vegetation), this is negligible in terms of the overall site, and given the modified nature of the development site no significant refuge, roosting

Prescribed impact	Response
	or breeding areas would be affected. The site residue provides potential habitat for threatened fauna and contains resources which are absent within the development area. Any threatened fauna which may occasionally access the development area (eg. foraging microbats) are unlikely to meet any significant restrictions to movement/dispersal.
<i>the impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)</i>	The hydrology of the site will not be significantly affected and stormwater detention will minimise releases of large volumes of untreated water to the environment. On this basis, pre-development hydrology is expected to be largely unchanged. Drainage regimes from the east (via Golding Street) and the west (from Carrs Drive) will remain unaffected. Impacts on water quality will be mitigated by implementation of erosion and sediment control measures during the construction phase.
<i>the impacts of wind turbine strikes on protected animals</i>	The proposal is not a wind farm development.
<i>the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community</i>	The proposal will result in an increase in vehicular traffic to the site which increases potential for roadkill of fauna. However, the internal road system comprises low speed urban roads (50 km/hr) and so the potential for roadkill is substantially reduced.

5.4 Credit requirements

Following the input of data into the BAM-C, a number of credits are required to offset biodiversity impacts associated with the proposal (refer to **Table 5.3**); BAM-C outputs are provided at **Appendix H**.

Table 5.3 Credit Requirements

PCT/species	Credit requirements
Ecosystem credits	
780	6
837 (Zone 1)	11
837 (Zone 2)	23
837 (Zone 3)	1
1064	7
1227	1
1235	5
Sub-total	54
Species credits	
Southern Myotis	47
TOTAL	101

6. Mitigation

6.1 Mitigation

While credits have been identified to offset biodiversity impacts of the proposed development (refer to **Section 5.4**), additional measures to minimise biodiversity impacts during construction and operation of the proposal are prescribed in **Table 6.1** for Council's consideration when determining conditions of consent.

Table 6.1 Mitigation measures

<i>Impact</i>	<i>Mitigation</i>	<i>Responsibility</i>
CONSTRUCTION		
	1. The extent of the proposal must be clearly pegged/marked on site by a registered surveyor, consistent with final approved plans/designs.	Project contractor
	2. Vegetation removal must be completed sensitively using appropriate equipment and to the minimum extent necessary.	Project contractor
	3. Prior to any woody vegetation removal, an ecologist is to examine all affected areas for active nests or dreys. Clearing may only commence to the satisfaction of the project ecologist.	Project contractor/ ecologist
	4. Vegetation to be cleared should not be pushed into adjacent vegetation but be chipped and mulch retained for use-onsite.	Project contractor
	5. No burning or other disposal of cleared vegetation shall occur.	Project contractor
	6. If lopping or pruning of any vegetation is required it must be completed by a certified and experienced arborist in accordance with <i>AS 4970-2009 Protection of trees on development sites</i> .	Project contractor/arborist
Soil and water	7. Appropriate soil and erosion control measures must be implemented and maintained for the duration of construction.	Project contractor
Biosecurity	8. Measures must be implemented during construction works so that machinery and plant do not introduce weed seed or propagules to the site (eg. by adoption and implementation of the 'Arrive Clean, Leave Clean' guidelines (DoE 2015)).	Project contractor
OPERATION/OCCUPATION		
Native vegetation loss and disturbance	9. Council establishes a management plan to maintain suitable conditions for <i>Rotala</i> in the residue land in the east of the site (proposed Lot 903).	CVC

Impact	Mitigation	Responsibility
	10. The proponent maintains existing management regimes within the residue in Lot 46 (proposed Lot 900) such that PCTs and Rotala habitat are not further degraded.	Developer
Fauna disturbance	11. Exterior lighting must be designed and installed in accordance with 'soft lighting' principles to limit spill into adjacent habitats.	Developer/appointed contractor
Habitat degradation	12. Signage must be installed along boundaries with residue land stating ' <i>Environmental Protection - No Entry</i> ' or words of similar intention.	Developer/CVC
	13. Stormwater swale and outlet works must be completed to minimise disturbance to native vegetation and appropriate erosion and sediment controls are installed and maintained.	Developer/appointed contractor

6.2 Compensation

Compensation for the loss of vegetation for the filling approval was based on a financial contribution (based on tree loss numbers) to CVC as part of the consent conditions. It is expected that a similar approach would apply to the current application, or alternatively, the proponent could fund vegetation management works (weed control, planting) within proposed Lot 903 subject to Council agreement.

7. Other Statutory Considerations

7.1 State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP) commenced 17 March 2021. NSW. This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW. At this stage:

- In nine of these LGAs – Metropolitan Sydney (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA – Koala SEPP 2021 applies to all zones.
- In all other identified LGAs, Koala SEPP 2021 does not apply to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3.

The subject site is zoned R1 under the Clarence Valley Local Environment Plan 2011 therefore the Koala SEPP 2021 applies to the proposal.

As the proposal will impacts areas of native vegetation, investigation is required to determine whether 'core Koala habitat' is present. The Policy defines 'core Koala habitat' as:

- a) *an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or*
- b) *an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.*

'Highly suitable habitat' is where 15% or greater of the total number of trees within any Plant Community Type (PCT) are the regionally relevant species of those listed in Schedule 2 of the SEPP.

The proposal footprint contains small areas of disjunct vegetation (PCT 1235, PCT 837 (derived), PCT 1064 and pasture grass) and Koala resources are negligible and limited to two Forest Red Gum in the south-east of Lot 46. When looking at the site as a whole, both PCT 1064 and PCT 837 meet the definitions of 'Highly suitable habitat'; PCT 1064 on the basis of dominance by Broad-leaved Paperbark (est. 90% cover), and PCT 837 on the basis of by Pink Bloodwood (est. 90% cover).

In the absence of any formalised guidelines to support the Policy, the following assessment process was completed:

1. Analysis of Koala records in BioNET with regard to any Koala records within 2.5 km of the site in the last 18 years (accepted as being three Koala generations) and where records have a locational accuracy < 1,000 metres.

2. Completion of a single Koala survey plot using the Spot Assessment Technique ('SAT') as per Phillips & Callaghan 2011, sampling PCT 837 (refer **Illustration 4.1**); targeted searches under 2 x paddock trees of Forest Red Gum on numerous occasions.

Based on step 1, BioNET records indicate a single Koala record within 2.5 kms of the site, an adult sighted within bushland within the Deering Street Road Reserve 3 Cox Street, Yamba (approximately 400 km north of the site) on 31/12/2008 (refer **Illustration 7.1**). This single record is from 12 years ago and appears to be an aberrant record of a lone animal, which is unlikely to be persistent in the wild based on typical adult life spans of up to 15 years.

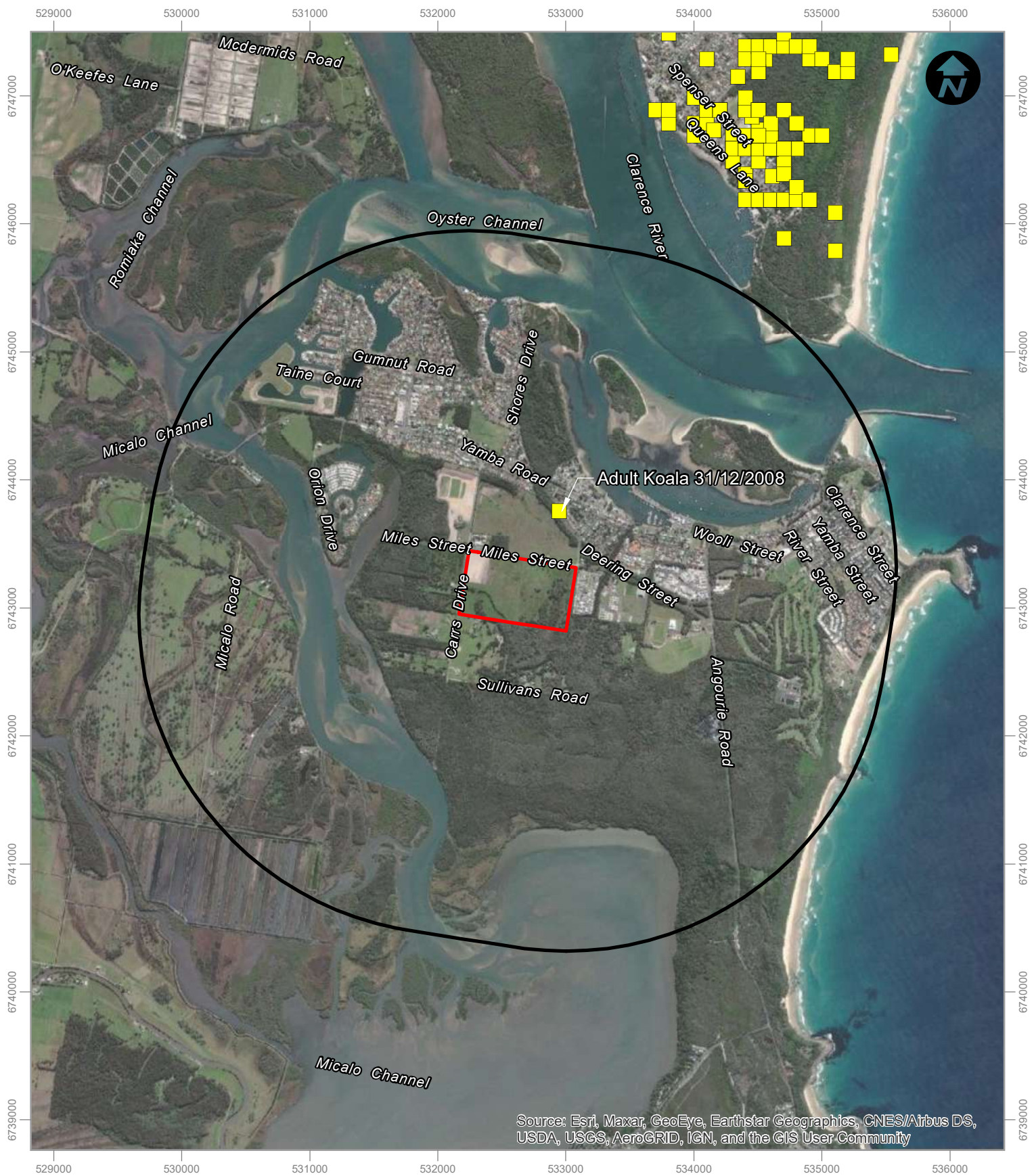
The lack of Koala records in the broader locality supports evidence that a Koala population does not currently reside within or proximate to Yamba township, as supported by recent Council reporting (Clarence Valley Koalas: Sighting Data Analysis July 2020).

Step 2 (SAT survey plot) did return any signs of Koalas (faecal pellets, sightings, scratches on smooth-barked trees). Results are reflective of the local of Koala records in the locality (as above)

As native vegetation is being removed (including two Forest Red Gum), the proposal requires the preparation of a Koala Assessment Report (KAR) which must address five key principles:

1. *Understand Koala habitat values,*
2. *Avoid intensifying land use in Koala habitat areas through appropriate landscape planning and site selection,*
3. *Encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas,*
4. *Minimise potential direct impacts to Koalas through koala sensitive design, and*
5. *Implement best practice measures for the management of identified risks to Koalas.*

A KAR has been prepared in table format to address the requirements set out in the *Koala SEPP 2021 FAQs — development applications* guideline (DPIE 2021); refer **Table 7.1**.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GDA 1994 MGA Zone 56

LEGEND

- The site
- 2.5 km site buffer
- Bionet Koala record

0 800 Metres

Koala Records within 2.5 km of the Site - Illustration 7.1

Table 7.1 Koala Assessment Report

KAR Requirement	Response
Principle 1. Understand Koala habitat values	
<i>What is known about the size, health and viability of the koala population?</i>	There is no evidence of a Koala population currently residing within the Yamba locality.
<i>What is known about the generational persistence of the local koala populations? This should be informed by a record analysis to determine population trends and persistence over time.</i>	There is no evidence of a Koala population currently residing within the Yamba locality, as supported by BioNET records.
<i>What is the broader landscape context of the habitat within the site area? For instance, is it contiguous with broader areas of habitat or relatively isolated, and what are the likely regional movement patterns of koalas using the site area?</i>	Habitat south of the site connects into extensive areas of conservation reserve within Yuraygir National Park. Koala records within this landscape are very few, with a single record from 2004 between Yamba and Brooms Head (BioNET). This supports the theory that there is no Koala population within the Yamba locality and the likelihood of animals immigrating into the area and establishing a population are extremely low.
<i>Does the site area contain particular values likely to serve an important ecological function for koalas? For instance, does it provide linkage between other habitats or serve as a habitat buffer to broader areas?</i>	The site provides poor foraging habitat, moderate refuge habitat and has high connectivity values. However, with no resident Koala population, these values are essentially void.
<i>Could the habitat area and/or koala population using the site area be important to the recovery of the koala? For instance, does the habitat contain features that might provide refuge during droughts, extreme heat, or fire? Or is the population considered to be healthy, robust or showing relatively low incidence of disease?</i>	There is no evidence of a Koala population currently residing within the Yamba locality.
<i>Drawing on evidence presented, what significance are the values of the site to preserving the existing Koala population and supporting recovering and expanding populations?</i>	The site contains poor resources for Koala, with only two trees being preferred Koala food trees, and other vegetation being small in area and of reduced quality for foraging or refuge.
Principle 2. Avoid intensifying land use in Koala habitat areas through appropriate landscape planning and site selection	
<i>How has the development footprint avoided core Koala habitat?</i>	The proposal has been designed to occur within more modified areas of the site where potential Koala refuge habitat is absent.
<i>What feasible alternative site selections were assessed as part of the process?</i>	The proposal has been amended to avoid more vegetated parts of the site where Koala may seek refuge.
Principle 3. Encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas	
<i>Development avoids the direct loss of core Koala habitat within the site area and avoids fragmentation</i>	Core Koala habitat does not occur at the site; no fragmentation of consolidated areas of potential habitat would occur as a result of the proposal.

KAR Requirement	Response
<i>Core Koala habitat is excluded from the development footprint</i>	Core Koala habitat does not occur at the site; no significant Koala habitat occurs within or will be affected by the proposed development.
Principle 4. Minimise potential direct impacts to Koalas through koala sensitive design	
<i>Development avoids direct impacts to core Koala habitat within the site area.</i>	n/a; core Koala habitat is absent from the site.
<i>Where some loss of core Koala habitat cannot be avoided (and provided it is consistent with all other criteria), development is designed in a way that retains higher value areas across the site and avoids fragmentation of habitat within the site area and more broadly within the region.</i>	n/a; core Koala habitat is absent from the site.
<i>Development is undertaken in a way that maintains the potential function of the core Koala habitat.</i>	Potential Koala refuge areas are maintained within residue land outside the development footprint.
Principle 5. Implement best practice measures for the management of identified risks to Koalas.	
<i>All relevant indirect impacts to Koalas and Koala habitat associated with the development are identified.</i>	Few indirect impacts to Koalas are likely given the lack of a local population. The incidence of road kill is likely to be low given the site is an urban area and roads will be low speed (50 km/hr). Other potential indirect impacts such as dog attack are not relevant given the absence of a local Koala population.
<i>Development uses best practice management measures to address the potential impacts considered likely to pose an increased risk to Koalas or their habitat.</i>	n/a - residue land will continue to provide limited resources to any roaming Koalas in the locality.

Based on BioNET results and site investigations, Koalas are unlikely to occur at the site. The KAR notes that the site does not contain core Koala habitat and impacts to Koalas and their habitats are negligible. On this basis the Policy has been satisfactorily addressed and there are no further requirements.

7.2 Environment Protection and Biodiversity Conservation Act 1999

An amending agreement to update the assessment bilateral relating to environmental assessment that the NSW Government has with the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been released for public consultation until 21 February 2019. Through the revised agreement the Australian Government is seeking to endorse the NSW Biodiversity Offset Scheme. OEH and DPE are working with the Australian Government to identify the best way to formally align the NSW Scheme to the EPBC Act environmental offsets policy.

The current bilateral agreement remains operational and will continue to be used for projects that are being assessed under the *Biodiversity Conservation Act 2016* transitional arrangements. Further, the Commonwealth is continuing to accredit use of the BAM for assessment of impacts on EPBC Act listed entities on a project-by-project basis.

Glossary of Terms and Acronyms

Term or acronym	Meaning
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method 2020
BAM-C	BAM Calculator
BC Act	<i>Biodiversity Conservation Act 2016</i>
BC Regulation	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
CVC	Clarence Valley Council
EES	(NSW) Environment, Energy and Science (formerly OEH)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>(Cth) Environment Protection and Biodiversity Conservation Act 1999</i>
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
OEH	Office of Environment and Heritage
PCT	Plant Community Type
SAIL	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community listed in the BC Act and/or EPBC Act
VI	Vegetation Integrity

References

BMT WBM (2018). *West Yamba Urban Release Area Flood Impact Assessment*. Report to Site Plus Pty Ltd on behalf of Yamba Residential Subdivision Pty Ltd.

Bushfiresafe (Aust) Pty Ltd (2021). *Bushfire Risk Management Plan for Residential Subdivision Lots 46 & 47 DP751395 52-54 Miles Street, Yamba*. Report prepared for Rob Donges.

Clarence Valley Council (2011). *Residential Zones Development Control Plan 2011*. Clarence Valley Council.

Clarence Valley Council (2020). *Clarence Valley Koalas: Sighting Data Analysis July 2020*. Report published by Clarence Valley Council.

<https://www.clarenceconversations.com.au/31105/widgets/202045/documents/173211> [Accessed 26/03/2021].

DECC (2008a). *NSW (Mitchell) Landscapes Version 3*. Department of Environment and Climate Change.

DECC (2008b). *Descriptions for NSW (Mitchell) Landscapes Version 2*. Based on descriptions compiled by Dr. Peter Mitchell. DECC, NSW. Department of Environment and Climate Change.

Department of the Environment (DoE) (2015). *Arrive Clean, Leave Clean. Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems*. Commonwealth of Australia 2015.

DPIE (2020). *Biodiversity Assessment Method Operational Manual – Stage 1. State of NSW and Department of Planning, Industry and Environment*

DPIE (2020). *Biodiversity Assessment Method*. Published by the State of NSW and Department of Planning, Industry and Environment.

DPIE (2021). *Koala SEPP 2021 FAQs — development applications*. Published by the State of NSW and Department of Planning, Industry and Environment.

<https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/Policy-and-legislation/faqs-Koala-SEPP-2021-development-applications-process-2021-03.pdf?la=en>

[Accessed 29/03/2021].

EES (2019a). *Biodiversity Assessment Method Operational Manual – Stage 2*. Environment, Energy and Science division of the Department of Planning, Industry and Environment, Sydney NSW.

EES (2019b). *Guidance to assist a decision-maker to determine a serious and irreversible impact*. Environment, Energy and Science division of the Department of Planning, Industry and Environment, Sydney NSW.

GeoLINK (2019). *Biodiversity Development Assessment Report Lot 46 DP751395 Miles Street Yamba*. Report to Garrard Building Pty Ltd.

GeoLINK (2020). *Vegetation Management Plan Lot 46 DP751395 Miles Street Yamba*. Report to Garrard Building Pty Ltd.

GHD (2018). *Mavid Developments Gold Coast Pty Ltd Yamba Manufactured Homes Estate Biodiversity Development Assessment Report*. Report prepared for Mavid Developments Gold Coast Pty Ltd.

James Warren and Associates (2010). *Draft Constraints Analysis Lot 46 DP751395 Lot 47 DP751395 Lot 77 DP751395 Lot 103 DP751395 Lot 51 DP751395 Miles Street, West Yamba*. Unpublished report prepared for Shepherd Harrison Pty Ltd.

Morand, D.T. (2001). *Soil Landscapes of the Woodburn 1:100, 000 Sheet*. Department of Conservation and Land Management, Sydney.

OEH (2017b). *Biodiversity Assessment Method Calculator Users Guide*. Office of Environment and Heritage.

OEH (2017e). *Biodiversity Assessment Method Calculator Version 1.2.1*. Office of Environment and Heritage.

Scotts, D. (2003). *Key Habitats and Corridors for Forest Fauna. Occasional Paper 32*. NSW NPWS.

Thackway R. & Cresswell I. (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program Version 4*, Australian Nature Conservation Agency, Canberra.

Copyright and Usage

©GeoLINK, 2021

This document, including associated illustrations and drawings, was prepared for the exclusive use of Garrard Building Pty Ltd. It is not to be used for any other purpose or by any other person, corporation or organisation without the prior consent of GeoLINK. GeoLINK accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

This document, including associated illustrations and drawings, may not be reproduced, stored, or transmitted in any form without the prior consent of GeoLINK. This includes extracts of texts or parts of illustrations and drawings.

The information provided on illustrations is for illustrative and communication purposes only. Illustrations are typically a compilation of data supplied by others and created by GeoLINK. Illustrations have been prepared in good faith, but their accuracy and completeness are not guaranteed. There may be errors or omissions in the information presented. In particular, illustrations cannot be relied upon to determine the locations of infrastructure, property boundaries, zone boundaries, etc. To locate these items accurately, advice needs to be obtained from a surveyor or other suitably-qualified professional.

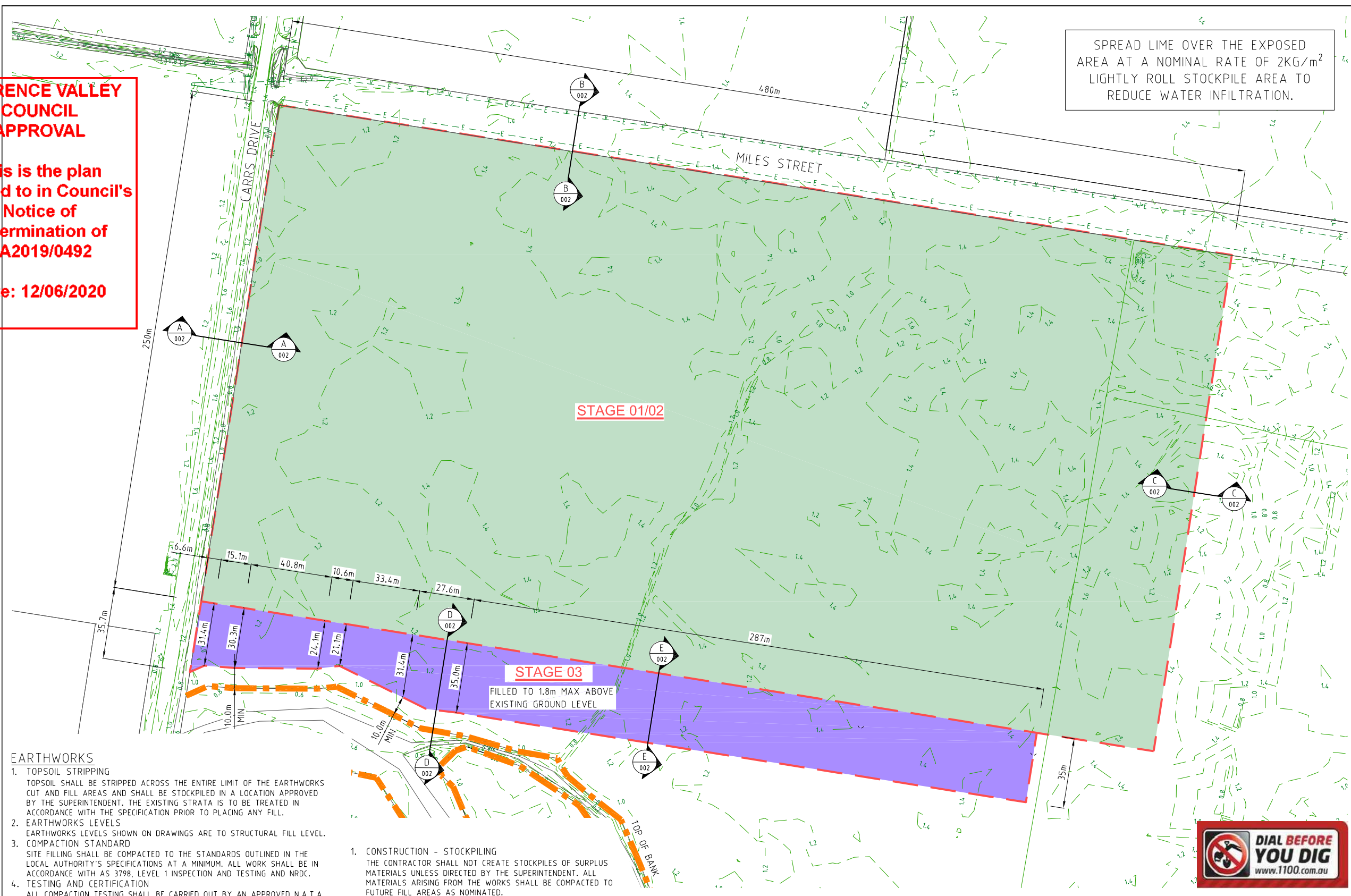
Appendix A

Approved Consents

CLARENCE VALLEY COUNCIL APPROVAL

This is the plan referred to in Council's Notice of Determination of DA2019/0492

Date: 12/06/2020



SPREAD LIME OVER THE EXPOSED AREA AT A NOMINAL RATE OF 2KG/m² LIGHTLY ROLL STOCKPILE AREA TO REDUCE WATER INFILTRATION.

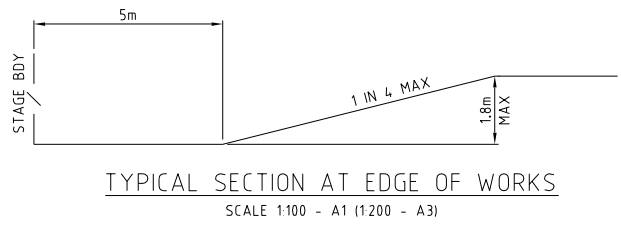
EARTHWORKS

1. TOPSOIL STRIPPING
TOPSOIL SHALL BE STRIPPED ACROSS THE ENTIRE LIMIT OF THE EARTHWORKS CUT AND FILL AREAS AND SHALL BE STOCKPILED IN A LOCATION APPROVED BY THE SUPERINTENDENT. THE EXISTING STRATA IS TO BE TREATED IN ACCORDANCE WITH THE SPECIFICATION PRIOR TO PLACING ANY FILL.
 2. EARTHWORKS LEVELS
EARTHWORKS LEVELS SHOWN ON DRAWINGS ARE TO STRUCTURAL FILL LEVEL.
 3. COMPACTION STANDARD
SITE FILLING SHALL BE COMPACTED TO THE STANDARDS OUTLINED IN THE LOCAL AUTHORITY'S SPECIFICATIONS AT A MINIMUM. ALL WORK SHALL BE IN ACCORDANCE WITH AS 3798, LEVEL 1 INSPECTION AND TESTING AND NRDC.
 4. TESTING AND CERTIFICATION
ALL COMPACTION TESTING SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. TESTING AUTHORITY. ALL SITE FILLING SHALL BE TESTED AT LEVEL 1 REQUIREMENTS. THE CONTRACTOR IS TO PROVIDE ALL REQUIRED EARTHWORKS CERTIFICATIONS IN ACCORDANCE WITH THE APPROVAL CONDITIONS.
 5. TOPSOIL REPLACEMENT
ALL FOOTPATHS, BATTERS AND ALLOTMENT CUT & FILL AREAS SHALL BE TOPSOILED WITH TOPSOIL FROM ONSITE STOCKPILES, AND AMELIORATE SOIL AS NECESSARY TO ENSURE GRASS STRIKE.
 6. GRASSING
ALL CUT/FILL AREAS, DISTURBED AREAS AND TRENCHED AREAS SHALL BE GRASSED TO THE SATISFACTION OF THE SUPERINTENDENT AND LOCAL AUTHORITY.
 7. ROCK
THE CONTRACTOR IS TO INCLUDE ROCK EXCAVATION AS PART OF THEIR EARTHWORKS RATE.
 8. EARTHWORKS ZONE
THE FOLLOWING ACTIVITIES ARE PROHIBITED OUTSIDE THE EARTHWORKS ZONE - STORAGE AND MIXING OF MATERIALS, VEHICLE PARKING, LIQUID DISPOSAL, MACHINERY REPAIRS/REFUELLING, PLACEMENT OF SITE OFFICES OR SHEDS, COMBUSTION OF ANY MATERIAL, STOCKPILING OF SOIL, RUBBLE OR DEBRIS, ANY FILLING OR EXCAVATION INCLUDING TRENCHES, TOPSOIL, SKIMMING AND/OR SURFACE EXCAVATION UNLESS OTHERWISE APPROVED BY THE RELEVANT AUTHORITY.
1. CONSTRUCTION - STOCKPILING
THE CONTRACTOR SHALL NOT CREATE STOCKPILES OF SURPLUS MATERIALS UNLESS DIRECTED BY THE SUPERINTENDENT. ALL MATERIALS ARISING FROM THE WORKS SHALL BE COMPACTED TO FUTURE FILL AREAS AS NOMINATED.
 2. TOPSOIL SCREENING
TOPSOIL SHALL BE SCREENED BY THE CONTRACTOR WHEN DIRECTED BY THE SUPERINTENDENT. ALL UNSUITABLE MATERIAL SCREENED FROM THE TOPSOIL WILL BE TAKEN TO AN OFFSITE TIP BY THE CONTRACTOR AT THE CONTRACTORS EXPENSE.
 3. RECORDS
RECORD DETAILS OF ALL EARTHWORKS, INCLUDING TEMPORARY STOCKPILE LOCATIONS, APPROXIMATE VOLUMES, TREATMENT UNDERTAKEN, IF ANY, AND MONITORING RESULTS. THE FOLLOWING MONITORING REGIME IS RECOMMENDED:
 - REGULAR VISUAL MONITORING DURING EXCAVATION TO NOTE THE PRESENCE OF ANY DARK GREY SANDS OR DARK GREY CLAYS THAT REPRESENT POTENTIAL ASS.
 - ACTION - THERE ENCOUNTERED EXCAVATION WORKS SHOULD TEMPORARILY CEASE AND AN ASSESSMENT OF THE EXCAVATION BE MADE BY A GEOTECHNICAL ENGINEER.
- IF ANY ACIDIC TOPSOIL IS TO BE TAKEN OFF SITE AND REQUIRE NEUTRALISATION TO PH 7 AT A LIMING RATE OF 6KG CaCO₃/TON DRY WEIGHT AND ASSESSMENT IN ACCORDANCE WITH NSW EPA REQUIREMENTS.

LEGEND

- EXISTING PROPERTY LINE
- - - 1.0 EXISTING CONTOURS MAJOR
- - - 1.5 EXISTING CONTOURS MINOR
- - - SURVEYED TOP OF BANK LINE
- - - STAGE BOUNDARY
- STAGE 02 (FILLED TO 1.8m MAX)
- STAGE 03

NOTE:
CONTRACTOR TO MAKE ALL NECESSARY ALLOWANCES FOR EXISTING SERVICES DURING ALL WORKS.



PROJECT NAME

YAMBA GARDENS

EARTHWORKS SKETCH

CLIENT

KAHUNA NO. 1 PTY LTD

NORTH

0 10 20 30 40 50m

Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	
CONSTRUCTION	

B	03-04-20	DETAILS REVISED
A	01-10-19	PRELIMINARY ISSUE

PRE DATE	AMENDMENT

COPYRIGHT IS VESTED IN MORTONS URBAN SOLUTIONS AND WRITTEN CONSENT IS REQUIRED PRIOR TO REPRODUCTION. COPYRIGHT MORTONS URBAN SOLUTIONS 2000. DO NOT SCALE FROM THIS DRAWING.

ASSOCIATED CONSULTANTS

DRAWING TITLE

BULK EARTHWORKS STAGING AND FILLING SKETCH

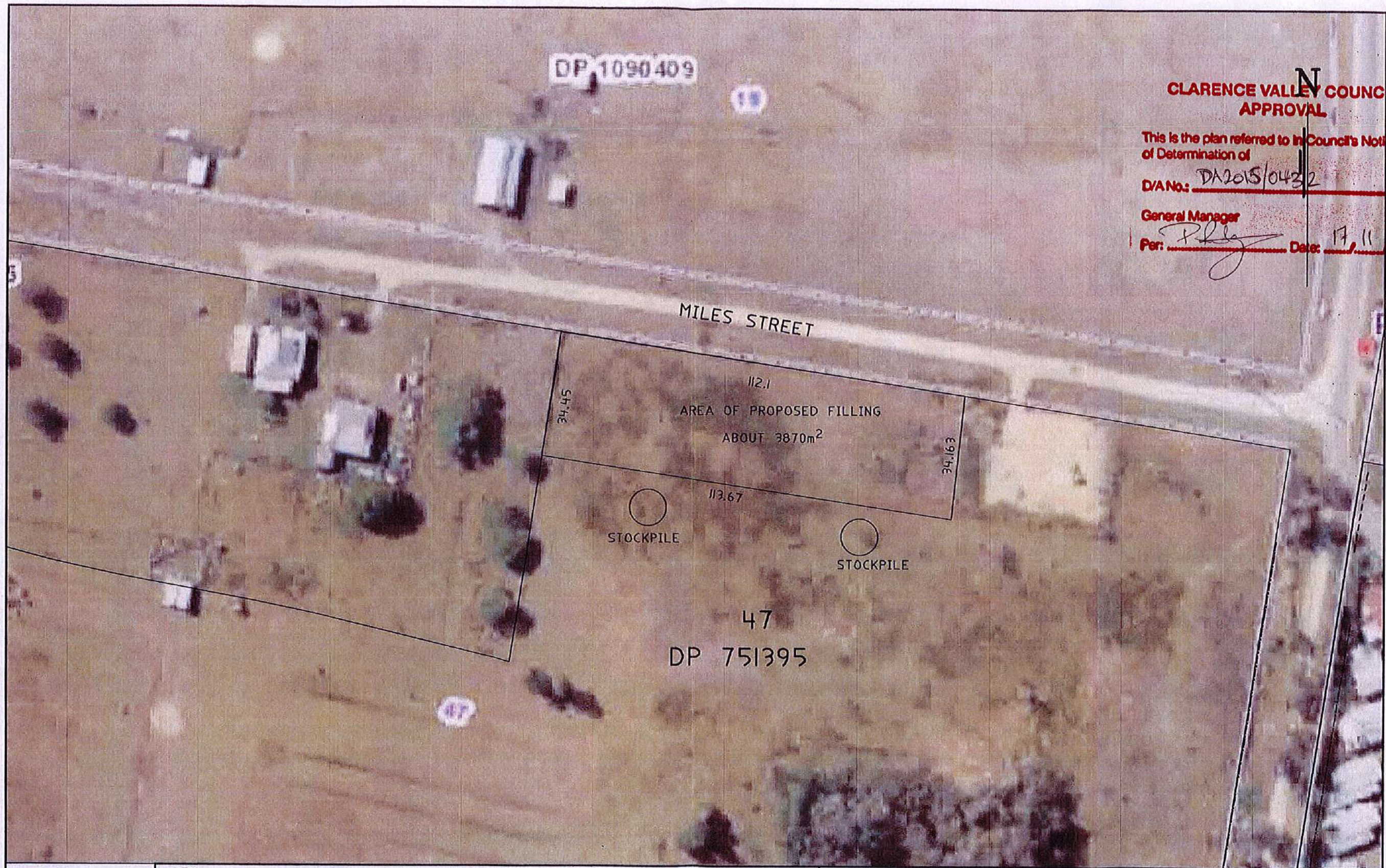
Urban & Regional Planning
Civil Engineering
Project Coordination

MUS Pty Ltd T/As:
Mortons-Urban Solutions
ABN 39 116 375 065
mortons@urbansolutions.net.au
www.urbansolutions.net.au
Tel 07 5571 1099

Postal Address
PO Box 2484
Southport QLD 4215

Gold Coast Office
Suite 9, 19 Short St
Southport QLD 4215

DESIGNED PP	DRAWN CB
APPROVED	RPED 4706 DATE 03-04-20
DRAWING NUMBER	
33801-EWMP-SK001	
AMEND.	
B	



**CLARENCE VALLEY COUNCIL
APPROVAL**

This is the plan referred to in Council's Notice
of Determination of

D/A No.: DA2015/0432

General Manager

Per: [Signature] Date: 17/11/15



HARRISON SHEPHERD PTY.LTD.

Professional Surveyors and Consultants
Incorporating Peter M. Williamson

CONSULTING SURVEYORS
AUSTRALIA
HARRISON SHEPHERD PTY LTD
ABN 62 614 344 95

3/19 Coldstream Street
YAMBA NSW 2464
(02)66461692 Fax(02)66468088
email:survey1@bigpond.com

Cnr Tweed & Fawcett Streets
BRUNSWICK HEADS NSW 2483
Ph/Fax (02)66851477

121 Alcorn Street
SUFFOLK PARK NSW 2481
Ph/ Fax(02) 66857277

PLAN : SHOWING AREA OF PROPOSED FILLING UPON LOT 47 DP751395

CLIENT :KAHUNA NO. 1 PTY LTD

REF. No. DWG. No.
15043/FILLINGDIAGRAM

DESIGN	x
DRAWN	WS
CHECKED	x
APPROVED	x
DATE	31/07/2015
R.R.	1:1000@A3
DATUM	x

Appendix B

Proposed Development

GENERAL

1. CONTRACT SPECIFICATIONS
ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATION.
2. SETOUT
SURVEY SETOUT INFORMATION HAS BEEN ESTABLISHED ON SITE BY THE PRINCIPAL'S SURVEYOR TO ENABLE THE CONTRACTOR TO ACCURATELY SETOUT THE WORKS TO THE CO-ORDINATES SHOWN. SETOUT INFORMATION SHALL NOT BE OBTAINED BY SCALING FROM THESE DRAWINGS.
3. DATUM
LEVELS SHOWN ARE TO A.H.D.
4. TRENCH SPOIL
ALL MATERIALS ARISING FROM ROADS & SERVICES ARE TO BE COMPACTED TO FUTURE STAGES, TO LEVEL 1 IF NO SPOIL AREA IS AVAILABLE THESE MATERIALS SHALL BE TRUCKED TO A LICENSED TIP. THESE WORKS FORM PART OF THE CONTRACTED WORKS.
5. CHECK ELECTRONIC SETOUT
CONTRACTOR IS RESPONSIBLE TO ENSURE ANY ELECTRONIC DATA FILES MATCH THE DRAWINGS.
6. PRE START
a. ERECT SITE SIGNAGE. CONSTRUCT ENTRY & EXIT POINT AS INDICATED.
b. CONSTRUCT VEHICLE WASHDOWN AREA & ASSOCIATED SILT MANAGEMENT DEVICES.
c. CONSTRUCT SITE OFFICE & STORAGE COMPOUND AREA.
d. INSTALL EROSION & SEDIMENT CONTROL DEVICES AS PER THE CONTRACTOR'S EROSION & SEDIMENT CONTROL PLAN.
e. ERECT TEMPORARY TREE PROTECTION FENCING IN ACCORDANCE WITH THE APPROVED VEGETATION MANAGEMENT PLAN & AUTHORITIES APPROVAL CONDITIONS (IF REQUIRED).
7. HEALTH & SAFETY
ALL WORKS UNDERTAKEN BY THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE WORKPLACE HEALTH & SAFETY LEGISLATION.
8. STOCKPILING
STOCKPILING OF ANY SURPLUS MATERIAL IS NOT PERMITTED

PROJECT SPECIFIC REPORTS

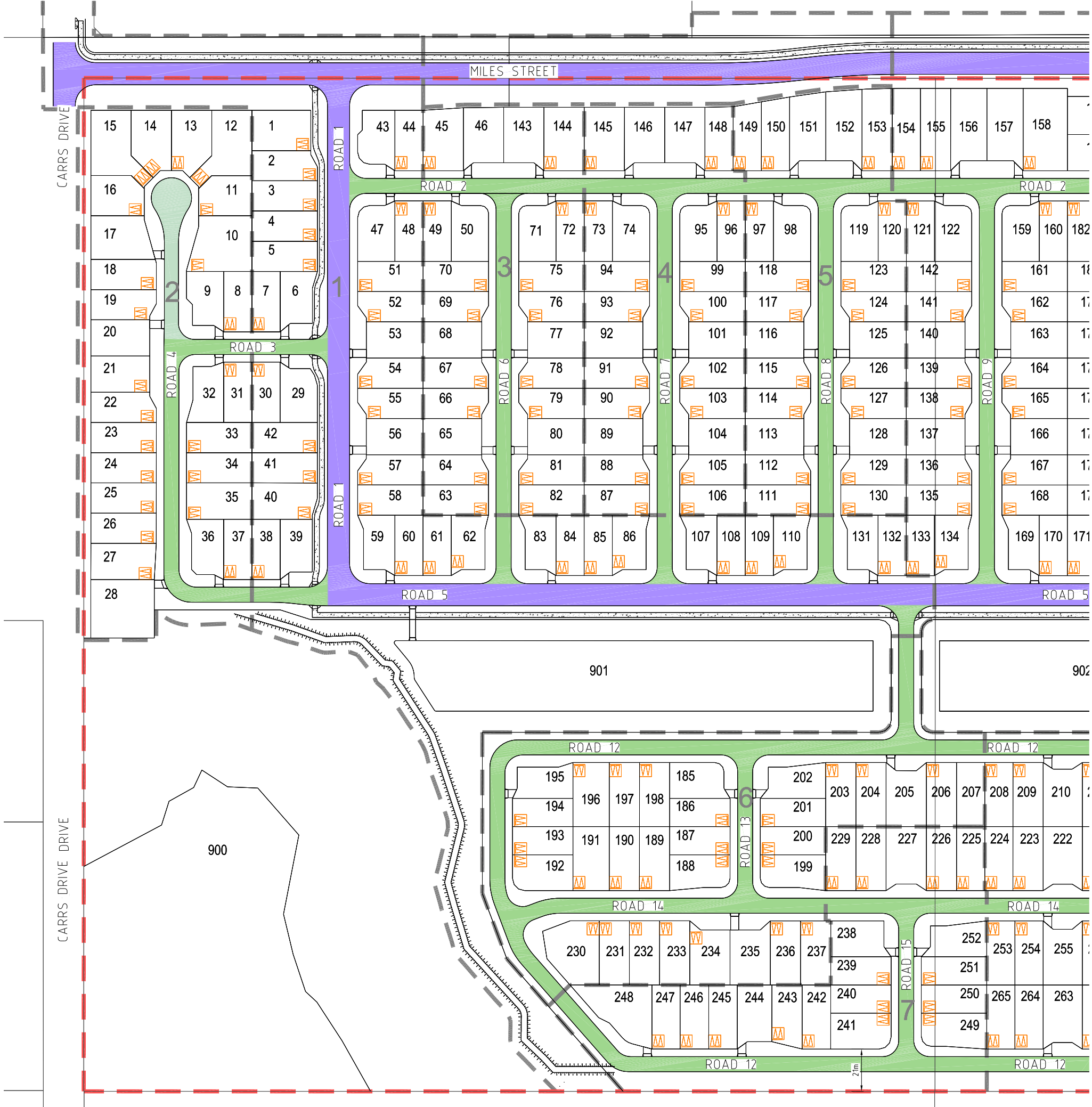
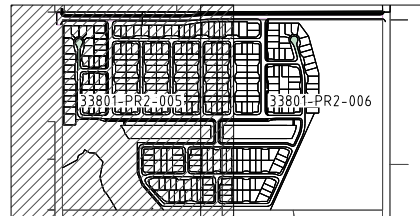
- THE CONTRACTOR MUST FOLLOW THE RECOMMENDATIONS & PROCEDURES OUTLINED IN THE FOLLOWING REPORTS AT ALL TIMES.
- a) GEOTECHNICAL INVESTIGATION REPORTS (INCLUDING ANY ACID SULPHATE OR DISPERSIVE SOIL REPORTING)
b) VEGETATION & FAUNA MANAGEMENT PLANS
c) OTHER MANAGEMENT PLANS NOMINATED IN THE CONTRACT, AUTHORITIES APPROVAL CONDITIONS OR BY THE SUPERINTENDENT.

LEGEND

- ACCESS STREET
(7m CARRIAGEWAY)
- LOCAL STREET
(7.5m CARRIAGEWAY)
- COLLECTOR STREET
WITH DUAL USE PATH
(11m CARRIAGEWAY)
- EXISTING PROPERTY LINE
- EXISTING KERB (INVERT)
- PROPOSED PROPERTY LINE
- PROPOSED KERB (INVERT)
- SITE BOUNDARY
- STAGE BOUNDARY



SHEET LAYOUT



PROJECT NAME

YAMBA GARDENS

PRELIMINARY

RP DESCRIPTION
Lot 46 & 47 on DP751395,
MILES ST, YAMBA NSW 2464
LOCALITY OF CLARENCE VALLEY
LOCAL AUTHORITY - CLARENCE VALLEY COUNCIL

CLIENT

KAHUNA NO. 1 PTY LTD

NORTH

0 10 20 30 40 50m

Scale 1:1000 - A1 (1:2000 - A3)

ISSUES	DATE
TENDER	
COUNCIL	
CONSTRUCTION	

A	28-05-21	ISSUED FOR APPROVAL
PRE DATE		AMENDMENT

COPYRIGHT IS VESTED IN MORTONS URBAN SOLUTIONS AND WRITTEN CONSENT IS REQUIRED PRIOR TO REPRODUCTION. COPYRIGHT MORTONS URBAN SOLUTIONS 2000 . DO NOT SCALE FROM THIS DRAWING.

ASSOCIATED CONSULTANTS



DRAWING TITLE

ROAD HIERARCHY, STAGING PLAN & GENERAL NOTES SHEET 01

PRELIMINARY ISSUE

MORTONS
urbansolutions
Urban & Regional Planning
Civil Engineering
Project Coordination

MUS Pty Ltd T/As:
Mortons-Urban Solutions
ABN: 39 116 375 065
mortons@urbansolutions.net.au
www.urbansolutions.net.au
Tel: 07 5571 1099

Postal Address
PO Box 2484
Southport QLD 4215

Gold Coast Office
Suite 9, 19 Short St
Southport QLD 4215

DESIGNED PP	DRAWN SF
APPROVED [Signature]	REQ 4706 DATE 28-05-21
DRAWING NUMBER 33801-PR2-005	AMEND. A

Appendix C

Plot Data

BAM Site – Field Survey Form

Site Sheet no: 1 of 1

Date		Survey Name	Zone ID	Recorders		
16/7/18		Yamba		ILC DGH		
Zone 56	Datum	Plot ID	~~3~~ 1	Plot dimensions	20x50	Photo #
Easting 532 840	Northing 674 2995	IBRA region	in m	Midline bearing from 0 m	10°	Magnetic
Vegetation Class						Confidence: H M L
Plant Community Type						Confidence: H M L
PCT 837						EEC: NCA

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	5
Shrubs	2
Grasses etc.	5
Forbs	5
Ferns	1
Other	3
Sum of Cover of native vascular plants by growth form group	
Trees	30.3
Shrubs	1.1
Grasses etc.	95.6
Forbs	0.5
Ferns	0.2
Other	0.3
High Threat Weed cover	0.5

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	
50 – 79 cm	1111	
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	nil	Tally space

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30, ..., 100, 200, 300, ...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	10 5 10 1 15			
Average of the 5 subplots	8.2			

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

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	-	-	
Soil erosion	-	-	
Firewood / CWD removal	-	-	
Grazing (identify native/stock)	2	R	
Fire damage	-	-	
Storm damage	-	-	
Weediness	1	R	
Other			Recently started - Historically cleared & understorey

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

4

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	16/7/2018	Yambe	3	ILC DGH

u/m/G

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
GG	1	Blady Grass	N	95	1000	G	
FG	2	Desmodium illinoense	N	0.1	5	G	
EG	3	Pteridium esculentum	N	0.2	20	G	
▷	4	Cenchrus clandestinum	HTE	0.2	100	G	
TG	5	Mel. quinqueflora	N	5	1	U	
TG	6	Acacia melanoxylon	N	6.1	3	M	
▷	7	Bredia pilosa	HTE	0.1	1	G	
	8	Selagin spachelata	E	0.1	5	G	
OG	9	Hibbertia scandens	N	0.1	15	G	
TG	10	Alphitonia excelsa	N	0.1	5	M	
SG	11	Acacia oblongifolia	N	1	4	M	
FG	12	Oxalis perennans	N	0.1	10	G	
	13	Papilion umbellata	E	0.1	1	G	
OG	14	Geitonoplesium cynosu.	N	0.1	10	G	
SG	15	Begonia oblongifolia	N	0.1	1	M	
OG	16	Glycine clandestina	N	0.1	10	G	
FG	17	Hydrocotyl laxiflorus	N	6.1	30	G	
	18	~~Gampelaea sp. (weed)~~					
	19	Hypochaeris radicata (Flatweed)	E	0.1	40	G	
GG	20	Plananda longifolia	N	0.2	10	G	
FG	21	Pratia purpurascens	N	6.1	10	G	
▷	22	Lantana camara	HTE	0.1	1	M	
FG	23	Pinnax umbellata	N	0.1	1	G	
GG	24	Scaevola indica	N	0.1	3	G	
TG	25	Corymbia intermedia	N	25	2	G	
GG	26	Thunbergia clarkii	N	0.1	1	G	
GG	27	Thunbergia acutifolia	N	0.2	20	G	
TG	28	Ceanothus anacardifolius	N	0.1	1	G	
▷	29	Andropogon virginicus	HTE	0.1	10	G	
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

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, ...

2

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

Date		Survey Name	Zone ID	Recorders		
16/7/18		Yanba		ILC DGH		
Zone	Datum	Plot ID	Plot dimensions	Photo #		
		42	20x50		✓	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic		
532962	6743163	In m	0° North			
Vegetation Class				Confidence:		
Plant Community Type				Confidence:		
PCT 1724 1064				EEC: tick	H M L	
				H M L		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	11
Shrubs	8
Grasses etc.	4
Forbs	6
Ferns	3
Other	87
Count of Native Richness	
Trees	94.6
Shrubs	21.6
Grasses etc.	46.3
Forbs	10.9
Ferns	1.6
Other	1.3
Sum of Cover of native vascular plants by growth form group	
High Threat Weed cover	0.9

BAM Attribute (1000 m ² 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	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	36, 6, 2.4, 7.4, 9.5, 10.8, 1.7, 0.5, 3.5, 2.7, 5.7, 2.1, 2.9, 2.2, 1, 0.9, 2.4, 1.2, 9.8, 1, 0.8, 1, 2, 0.8	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30, 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

TOTAL LOGS: 148

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 95 75 70 80	a b c d e	a b c d e	a b c d e
Average of the 5 subplots	82			

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

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1		
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date			

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
OG	1 Scrambling Lilly	N	0.2	6/100	G.	
▷	2 Coastal Morning Glory	HTE	0.2	50	M.	
SG	3 Melaleuca styphelioides	Z	20.	10	M.	
FG	4 Viola hederacea	Z	10	1000	G.	
OG	5 Pisonia gasmiodides	Z	0.1	10	G.	
GG	6 Baumea juncea	Z	40	1000	G.	
TG	7 Melaleuca quinkana	Z	75	20	U.	
OG	8 Cockspur	Z	0.1	10	G.	
TG	9 Cheese Tree	Z	8	10	M.	
SG	10 Anny Psychotria	Z	0.1	10	G.	
▷	11 Lantana camara	HTE	0.1	2	G.	
OG	12 Dendrobium limiforme	Z	0.2	50	L.M.	
	13 ~~Epiphyllum~~ ~~concolor~~					
TG	14 Ficus watkinsoniana	Z	5.	2	M.	
OG	15 Parsonsia straminea	Z	0.5	20	U.	
TG	16 Umbrella Cheese tree	Z	3	10	U.	
GG	17 Carex appressa	Z	5	50	G.	
SG	18 Ficus coronata	Z	1	10	M.	
FG	19 Commelina	Z	0.1	10	G.	
FG	20 Annyda fluctuans	Z	0.5	100	G.	
▷	21 Senha pendula	HTE	0.1	2	M.	
SG	22 Brash Muttonwood	Z	0.1	4	G.	
	23 Coral Berry (Rivina)	Z	0.1	1	G.	
EG	24 Blechnum indicum	Z	0.5	100	G.	
OG	25 Cordyline stricta	Z	0.1	5	M.	
OG	26 Smilax australis	Z	0.1	5	M.	
TG	27 Acmena smithii	Z	2	10	M.	
EG	28 Skeleton Fork fern	Z	0.1	2	G.	
FG	29 Pratia	Z	0.1	10	G.	
GG	30 Entolasia marginata	Z	0.1	50	G.	
▷	31 Asparagus ethiopiensis	HTE	0.1	5	G.	
TG	32 Pink Endia	Z	0.2	5	M.	
▷	33 Cherry Guava	HTE	0.5	5	M.	
SG	34 Bleeding Hart	Z	0.1	1	G.	
FG	35 Ranunculus inundatus	Z	0.1	10	G.	
GG	36 Baumea rubiginosa	Z	0.2	100	G.	
TG	37 Casuarina glauca	Z	0.1	1	G.	
FG	38 Hydracotyl viticollata	Z	0.1	10	G.	
EG	39 Hypolepis	Z	1	100	G.	
GG	40 Blady Grass	Z	1	100	G.	

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, ...

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders			
Date			2				
GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher	
TG	1 <i>Eriodaphne cryptocarya</i> <i>trichocarpa</i>	N	1	2	M		
D	2 <i>Bacharis halimifolia</i>	HTE	0.1	1	G		
D	3 <i>Canthara cinamomum</i>	HTE	0.1	5	M		
TG	4 <i>Impatiopsis anacardioides</i>	N	0.1	1	G		
SG	5 <i>Rubus moluccana</i>	N	0.1	1	G		
D	6 <i>Ochroma cernuata</i>	HTE	0.1	1	G		
TG	7 Red Ash	N	0.1	5	G		
TG	8 <i>Syzygium francissii</i>	N	0.1	2	G		
SG	9 <i>Bryonia oblongifolia</i>	N	0.1	2	G		
SG	10 <i>Callistemon salignus</i>	N	0.1	1	M		
	11 ~~<i>Ambrath Cheese Tree</i>~~						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

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, ...

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no: 2 of 2

Date		Survey Name		Zone ID		Recorders	
16/7/18		Yamba		Yamba		ILC, DGH	
Zone	Datum	Plot ID	Plot dimensions	Photo #			
		4					
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic			
		in m					
Vegetation Class						Confidence:	
						H M L	
Plant Community Type						EEC: JCK	
						Confidence:	
						H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m ² 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		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		Tallyspace

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots																				

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

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

NB: 100x8m plot



-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

Lot 46

BAM Site – Field Survey Form

Site Sheet no: 1 of 1

Date		Survey Name	Zone ID	Recorders		
16/7/18		Yamba	Cas davan	KC DGH		
Zone	Datum	Plot ID	Plot dimensions	Photo #		
		8/3		11-14		
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic		
532410	6743092		140			
Vegetation Class					Confidence: H M L	
Plant Community Type		1235			Confidence: H M L	
		EEC: tick				

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	2
Shrubs	—
Grasses etc.	11
Forbs	11
Ferns	—
Other	1
Count of Native Richness	
Trees	97
Shrubs	—
Grasses etc.	14.9
Forbs	14.2
Ferns	—
Other	0.1
Sum of Cover of native vascular plants by growth form group	
High Threat Weed cover	5.3

BAM Attribute (1000 m ² 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	✓	—
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2.5	Tally space

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30, 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

10, 30, 50, 70, 90m

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	0 0 0 0 1	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	0.2	0	0	0

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

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	0	
Cultivation (inc. pasture)	—	—	
Soil erosion	—	—	
Firewood / CWD removal	—	—	
Grazing (identify native/stock)	—	—	
Fire damage	—	—	
Storm damage	—	—	
Weediness	1		generally good cond. Some Aster, pasture species.
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	16-7-18	Yamba	8	DGH + L.C.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
TG	1	Cas. glauca	N	90	250	U	
TG	2	met guilguenerren	N	7	10	U	
	3	Cypera carthagenensis	E	0.1	5	G	
FG	4	Philydium lanuginosum	N	0.2	20	G	
GG	5	Schoenoplectalla micronata	N	5	100	G	
FG	6	Oclera ovalifolia (Potamogeton + microstoma)	N	3	50	G	
FG	7	Bacopa monnina	N	0.1	50	G	
	8	Aster subulatus	E	0.1	20	G	
GG	9	Emmenanthe vulgata	N	0.1	10	G	
GG	10	Impatiens cylindrica	N	0.1	5	G	
FG	11	Zeyheria hoodii	N	5	100	G	
FG	12	Vicia hederacea	N	0.1	50	G	
▷	13	Cenchrus clandestinus	HTE	5	200	G	
	14	Trifolium repens	E	0.1	10	G	
FG	15	Lidogra ptychodes	N	0.3	50	G	
GG	16	Gleichenia equisetica	N	3	300	G	
GG	17	Baumea rubiginosa	N	0.5	100	G	
FG	18	Ranunculus chrysanthus	N	0.1	5	G	
▷	19	Senecio madagascariensis	HTE	0.1	5	G	
FG	20	Triglochin procera	N	5	100	G	
	21	* Creeper (Asteraceae) from prev.	N	0.1	10	G	✓
GG	22	Baumea juncea	N	0.2	30	G	
OG	23	Parsonia straminea	N	0.1	10	G	
GG	24	Cynodon dactylon	N	5	100	G	
GG	25	Juncus polyanthemos	N	0.1	10	G	
GG	26	Typha orientalis	N	0.1	5	G	
FG	27	Centella asiatica	N	0.1	100	G	
	28	Ptilypala paniculata (cultivat)	N	0.1	20	G	
GG	29	Juncus polytachyos	N	0.1	20	G	
▷	30	Andropogon virginicus	HTE	0.1	10	G	
▷	31	Senna pendula	HTE	0.1	1	M	
FG	32	Pennisetum strigosum	N	0.2	50	G	
▷	33	Ipomoea cairica	HTE	0.1	1	G	
GG	34	Bolboschoenus fluviatilis	N	0.1	5	G	
FG	35	Pennisetum decipiens	N	0.1	1	G	
	36						
	37						
	38						
	39						
	40						

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, ...

Phylog. nodifera

Plot 4

Date	20/04/2021						
Zone	Datum	Survey Name	Zone ID				
56	MGA94	Yamba	A				
Start Easting	Start Northing	Start WP	Recorders	IBRA region (in m)	Plot dimensions	Photo #	Midline bearing from 0 m (magnetic ⁰)
532652	6742997	200	ILC	SEQ	20 x 50	1	175
End Easting	End Northing	End WP					

		Confidence	
Vegetation Class	Coastal Swamp Forests	High	
Plant Community Type	1227	High	EEC? No
Plant Community Name	Swamp Box swamp forest of the coastal lowlands of the NSW North Coast	High	
	Bioregion		

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	0
	Grasses etc.	8
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	60.6
	Shrubs	0
	Grasses etc.	30.5
	Forbs	1.4
	Ferns	0
	Other	0
High Threat Exotic cover		55.6

Codes for formulas
Tree (TG)
Shrub (SG)
Grass & grasslike (GG)
Forb (FG)
Fern (EG)
Other (OG)
N
E
HTE

BAM Attribute (1000 m ² plot)		# Tree Stems Count	# Stems with Hollows
DBH			
80 + cm		0	0
50 - 79 cm		0	0
30 - 49 cm	N		0
20 - 29 cm	N		0
10 - 19 cm	N		0
5 - 9 cm	N		0
< 5 cm	Y		n/a
Length of logs (m) (≥ 10 cm in diameter, >50cm in length)			0

BAM Attribute (1 x 1 m plots)	Litter cover (%)				Bare ground cover (%)			
Subplot score (% in each)	2	1	7	1	2			
Average of the 5 subplots	2.6				#DIV/0!			

GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Natives below this line (see row 89 for exotics). NB search for species in "Native Species by Growth Form" sheet and copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
Tree (TG)	Melaleuca quinquenervia		N		0.5	10 M	
Grass & grasslike (GG)	Cyperus polystachyos		N		10	300 G	
Tree (TG)	Lophostemon confertus		N		60	100 M	
Grass & grasslike (GG)	Sacciolepis indica		N		15	300 G	
Forb (FG)	Centella asiatica		N		1	50 G	
Forb (FG)	Stylidium debile		N		0.1	5 G	
Forb (FG)	Philydrum lanuginosum		N		0.1	3 G	
Grass & grasslike (GG)	Cyperus haspan		N		0.1	20 G	
Tree (TG)	Banksia integrifolia subsp. integrifolia		N		0.1	2 G	
Grass & grasslike (GG)	Juncus usitatus		N		0.1	5 G	
Forb (FG)	Goodenia paniculata		N		0.1	10 G	
Grass & grasslike (GG)	Xyris complanata		N		0.1	15 G	
Grass & grasslike (GG)	Fimbristylis dichotoma		N		0.1	10 G	
Forb (FG)	Pratia purpurascens		N		0.1	1 G	
Grass & grasslike (GG)	Cynodon dactylon		N		5	50 G	
Grass & grasslike (GG)	Fuirena ciliaris		N		0.1	1 G	
GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Exotics (both E and HTE) below this line. NB search for species in "High Threat Weeds" sheet and if a match, copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
	Cenchrus clandestinum		HTE		50	500 G	
	Setaria sphacelata		E		5	20 G	
	Andropogon virginicus		HTE		5	20 G	
	Hypochaeris radicata		E		0.2	20 G	
	Senecio madagascarensis		HTE		0.1	2 G	
	Cyperus sesquiflorus		E		0.1	1 G	
	Cuphea carthagenensis		E		0.1	5 G	
	Paspalum urvillei		E		0.1	1 G	
	Axonopus fissifolius		HTE		0.5	20 G	

Plot 5

Date	20/04/2021						
Zone	Datum	Survey Name	Zone ID				
56	MGA94	Yamba	B				
Start Easting	Start Northing	Start WP	Recorders	IBRA region (in m)	Plot dimensions	Photo #	Midline bearing from 0 m (magnetic ⁰)
532738	6742983	201	ILC	SEQ	20 x 50	1	10
End Easting	End Northing	End WP					

		Confidence	
Vegetation Class	Coastal Valley Grassy Woodlands	High	
Plant Community Type	837	High	EEC? No
Plant Community Name	Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	High	

BAM Attribute (400 m ² plot)	Sum values	
Count of Native Richness	Trees	3
	Shrubs	2
	Grasses etc.	6
	Forbs	4
	Ferns	1
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0.4
	Shrubs	0.2
	Grasses etc.	55.3
	Forbs	0.8
	Ferns	5
	Other	0
High Threat Exotic cover		37.4

Codes for formulas
Tree (TG)
Shrub (SG)
Grass & grasslike (GG)
Forb (FG)
Fern (EG)
Other (OG)
N
E
HTE

BAM Attribute (1000 m ² plot)	# Tree Stems Count	# Stems with Hollows
DBH		
80 + cm	0	0
50 - 79 cm	0	0
30 - 49 cm	N	0
20 - 29 cm	N	0
10 - 19 cm	N	0
5 - 9 cm	N	0
< 5 cm	Y	n/a
Length of logs (m) (≥ 10 cm in diameter, >50cm in length)		0

BAM Attribute (1 x 1 m plots)	Litter cover (%)				Bare ground cover (%)			
Subplot score (% in each)	70	40	2	5	10			
Average of the 5 subplots	25.4				#DIV/0!			

GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Natives below this line (see row 89 for exotics). NB search for species in "Native Species by Growth Form" sheet and copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
Grass & grasslike (GG)	Cynodon dactylon		N		15	100 G	
Grass & grasslike (GG)	Imperata cylindrica		N		35	100 G	
Fern (EG)	Pteridium esculentum		N		5	50 G	
Forb (FG)	Pratia purpurascens		N		0.3	50 G	
Forb (FG)	Dichondra repens		N		0.2	50 G	
Grass & grasslike (GG)	Sacciolepis indica		N		5	50 G	
Forb (FG)	Centella asiatica		N		0.2	20 G	
Tree (TG)	Corymbia intermedia		N		0.2	5 G	
Tree (TG)	Lophostemon confertus		N		0.1	5 G	
Tree (TG)	Alphitonia excelsa		N		0.1	3 G	
Grass & grasslike (GG)	Cyperus polystachyos		N		0.1	5 G	
Grass & grasslike (GG)	Fimbristylis dichotoma		N		0.1	10 G	
Grass & grasslike (GG)	Lomandra longifolia		N		0.1	2 G	
Shrub (SG)	Platylobium formosum		N		0.1	1 G	
Shrub (SG)	Acacia dispartima subsp. disparrima		N		0.1	1 G	
Forb (FG)	Desmodium rhytidophyllum		N		0.1	1 G	
GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Exotics (both E and HTE) below this line. NB search for species in "High Threat Weeds" sheet and if a match, copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
	Cenchrus clandestinum		HTE		35	100 G	
	Richardia brasiliensis		E		0.5	50 G	
	Setaria sphacelata		E		0.2	10 G	
	Ageratum houstonianum		E		0.1	5 G	
	Hypochaeris radicata		E		0.1	5 G	
	Polygala paniculata		E		0.1	1 G	
	Bidens spp.		HTE		0.1	5 G	
	Andropogon virginicus		HTE		0.3	10 G	
	Axonopus fissifolius		HTE		2	50 G	

Plot 6

Date

20/04/2021

Zone

56

Datum

MGA94

Survey Name

Yamba

Zone ID

C

Start Easting

532787

Start Northing

6743117

Start WP

202

Recorders

ILC

IBRA region (in m)

SEQ

Plot dimensions

16 x 25

Photo #

1

 Midline bearing from 0 m (magnetic ⁰)

60

Confidence

Vegetation Class

Coastal Floodplain Wetlands

High

Plant Community Type

780

High

EEC? No

Plant Community Name

Coastal floodplain sedgeland, rushlands, and forblands of the North Coast

High

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	0
	Grasses etc.	10
	Forbs	4
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0.2
	Shrubs	0
	Grasses etc.	75.2
	Forbs	17
	Ferns	0
	Other	0
High Threat Exotic cover		2.1

Codes for formulas

 Tree (TG)
 Shrub (SG)
 Grass & grasslike (GG)
 Forb (FG)
 Fern (EG)
 Other (OG)
 N
 E
 HTE

BAM Attribute (1000 m ² plot)		# Tree Stems Count	# Stems with Hollows
DBH			
80 + cm		0	0
50 - 79 cm		0	0
30 - 49 cm	N		0
20 - 29 cm	N		0
10 - 19 cm	N		0
5 - 9 cm	N		0
< 5 cm	Y		n/a
Length of logs (m) (≥ 10 cm in diameter, >50cm in length)			0

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)				
Subplot score (% in each)	0	0	0	0	0					
Average of the 5 subplots	0					#DIV/0!				

GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Natives below this line (see row 89 for exotics). NB search for species in "Native Species by Growth Form" sheet and copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
Grass & grasslike (GG)	Baumea rubiginosa		N		10	70 G	
Grass & grasslike (GG)	Fuirena ciliaris		N		0.2	5 G	
Grass & grasslike (GG)	Cyperus haspan		N		0.2	10 G	
Forb (FG)	Philydrum lanuginosum		N		10	50 G	
Grass & grasslike (GG)	Eleocharis philippinensis		N		60	300 G	
Forb (FG)	Persicaria decipiens		N		1	10 G	
Forb (FG)	Triglochin procera		N		3	50 G	
Forb (FG)	Persicaria strigosa		N		3	50 G	
Grass & grasslike (GG)	Paspalum distichum		N		0.1	10 G	
Grass & grasslike (GG)	Eleocharis equisetina		N		0.5	20 G	
Grass & grasslike (GG)	Fimbristylis dichotoma		N		0.1	10 G	
Grass & grasslike (GG)	Sacciolepis indica		N		2	50 G	
Tree (TG)	Casuarina glauca		N		0.1	2 G	
Grass & grasslike (GG)	Schoenoplectus mucronatus		N		2	20 G	
Tree (TG)	Lophostemon confertus		N		0.1	1 G	
Grass & grasslike (GG)	Xyris complanata		N		0.1	1 G	
GF Code	Species name	Common name/ field notes	N.E or HTE	Cover	Abund	stratum	voucher
Exotics (both E and HTE) below this line. NB search for species in "High Threat Weeds" sheet and if a match, copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
	Cuphea carthagenensis		E		5	100 G	
	Paspalum urvillei		E		0.1	3 G	
	Juncus cognatus		E		0.1	5 G	
	Ludwigia longifolia		E		0.2	10 G	
	Axonopus fissifolius		HTE		2	10 G	
	Andropogon virginicus		HTE		0.1	3 G	

Plot 7

Date	20/04/2021						
Zone	Datum	Survey Name	Zone ID				
56	MGA94	Yamba	D				
Start Easting	Start Northing	Start WP	Recorders	IBRA region (in m)	Plot dimensions	Photo #	Midline bearing from 0 m (magnetic ⁰)
532746	6743319	203	ILC	SEQ	25 x 40	1	3
End Easting	End Northing	End WP					

		Confidence	
Vegetation Class	Coastal Valley Grassy Woodlands	Medium	
Plant Community Type	837	Medium	EEC? No
Plant Community Name	Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	Medium	

BAM Attribute (400 m ² plot)	Sum values	
Count of Native Richness	Trees	2
	Shrubs	0
	Grasses etc.	4
	Forbs	1
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	18
	Shrubs	0
	Grasses etc.	30.2
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Exotic cover		15.6

Codes for formulas
Tree (TG)
Shrub (SG)
Grass & grasslike (GG)
Forb (FG)
Fern (EG)
Other (OG)
N
E
HTE

BAM Attribute (1000 m ² plot)	# Tree Stems Count	# Stems with Hollows
DBH		
80 + cm	0	0
50 - 79 cm	0	0
30 - 49 cm	N	0
20 - 29 cm	N	0
10 - 19 cm	N	0
5 - 9 cm	N	0
< 5 cm	Y	n/a
Length of logs (m) (≥ 10 cm in diameter, >50cm in length)		0

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)				
Subplot score (% in each)	5	10	20	0	0					
Average of the 5 subplots	7					#DIV/0!				

GF Code	Species name	Common name/ field notes	N,E or HTE	Cover	Abund	stratum	voucher
Natives below this line (see row 89 for exotics). NB search for species in "Native Species by Growth Form" sheet and copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
Tree (TG)	Banksia integrifolia subsp. integrifolia		N		15	3 U	
Grass & grasslike (GG)	Cyperus polystachyos		N		10	100 G	
Grass & grasslike (GG)	Cynodon dactylon		N		20	300 G	
Forb (FG)	Centella asiatica		N		0.1	10 G	
Grass & grasslike (GG)	Fimbristylis dichotoma		N		0.1	3 G	
Grass & grasslike (GG)	Juncus usitatus		N		0.1	1 G	
Tree (TG)	Lophostemon confertus		N		3	13 G	
GF Code	Species name	Common name/ field notes	N,E or HTE	Cover	Abund	stratum	voucher
Exotics (both E and HTE) below this line. NB search for species in "High Threat Weeds" sheet and if a match, copy/paste exact spelling of species name. If unsure in field use common name/ field notes then enter species name at office.							
	Cenchrus clandestinum		HTE		15	100 G	
	Bidens spp.		HTE		0.5	20 G	
	Hypochaeris radicata		E		0.1	2 G	
	Sporobolus africanus		E		3	50 G	
	Senecio madagascarensis		HTE		0.1	5 G	
	Cuphea carthagenensis		E		40	200 G	
	Conyza bonariensis		E		0.1	1 G	
	Sida rhombifolia		E		0.1	3 G	
	Asclepias curassavica		E		0.1	1 G	
	Juncus cognatus		E		0.1	5 G	
	Cyperus sesquiflorus		E		0.1	5 G	
	Aster subulatus		E		0.1	3 G	
	Eragrostis cilianensis		E		0.1	2 G	

Appendix D

Assessment of Habitat Suitability – Ecosystem Credit Species

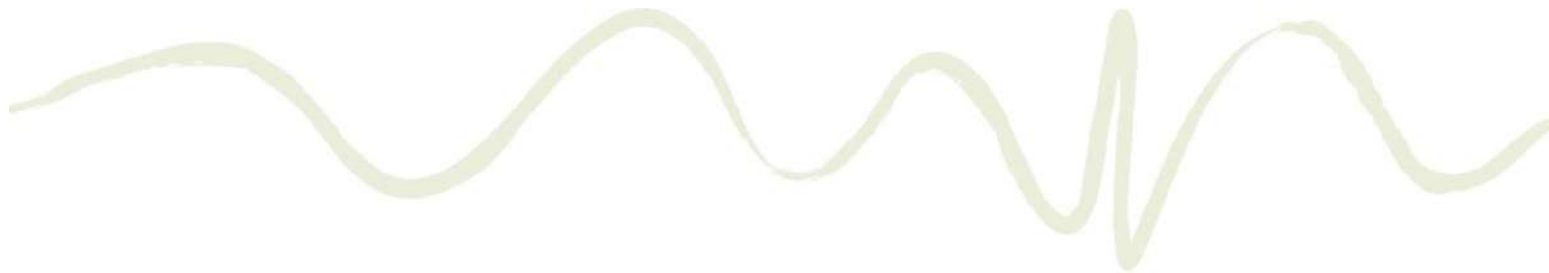
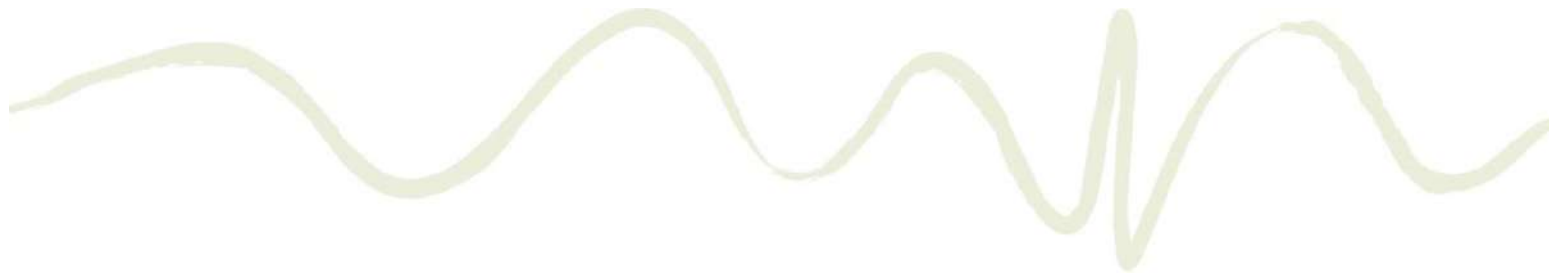


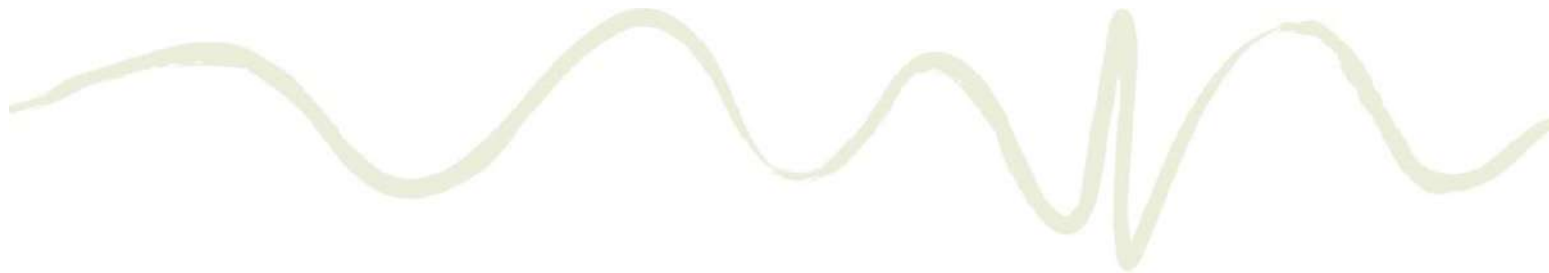
Table D1. Assessment of Habitat Suitability for Predicted Threatened Species (Ecosystem Credit Species)

NOTE: Species which may occur are shaded in grey

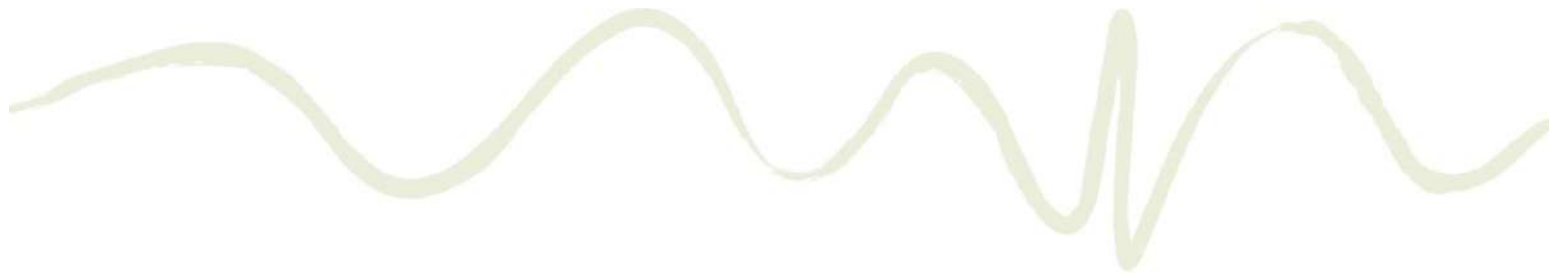
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Anseranas semipalmata</i>	Magpie Goose	Mainly found in shallow wetlands (less than one metre deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation. Nests in large rush/sedge swamps but forage broadly in wet grassland habitat often a significant distance from nesting locations.	Possible	Habitat at site is marginal – being small in area, poorly developed, lacking a fringing shrub layer, ephemeral and subject to grazing and disturbance. No local records, with the closest records associated with a wetland at Lawrence, ~25 km to the south-west (BioNet).
<i>Anthochaera phrygia</i>	Regent Honeyeater	Typically inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Preferred habitat has significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Non-breeding flocks forage in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast.	Possible	PCT 837 provides very poor foraging habitat, is small in area and lacks key coastal forage species such as Swamp Mahogany.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. Also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Paddock trees may be used for nesting	Possible	PCT 837 offers marginal foraging habitat within the development site. Paddock trees (for nesting) occur.



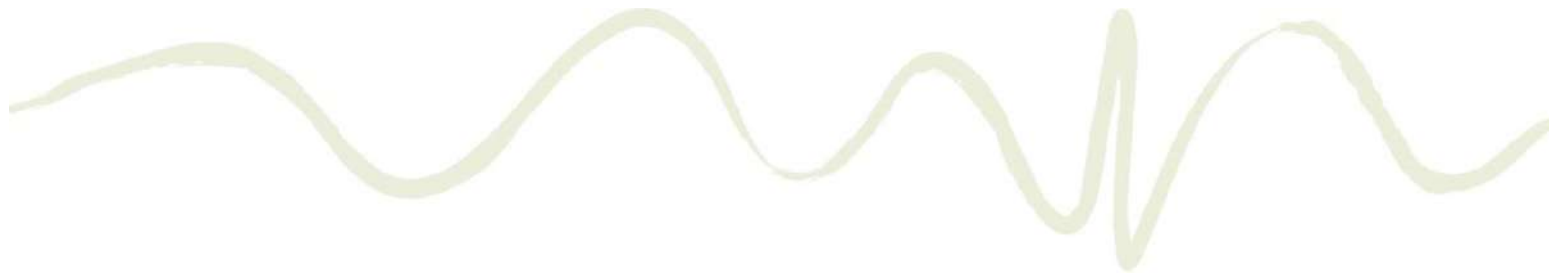
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.).	Unlikely	Suitable habitat is absent and no permanent wetlands occur. PCT 780 comprises ephemeral wetlands which are slashed, grazed and disturbed and lacks vegetative cover.
<i>Calyptorhynchus lathamii</i> (Foraging)	Glossy Black-Cockatoo	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods.	Unlikely	No suitable feed trees occur within PCT 837.
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Forests with naturally sparse understorey layers may provide the best habitat. Will occupy urban areas with suitable habitat. Roosts in hollows and rock crevices. Roost requirements poorly known, paddock trees should be flagged as potential roosts.	Possible	PCT 837 offers marginal foraging habitat within the development site. Local coastal records occur (BioNet).
<i>Circus assimilis</i>	Spotted Harrier	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. Most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	Possible	Open pasture is grazed and slashed and provides poor prey resources, however potential foraging habitat occurs.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/disturbance and is small in area. A lack of breeding habitat occurs within a highly fragmented landscape.



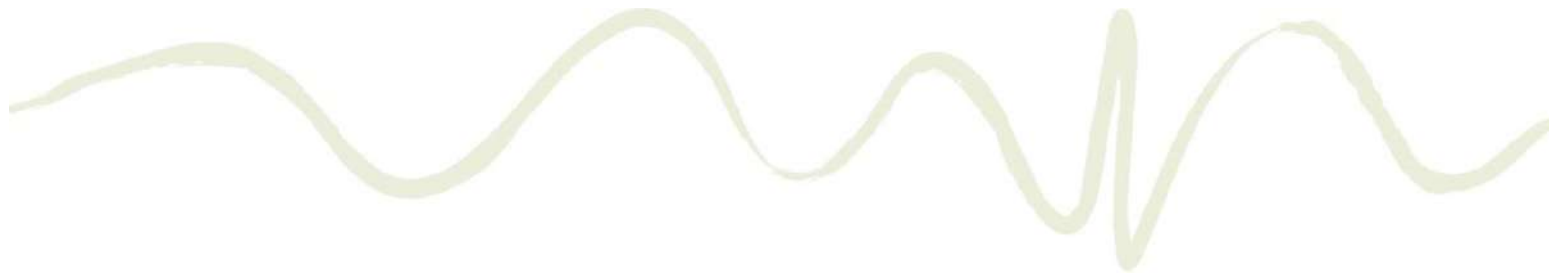
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		less commonly, in similar woodland habitats on the coastal ranges and plains. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Hollows in standing dead or live trees and tree stumps are essential for nesting.		
<i>Coracina lineata</i>	Barred Cuckoo-shrike	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit.	Unlikely	PCT 1064 within the development site does not provide suitable foraging habitat (minor linear regrowth along fencelines and regenerating regrowth).
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/ disturbance and is small in area.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Females occupy home ranges of 200-500 ha, while males occupy very large home ranges from 500 to over 4000 ha. Are known to traverse their home ranges along densely vegetated creeklines. The species has been shown to use small patches and highly fragmented landscapes. Paddock trees can be used for denning in cleared landscape, as can other habitat (e.g. windrows). Males will disperse long distances however females remain close to maternal home range and are unlikely to disperse more than 10 km.	Unlikely	Habitat within the development site lacks preferred attributes, is small in area and of low quality and would be unlikely to be utilised on a local scale where substantial areas of undisturbed forest occur to the south and east of the site. No suitable denning resources occur.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands	Possible	PCT 780 provides opportunistic short-term foraging habitat following rainfall events.



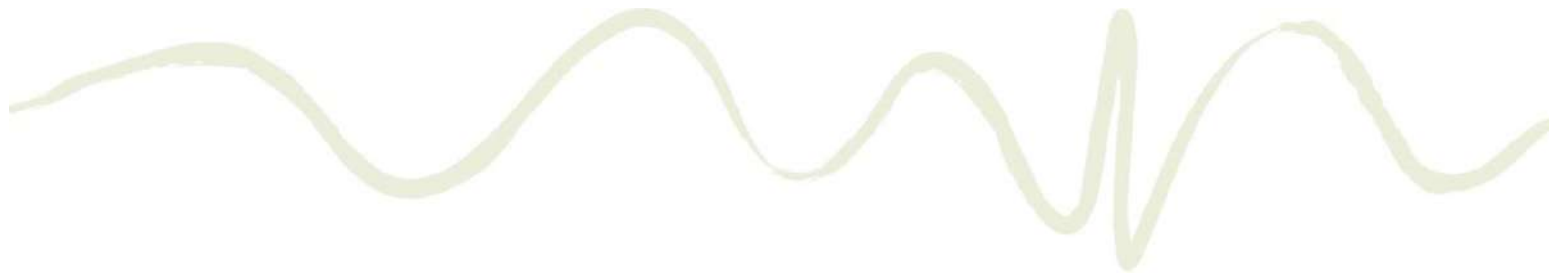
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		and estuaries. Forages in the many small wet habitats, within a large home range, that in total form an important resource. Generally nests in isolated paddock trees or on the fringing vegetation of waterbodies.		
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Roost requirements poorly known; paddock trees should be flagged as potential roosts.	Unlikely	Habitat within the development site does not provide suitable foraging habitat; no potential roost habitat occurs.
<i>Glossopsitta pusilla</i>	Little Lorikeet	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (three centimetres) and usually high above the ground (2 to 15 m).	Possible	PCT 837 & 1064 provide nominal foraging habitat; no breeding resources occur.
<i>Grus rubicunda</i>	Brolga	Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. Two eggs are laid from winter to autumn.	Possible	PCT 780 provides opportunistic short-term foraging habitat following rainfall events.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs,	Unlikely	No foraging habitat occurs.



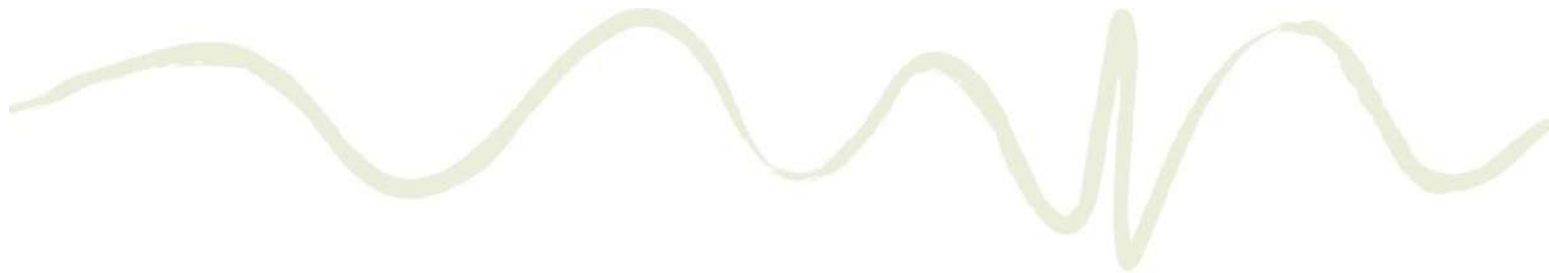
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).		
<i>Hieraaetus morphnoides</i>	Little Eagle	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Possible	Areas of PCT 837 are small, disturbed and fragmented. Open pasture is grazed and slashed. Foraging habitat is marginal.
<i>Irediparra gallinacea</i>	Comb-crested Jacana	Inhabits permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation. Comb-crested Jacanas are dispersive, moving about in response to the condition of wetlands, and occasionally turn up well beyond normal range.	Unlikely	Suitable habitat is absent. PCT 784 lacks suitable vegetation cover and is ephemeral. The farm dam lacks surface cover of macrophytes is small in area and isolated.
<i>Ixobrychus flavicollis</i>	Black Bittern	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Primarily a vagrant in NSW.	Unlikely	Suitable habitat is absent; considered vagrant in NSW.
<i>Lathamus discolor</i>	Swift Parrot	Foraging habitat includes areas where eucalypts are flowering profusely or where abundant lerp infestations occur. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Forest Red Gum <i>E. tereticornis</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Inland Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> , Blackbutt <i>E. pilularis</i> and Yellow Box <i>E. melliodora</i> .	Unlikely	PCT 837 provides very poor foraging habitat and winter flowering species are absent. No BioNET records in Yamba locality
<i>Lophoictinia isura</i>	Square-tailed Kite	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Home ranges can extend over at least 100 km ² .	Possible	Areas of PCT 837 are small, disturbed and fragmented. Open pasture is grazed and slashed. Foraging habitat is marginal.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and



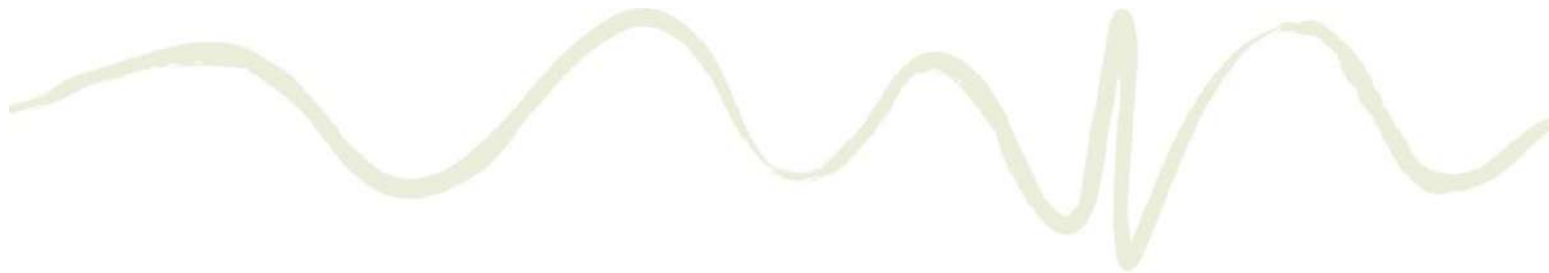
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. Paddock trees can be important for this species as they can link remnant foraging habitat.		grazing/disturbance and is small in area. No BioNET records in Yamba locality.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/disturbance and is small in area. No BioNET records in Yamba locality.
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually change breeding sites regularly (every few days), rendering it very difficult to confirm breeding sites. Known to occasionally aggregate in large breeding groups (including in buildings). The species has been found to use paddock trees at Ravensworth SF in Hunter Valley, may provide critical roosts in some areas.	Possible	PCT 837 offers marginal foraging habitat.
<i>Miniopterus australis</i> (Foraging)	Little Bentwing-bat	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.	Possible	Suitable foraging habitat occurs within open habitats and PCTs 837, 1064 and 1235.
<i>Miniopterus orianae oceanensis</i> (Foraging)	Large Bentwing-bat	Hunts in forested areas, catching moths and other flying insects above the tree canopy.	Possible	Suitable foraging habitat occurs within open habitats and PCTs 837, 1064 and 1235.
<i>Ninox connivens</i> (Foraging)	Barking Owl	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to	Possible	Areas of PCT 837 are small, disturbed and fragmented. Open pasture is grazed and slashed. Foraging habitat is marginal.



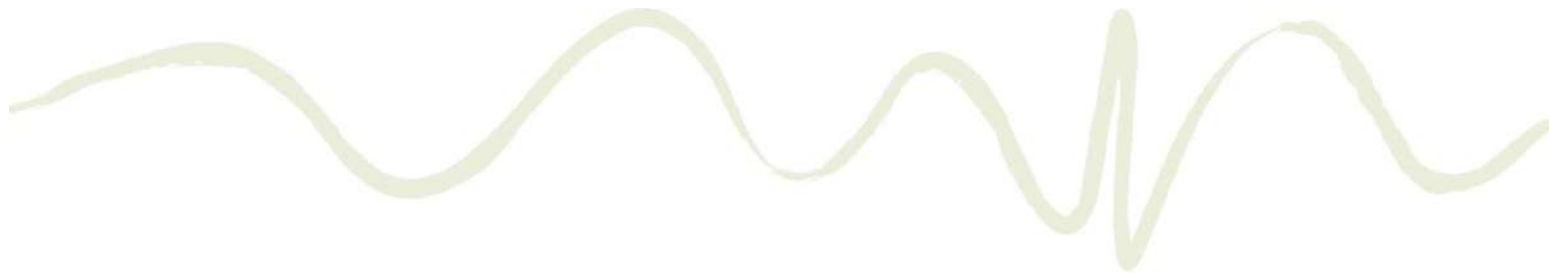
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. Requires very large permanent territories in most habitats due to sparse prey densities.		
<i>Ninox strenua</i> (Foraging)	Powerful Owl	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species.	Possible	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/disturbance and is small in area. Open pasture (and derived PCT 837) is grazed and slashed and provides poor prey resources. No live BioNet records in Yamba locality. Foraging habitat is marginal.
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured. Roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings.	Possible	Marginal foraging habitat; nearby records from swamp forest along Sullivans Road to the south of the site (BioNet). No roosting habitat occurs.
<i>Oxyura australis</i>	Blue-billed Duck	Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and overwintering lakes with some long-distance dispersal to breed during spring and early summer.	Unlikely	Suitable habitat is absent. Patches of PCT 780 lack suitable vegetation cover and are ephemeral.



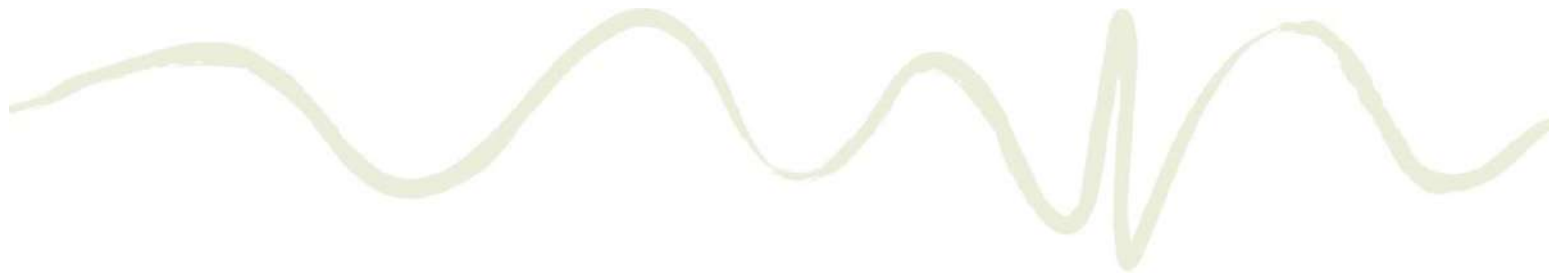
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat	A range of vegetation types in northern Australia, from rainforests to open forests and woodlands; often recorded along watercourses. They can also occur in towns and cities. Roost mainly in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland. Paddock trees are potentially used for roosting and breeding.	Possible	Potential foraging habitat associated with PCT 837 and PCT 1235/1064.
<i>Pandion cristatus</i>	Eastern Osprey	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water.	Unlikely	No foraging habitat occurs.
<i>Petaurus australis</i>	Yellow-bellied Glider	Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. Dispersal requires continuous habitat connectivity (gliding distance around 120m).	Unlikely	PCT 837 is isolated and small in area and has no links to areas of contiguous forest. No coastal records occur between Iluka and Brooms Head (BioNet). No denning habitat within PCT 837 occurs.
<i>Petroica boodang</i>	Scarlet Robin	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Both mature and regrowth vegetation are utilised. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Abundant logs and fallen timber are important habitat components. Primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Paddock trees are used for roosting and foraging.	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/ disturbance and is small in area. Preferred structural elements are absent.
<i>Petroica phoenicea</i>	Flame Robin	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/



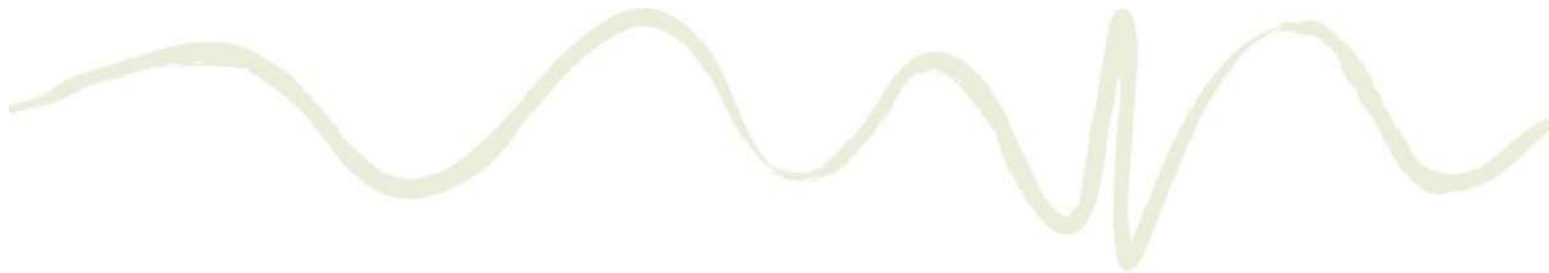
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). In winter occurs in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees; occasionally seen in heathland or other shrublands in coastal areas. Breeding and non-breeding habitat is very different. The species will occupy smaller patches outside breeding season. Paddock trees are used for roosting and foraging.		disturbance and is small in area. Native grasses are poorly represented in the ground layer.
<i>Phascolarctos Cinereus</i> (Foraging)	Koala	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Preferred (primary) food tree species in coastal parts of the Clarence LGA include Tallowwood, Swamp Mahogany, Forest Red Gum, Small-fruited Grey Gum, Orange Gum and Cabbage Gum (refer to <i>Comprehensive Koala Plan of Management for the Ashby, Woombah and Iluka localities in the Clarence Valley LGA</i> ; Clarence Valley Council 2015).	Unlikely	Koala resources are very poor (two isolated Forest Red Gum); no recent Koala records are known from the locality (BioNet) and a resident population does not occur.
<i>Phoniscus papuensis</i>	Golden-tipped Bat	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000 m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Will fly up to two kilometres from roosts to forage in rainforest and sclerophyll forest on mid and upper-slopes. Roost mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests. May also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes. Bats will use multiple roost and change roosts regularly. Bats roost individually or in small	Unlikely	Suitable habitat is absent; no records east of Grafton within the LGA (BioNet).



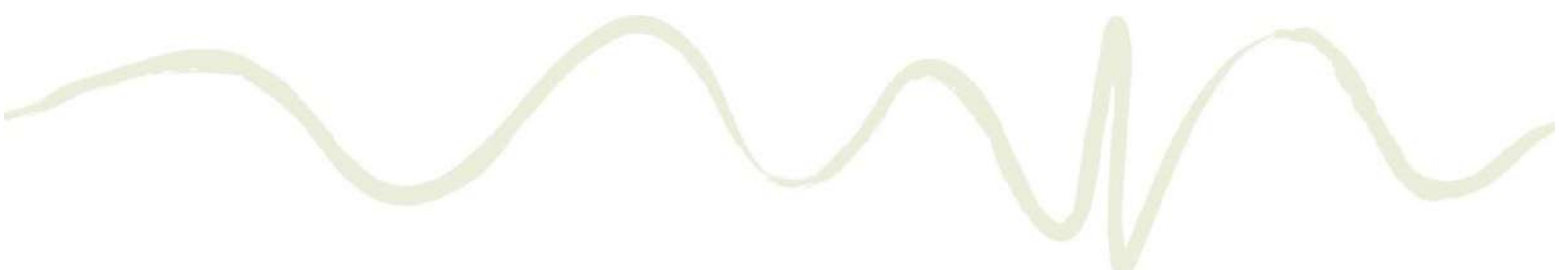
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		colonies which can contain up to approximately 20 bats of both males and females or just a single sex.		
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Inhabits open Box-Gum Woodlands on the slopes, Box-Cypress-pine and open Box Woodlands on alluvial plains and woodlands on fertile soils in coastal regions. Build and maintain several conspicuous, dome-shaped stick nests about the size of a football. Nests are usually located in shrubs or sapling eucalypts, although may be built in the outermost leaves of low branches of large eucalypts. Territories range from 1 to 50 ha (usually around 10 ha) and are defended all year. Paddock trees can be important for this species as they can link remnant foraging habitat.	Possible	Family group historically known to occur along Sullivans Road to the south. Records also along Golding Street to the north-east. May opportunistically forage in PCT 837 and along forest edges.
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again. Generally only located in large patches.	Unlikely	Suitable habitat is absent.
<i>Pteropus poliocephalus</i> (Foraging)	Grey-headed Flying-fox	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possible	Potential opportunistic foraging habitat associated with PCT 837, 1064, 1235 & 784.
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic.	Unlikely	PCT 1064 regrowth in the development area has no resources for the species – rainforest trees absent; no figs occur.



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Rostratula australis</i>	Australian Painted Snipe	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely	Habitat at site is unsuitable – being ephemeral, small in area, poorly developed, ephemeral and subject to grazing and disturbance. Only 1 record in the LGA at Tucabia (BioNET).
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn. Paddock trees should be flagged as potential roosts.	Possible	Potential foraging habitat associated with PCT 837, PCT 1235 and PCT 1064. No potential roost habitat within development site.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	Possible	Potential foraging habitat associated with PCT 837, PCT 1235 and PCT 1064. No potential roost habitat within development site.
<i>Stagonopleura guttata</i>	Diamond Firetail	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Appears to be sedentary, though some populations move locally, especially those in the south. Has been recorded in some towns and near farm houses.	Unlikely	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/disturbance and is small in area. Native grasses are poorly represented in the ground layer. No records in broader Yamba locality (BioNet).
<i>Stictonetta naevosa</i>	Freckled Duck	Prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Unlikely	Habitat at site is marginal – being small in area, poorly developed, ephemeral and subject to grazing and disturbance.
<i>Syconycteris australis</i>	Common Blossom-bat	Common Blossom-bats often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. They have also been recorded in a range of other vegetation communities,	Possible	PCT 784 & 1064 provide foraging habitat; roost habitat not present. Nearby local records (BioNet).



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		such as subtropical rainforest, wet sclerophyll forest and other coastal forests. They generally roost individually in dense foliage and vine thickets of the sub-canopy, staying in the same general area for a season. They change roost sites daily, but each roost site is generally only 50 m or so away from other recent roosts. Favoured feeding sites are repeatedly visited on consecutive nights within a flowering season and revisited over several years. They require a year round supply of nectar and pollen which is gathered from a mosaic of coastal complex vegetation types. When these vegetation types are in short supply of nectar and pollen (Nov/Dec in northern NSW) Common Blossom-bats have been known to utilise riverine areas containing Black Bean, Silky Oak and Weeping Bottlebrush.		
<i>Tyto longimembris</i>	Eastern Grass Owl	Areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	Possible	Grassland and sedgeland (PCT 780) are disturbed, grazed, slashed and fragmented. Foraging habitat is marginal.
<i>Tyto novaehollandiae</i> (Foraging)	Masked Owl	Dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 500 to 1000 ha. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Will use areas that are quite small, especially as foraging habitat but also as roosting habitat and occasionally as breeding habitat. Dead stags are especially popular for roosting/breeding habitat and are a limited resource due to natural attrition.	Possible	PCT 837 offers very poor foraging habitat due to a lack of ground and shrub layer and grazing/ disturbance and is small in area. Open pasture is grazed and slashed. Foraging habitat is marginal.
<i>Xenus cinereus</i>	Terek Sandpiper	Coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Unlikely	Suitable habitat is absent.



Appendix E

Assessment of Habitat Suitability – Species Credit Species

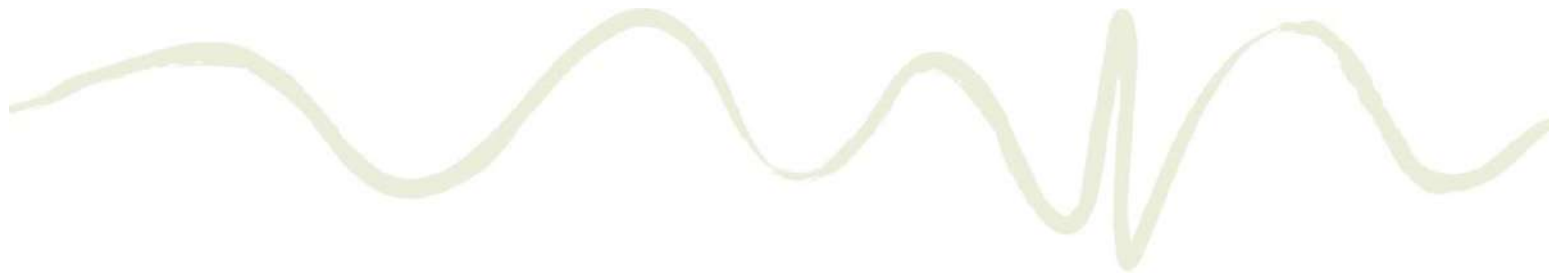
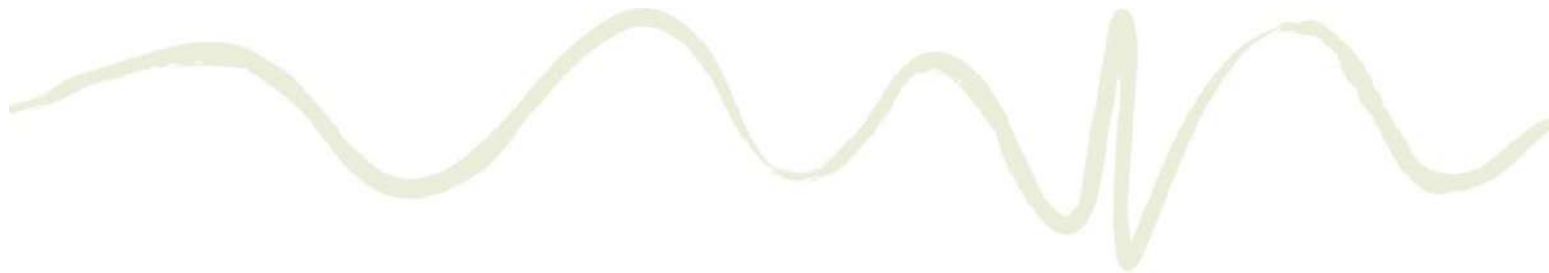


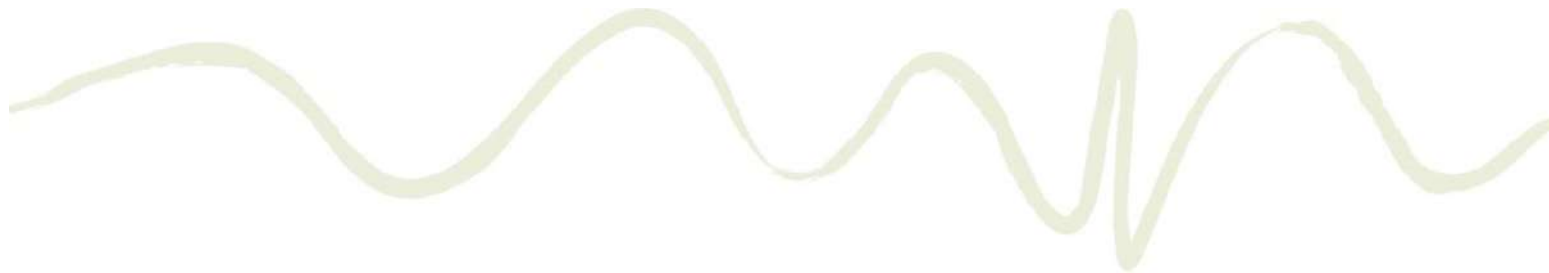
Table E1. Assessment of Habitat Suitability for Candidate Threatened Species (Species Credit Species)

NOTE: Species which may occur are shaded in grey

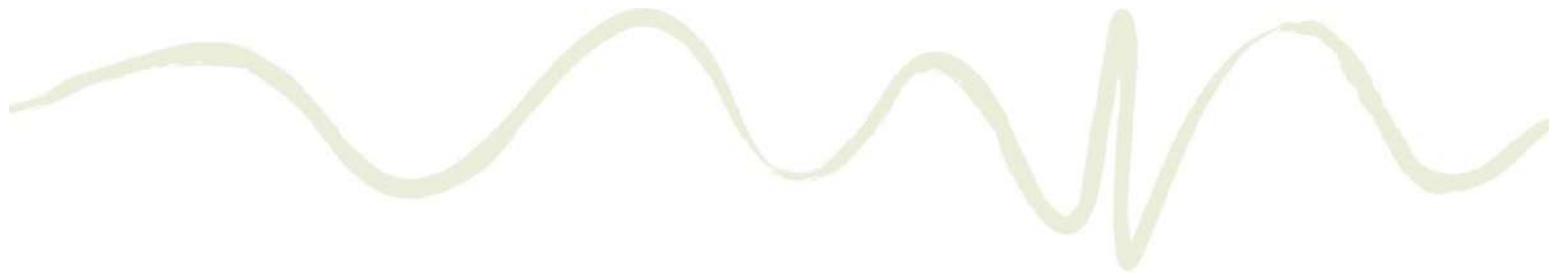
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Acronychia littoralis</i>	Scented Acronychia	Mainly occurs within two kilometres from the coast on sandy soil in transition zones between littoral rainforest and swamp sclerophyll forest, between littoral and coastal cypress pine communities and margins of littoral forest.	Unlikely	Suitable habitat is absent. No <i>Acronychia</i> sp. present at site.
<i>Aepyprymnus rufescens</i>	Rufous Bettong	Inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	Unlikely	Suitable habitat is absent. Grassland and forest degraded, slashed and grazed. No shelter habitat occurs.
<i>Allocasuarina defungens</i>	Dwarf Heath Casuarina	Tall heath on sand, also on clay and sandstone. Habitat also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains.	Unlikely	Suitable habitat is absent.
<i>Ancistrachne maidenii</i>	Ancistrachne	Dry sclerophyll forest on sandstone-derived soils.	Unlikely	Suitable habitat is absent.
<i>Anthochaera phrygia</i> (Breeding)	Regent Honeyeater	Typically inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Preferred habitat has significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Non-breeding flocks forage in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Two known key breeding areas occur in NSW (Capertee Valley and Bundarra-Barraba regions).	Unlikely	Suitable habitat is absent. No recent local records. The site is not within proximity to key known breeding sites.
<i>Archidendron hendersonii</i>	White Lace Flower	Riverine and lowland subtropical rainforest, littoral rainforest, coastal cypress pine forest and their ecotones. Occurs on a variety of soils including coastal sands and those derived from basalt and metasediments.	Unlikely	Suitable habitat is absent.
<i>Argynnis hyperbius</i>	Laced Fritillary	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (<i>Viola betonicifolia</i>) occurs in the vegetation ground layer beneath grasses and mat-rushes (<i>Lomandra</i> spp.). Laced Fritillary require a high watertable and high water nutrient load and is a 'boom and bust' species, triggered by flooding.	Unlikely	Suitable habitat is absent; no <i>Viola betonicifolia</i> on-site.



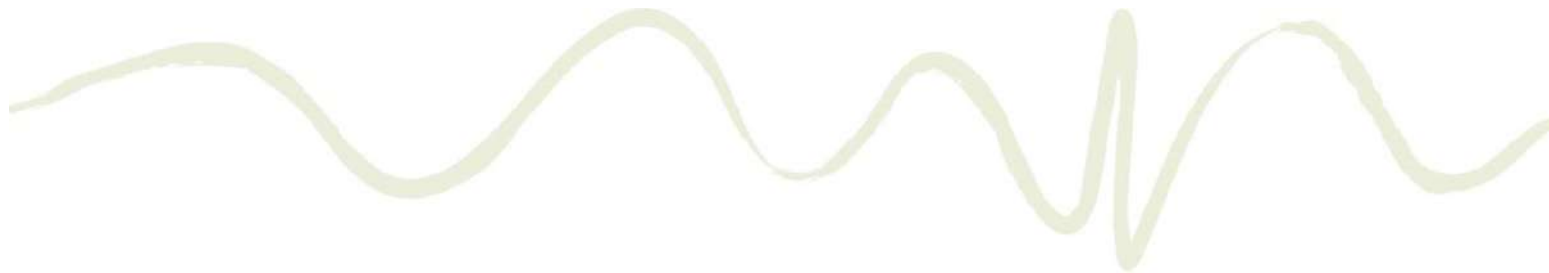
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Arthraxon hispidus</i>	Hairy Jointgrass	Moist shady places in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality. Grassland and sedgeland habitats degraded and modified; typical companion species Swamp Foxtail is absent (refer White <i>et al.</i> 2019).
<i>Burhinus grallarius</i>	Bush Stone-curlew	Lightly timbered open forest and woodland and partly cleared farmland with woodland remnants, preferring areas with dry leaf-litter, fallen timber and sparse ground cover.	Unlikely	Suitable habitat is absent; no recent records in Yamba locality. Grassland and woodland habitats degraded and modified (slashing/grazing).
<i>Cacophis harriettae</i>	White-crowned Snake	Low to mid-elevation dry eucalypt forest and woodland with well-developed litter layer. Also occasionally found in moist eucalypt forest and coastal heathland.	Unlikely	Suitable habitat is absent. Grassland and woodland habitats degraded and modified (slashing/grazing).
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Dry sclerophyll forest on the coast and adjacent ranges.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality.
<i>Calyptorhynchus banksii banksii</i>	Red-tailed Black-Cockatoo (coastal subspecies)	Dry open forest and areas of mixed rainforest-eucalypt forest. Almost certainly extinct in NSW.	Unlikely	Suitable habitat is absent. Listed as extinct in NSW.
<i>Calyptorhynchus lathami</i> (Breeding)	Glossy Black-Cockatoo	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Dependent on large hollow-bearing eucalypts for nest sites.	Unlikely	No hollow trees of suitable dimensions occur; other preferred breeding features are absent.
<i>Carterornis leucotis</i>	White-eared Monarch	Occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.	Unlikely	PCT 1064 lacks suitable structure and is isolated and small in area.
<i>Centranthera cochininensis</i>	Swamp Foxglove	Swampy areas and other moist sites.	Possible	Suitable (albeit degraded and disturbed) habitat occurs.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Inhabits a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.	Unlikely	Suitable habitat is absent.



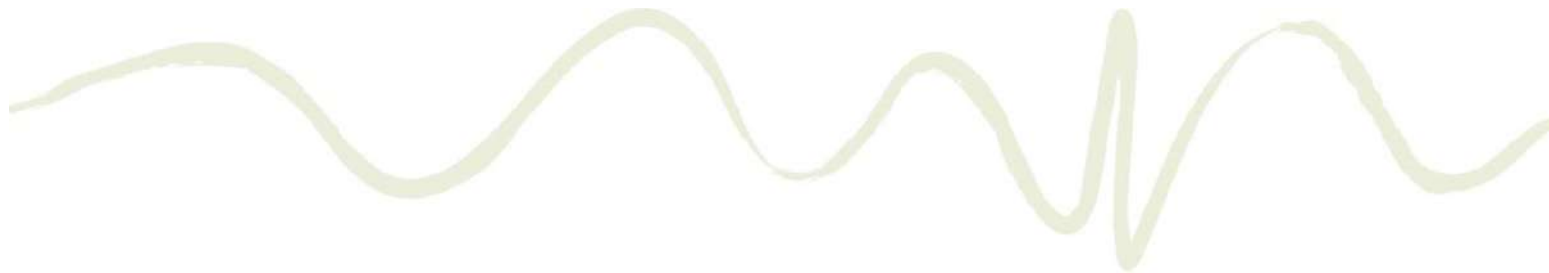
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features.	Unlikely	Suitable habitat is absent.
<i>Chamaesyce psammogeton</i>	Sand Spurge	Fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>).	Unlikely	Suitable habitat is absent.
<i>Crinia tinnula</i>	Wallum Froglet	Usually associated with acidic swamps on coastal sand plains; typically occur in sedgeland and wet heathlands. Also found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. Breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches.	Unlikely	Suitable habitat is absent; watercourses are not permanent. No recent BioNet records in Yamba locality.
<i>Cyperus aquatilis</i>	Water Nutgrass	Appears as an annual during the wet summer period within ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs; sandstone areas.	Possible	Suitable (albeit degraded and disturbed) habitat occurs.
<i>Davidsonia jerseyana</i>	Davidson's Plum	Lowland subtropical rainforest and wet eucalypt forest at low altitudes (below 300 m). Restricted to north-east NSW to as far south as Wardell.	Unlikely	Suitable habitat is absent within development site; site outside natural range. No BioNet records in LGA.
<i>Dendrobium melaleucaphilum</i>	Spider Orchid	Grows frequently on <i>Melaleuca styphelioides</i> , less commonly on rainforest trees or on rocks in coastal districts.	Possible	Suitable habitat occurs. Plants within larger patches of PCT 1064 on Lot 47.
<i>Desmodium acanthocladum</i>	Thorny Pea	Dry rainforest and fringes of riverine subtropical rainforest on basalt-derived soils at low elevations.	Unlikely	Suitable habitat is absent.
<i>Diploglottis campbellii</i>	Small-leaved Tamarind	Habitat varies from lowland subtropical rainforest to drier subtropical rainforest with a Brush Box open overstorey. Occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite.	Unlikely	Suitable habitat is absent.
<i>Dromaius novaehollandiae</i> - endangered population	Emu population in the NSW North Coast Bioregion and Port Stephens LGA	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in	Unlikely	Suitable habitat is absent. No recent BioNet records in Yamba locality.



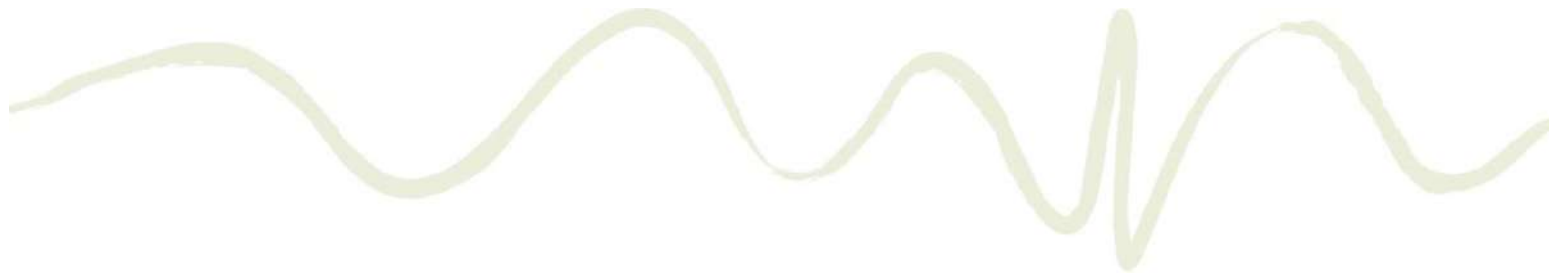
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		plantations of tea-tree and open farmland, and occasionally in littoral rainforest.		
<i>Drynaria rigidula</i>	Basket Fern	Usually found in rainforest but also in moist eucalypt and Swamp Oak forest. Grows on plants, rocks or ground in rainforest and moist eucalypt forest.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality.
<i>Eleocharis tetraquetra</i>	Square-stemmed Spike-rush	Damp locations on stream edges and in and on the margins of freshwater swamps.	Possible	Suitable habitat occurs. No recent BioNet records in Yamba locality. A species with a sporadic distribution and known to occur in disturbed areas.
<i>Elionurus citreus</i>	Lemon-scented Grass	Associated with sandy soils near rivers or along the coast in wallum areas or sand dunes (including in infertile white sands).	Unlikely	Suitable habitat is absent.
<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	Green-leaved Rose Walnut	Subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats. Records are usually from poorer soils derived from sedimentary, metamorphic or acid volcanic rocks, chiefly at lower altitudes.	Unlikely	Suitable habitat is absent.
<i>Eucalyptus glaucina</i>	Slaty Red Gum	Grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality.
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	Dry or moist eucalypt forest on moderately fertile soil, often in low areas with poor drainage.	Unlikely	Suitable habitat is absent; no ironbark on-site. No BioNet records in Yamba locality.
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	Dry eucalypt forest and coastal swamp forest at lower altitudes, often on sand.	Unlikely	Suitable habitat is absent.
<i>Gossia fragrantissima</i>	Sweet Myrtle	Dry subtropical and riverine rainforest, isolated plants can be found in paddocks from regrowth mostly on basalt-derived soils.	Unlikely	Suitable habitat is absent. No BioNet records in LGA.
<i>Grevillea masonii</i>	Mason's Grevillea	Occurs on gravelly loam soils and in sand in open eucalypt woodland.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality.
<i>Haliaeetus leucogaster</i> (Breeding)	White-bellied Sea-Eagle	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh.	Unlikely	No stick nests occur within the development site.



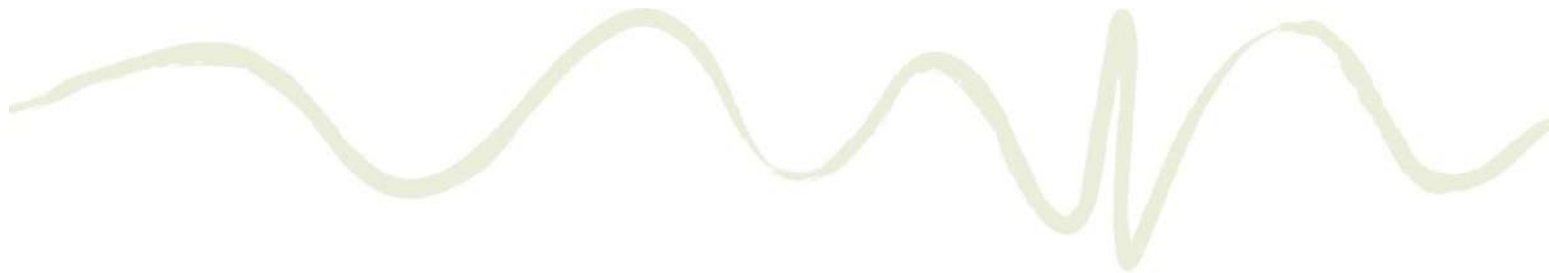
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period.		
<i>Hieraaetus morphnoides</i> (Breeding)	Little Eagle	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Paddock trees can provide important breeding habitat.	Unlikely	No stick nests occur within the development site.
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas.	Unlikely	Suitable habitat is absent. PCT 837 provides unsuitable habitat due to its isolation, small size and lack of structural complexity. Woodland habitat degraded and modified (slashing/grazing).
<i>Indigofera baileyi</i>	Bailey's Indigo	Open woodlands on loam and clay loam soils, typically from granite or basalt, but also from sediments in the Clarence lowlands.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality.
<i>Lathamus discolor</i> (Breeding)	Swift Parrot	On mainland Australia only present in non-breeding season (breeding occurs in Tasmania only).	Unlikely	No breeding occurs in NSW.
<i>Lichenostomus fasciolaris</i>	Mangrove Honeyeater	Primary habitat is mangrove woodlands and shrublands but Mangrove Honeyeaters also range into adjacent forests, woodlands and shrublands, including casuarina and paperbark swamp forests and associations dominated by eucalypts or banksias.	Possible	Potential opportunistic foraging habitat.
<i>Lindernia alsinoides</i>	Noah's False Chickweed	Swamp forests and wetlands along coastal and hinterland creeks.	Unlikely	Wetland areas (PCT 780) are degraded from grazing and slashing; no BioNet records in the Yamba locality.
<i>Lindsaea incisa</i>	Slender Screw Fern	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. Waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly.	Unlikely	Suitable habitat is absent as all drainage areas are highly modified. No BioNet records in Yamba locality.



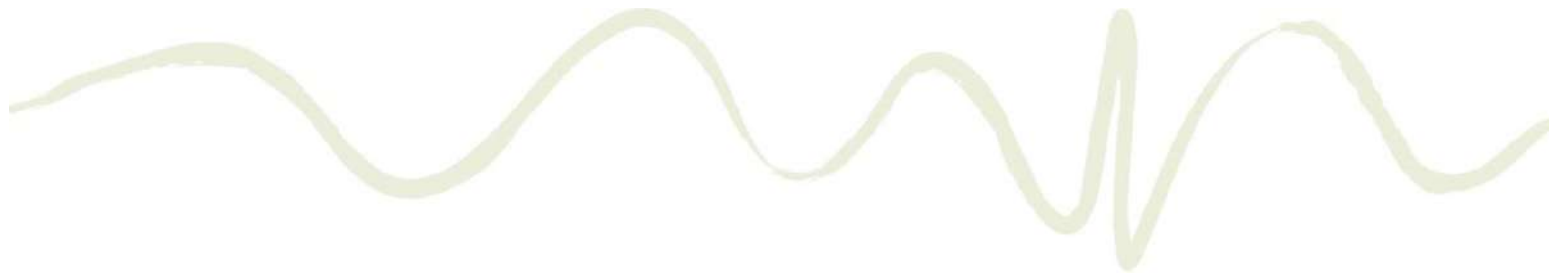
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Litoria aurea</i>	Green and Golden Bell Frog	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available.	Unlikely	Suitable habitat is absent. No recent BioNet records in Yamba locality. Wetland areas (PCT 780) are degraded from grazing and slashing.
<i>Litoria brevipalmata</i>	Green-thighed Frog	Occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. They prefer wetter forests in the south of the range but extend into drier forests in northern NSW and southern Queensland.	Unlikely	Suitable habitat is absent. No recent BioNet records in Yamba locality. Woodland and Wetland areas (PCT 837 and 780) are degraded from grazing and slashing.
<i>Litoria olongburensis</i>	Olongburra Frog	Confined to coastal sandplain wallum swamps within acidic pH (2.8-5.5) wetlands. Frogs are highest in abundance in relatively undisturbed wallum swamps.	Unlikely	Suitable habitat is absent. No recent BioNet records in Yamba locality.
<i>Lophoictinia isura</i> (Breeding)	Square-tailed Kite	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Home ranges can extend over at least 100 km ² . Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Unlikely	No stick nests occur within the development site.
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	Subtropical rainforest usually near the coast.	Unlikely	Suitable habitat is absent.
<i>Maundia triglochinos</i>	Maundia	Swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Associated with wetland species e.g. <i>Cycnogeton procerum</i> .	Possible	PCTs 1235 and 780 provide potential habitat where <i>Cycnogeton procerum</i> occurs.
<i>Melaleuca irbyana</i>	Weeping Paperbark	Open eucalypt forest in poorly drained, usually clay, sandstone or alluvial soils.	Unlikely	Suitable habitat is absent. No BioNet records in Yamba locality. Potential habitat (PCT 837) degraded from grazing and slashing and no shrub layer occurs.
<i>Miniopterus australis</i> (Breeding)	Little Bentwing-bat	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree	Unlikely	No suitable breeding habitat present.



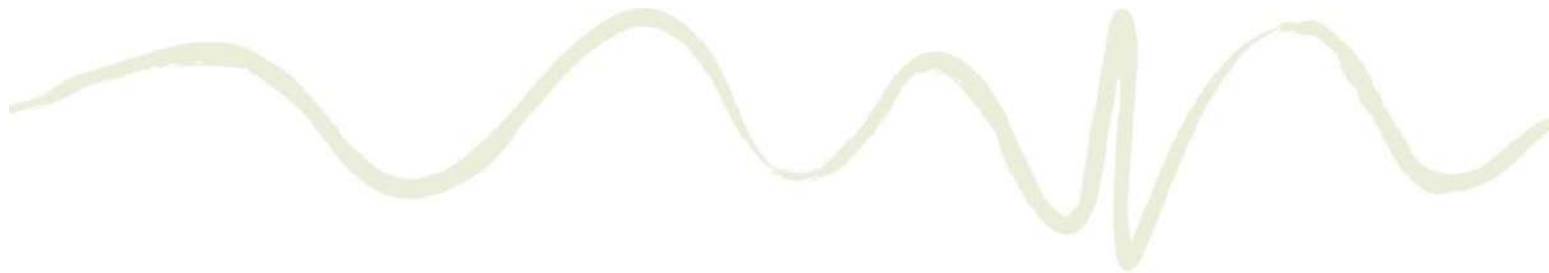
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. They often share roosting sites with the Large Bentwing-bat and, in winter, the two species may form mixed clusters. Maternity colonies form in spring and birthing occurs in early summer. Only five nursery sites/maternity colonies are known in Australia.		
<i>Miniopterus orianae oceanensis</i> (Breeding)	Large Bentwing-bat	Hunts in forested areas, catching moths and other flying insects above the tree tops. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves.	Unlikely	No suitable breeding habitat present.
<i>Mixophyes iteratus</i>	Giant Barred Frog	Freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured habitat.	Unlikely	Suitable habitat is absent.
<i>Myotis macropus</i>	Southern Myotis	Generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish by raking their feet across the water surface. Dependent on waterways with pools of three metres wide or greater for foraging. Dependent on waterways with pools of three metres wide or greater for foraging, habitat surrounding waterways is used for breeding and roosting.	Possible	Potential foraging habitat is present within the farm dam on Lot 47. Small stretches of open water occur within the ephemeral drain bisecting regrowth Swamp Oak (PCT 1235). While much of the waterway may contain macrophytes, an estimated 100 m ² (50 m x 2 m width) of open water occurs which provides poor foraging opportunities and only when the drain holds water. Sedgeland (PCT 780) is also unsuitable foraging habitat due to the lack of open water and ephemeral nature of fragmented patches. No hollow-bearing trees occur within the development site. No breeding habitat is present.
<i>Myrsine richmondensis</i>	Ripple-leaf Muttonwood	Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil and alluvial deposits.	Unlikely	Suitable habitat is absent. No BioNet records in LGA.
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. This species is vagrant in	Unlikely	Suitable habitat is absent. No BioNet records in LGA, vagrant in NSW.



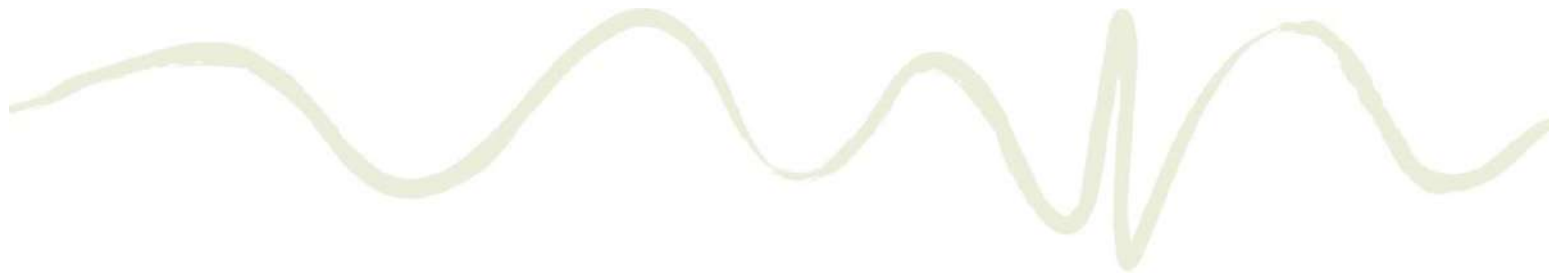
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		NSW, an occasional visitor to northern NSW from South-east Qld. Although they breed in tree hollows there are no breeding records in NSW.		
<i>Ninox connivens</i> (Breeding)	Barking Owl	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 ha, with 2000 ha being more typical in NSW habitats. Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas). Breeding is identified by suitable habitat and presence of male and female or calling to each other (duetting) or presence of a nest or existing breeding habitat identified.	Unlikely	No hollow trees of suitable dimensions occur; other preferred breeding features are absent.
<i>Ninox strenua</i> (Breeding)	Powerful Owl	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. Nesting occurs in large tree hollows (at least 0.5 m deep), in large	Unlikely	No hollow trees of suitable dimensions occur; other preferred breeding features are absent.



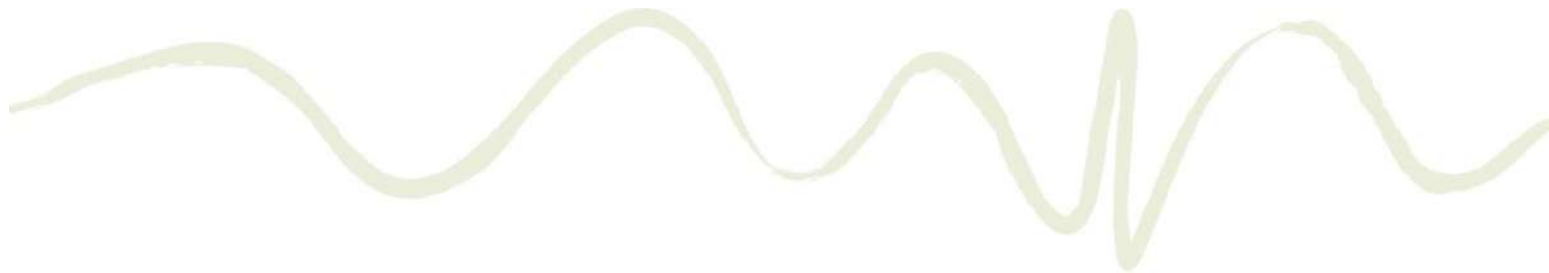
Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. The species can breed and forage in very small patches of vegetation, although this is hugely variable across their range. Breeding can be identified by suitable habitat AND 1. presence of male and female or 2. calling to each other (duetting) or 3. find nest or 4. existing breeding habitat identified.		
<i>Oberonia complanata</i>	Yellow-flowered King of the Fairies	Grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves.	Unlikely	Suitable habitat is absent; no BioNet records in the Yamba locality, with only one record in the LGA (east of Grafton).
<i>Oberonia titania</i>	Red-flowered King of the Fairies	Littoral and subtropical rainforest and paperbark swamps; may also occur in eucalypt-forested gorges and in mangroves.	Unlikely	Suitable habitat is absent; no BioNet records in the Yamba locality, with only two records in the LGA (near Woolgoolga).
<i>Ochrosia moorei</i>	Southern Ochrosia	Riverine and lowland subtropical rainforest.	Unlikely	Suitable habitat is absent.
<i>Olax angulata</i>	Square-stemmed Olax	Low-lying coastal heaths and heathy woodlands on sandy soils near swamps, often in association with Wallum Banksia (<i>Banksia aemula</i>).	Unlikely	Suitable habitat is absent.
<i>Oldenlandia galioides</i>	Oldenlandia	Margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum (<i>Eucalyptus tereticornis</i>) woodlands.	Unlikely	Suitable habitat is absent; no known BioNet records in the LGA.
<i>Pandion cristatus</i> (Breeding)	Eastern Osprey	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breeds from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. This species can nest in isolated trees.	Unlikely	No stick nests occur at within the development site.
<i>Peristeranthus hillii</i>	Brown Fairy-chain Orchid	Restricted to coastal and near-coastal environments, particularly littoral rainforest and lowland rainforest on floodplain.	Unlikely	Suitable habitat is absent; only one BioNet record in the LGA from littoral rainforest at Iluka.
<i>Persicaria elatior</i>	Tall Knotweed	Typically grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Possible	Potential habitat within PCT 780 and adjacent wet pasture (although both habitats degraded and modified). Numerous records along the W2B



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
				highway upgrade associated with areas of swampy pasture.
<i>Petalura litorea</i>	Coastal Petaltail	Permanent wetlands, swamps and bogs with some free water and open vegetation. Restricted to coastal and near coastal lowlands between Coffs Harbour and Byron Bay; known from a very small number of locations, including Brooms Head, Tucabia, Diggers Camp and Bonville.	Possible	Very marginal suitable habitat within development site; PCT 780 represents degraded habitat which is disturbed by grazing. Potential habitat within eastern residue land.
<i>Petaurus norfolcensis</i>	Squirrel Glider	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	Unlikely	While there are records of Squirrel Glider in Yamba township in association with swamp forest, resources within the development site are small in area, isolated and have a fragmented connection to substantial areas of habitat to the south of the site. These adjacent habitats provide large areas of well-connected structurally complex open forest. In contrast, PCT 837 at the site is highly modified to a woodland type formation with large gaps between trees within the development site. Patches of PCT 1064 within the development site are very small in area and are isolated/fragmented and comprise poorly developed regrowth. No hollow-bearing trees (potential den trees) occur within the development site.
<i>Phaius australis</i>	Southern Swamp Orchid	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest mostly in coastal areas.	Unlikely	Known populations around Yamba from swamp sclerophyll forest along Angourie Road, however no suitable habitat occurs within the development site, which has been significantly disturbed and modified.
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.	Unlikely	Suitable habitat is absent. PCT 837 provides unsuitable habitat due to its isolation, small size and lack of den trees.
<i>Phascolarctos cinereus</i>	Koala (Breeding)	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Preferred (primary) food tree species in coastal	Unlikely	Suitable habitat is absent and there are no recent local records (BioNet).



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		parts of the Clarence LGA include Tallowwood, Swamp Mahogany, Forest Red Gum, Small-fruited Grey Gum, Orange Gum and Cabbage Gum (refer to <i>Comprehensive Koala Plan of Management for the Ashby, Woombah and Iluka localities in the Clarence Valley LGA</i> ; Clarence Valley Council 2015).		
<i>Phyllanthus microcladus</i>	Brush Sauropus	Banks of creeks and rivers, in streamside rainforest or dry rainforest.	Unlikely	Suitable habitat is absent.
<i>Planigale maculata</i>	Common Planigale	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. Habitat includes hollow logs, under bark, rocks, cracks in soil, grass tussocks or building debris.	Unlikely	Suitable habitat is absent. Vegetation is too disturbed from regular grazing and occasional slashing, logs and debris are absent and structural complexity is very low.
<i>Polygala linariifolia</i>	Native Milkwort	Sandy soils in dry eucalypt forest and woodland with a sparse understorey. Typically associated with inland habitats (Pilliga, Torrington districts).	Unlikely	Suitable habitat is absent, site is outside known range; no known BioNet records in the LGA.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas.	Unlikely	Suitable habitat is absent.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (breeding)	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Unlikely	No suitable breeding habitat on-site due to very small degraded areas of vegetation. There are no historical records of a camp at the site.
<i>Rotala tripartita</i>	Rotala	Riparian species that grows in free-standing water with sedges. Individuals disappear above-ground during dry periods and may only persist during these times in the soil seed-bank. Also known from Melaleuca freshwater coastal wetland.	Possible	Potential habitat within PCT 780; known records from parts of the site outside the development footprint.
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	Riverine and subtropical rainforest on rich alluvial or basaltic soils.	Unlikely	Suitable habitat is absent, site is outside known range; no known BioNet records in the LGA.



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
<i>Thersites mitchellae</i>	Mitchell's Rainforest Snail	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat. Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees. The species is almost entirely known from the coastal plains and hills in swamp forests, which is a peripheral vegetation to its true core habitat, the lowland subtropical rainforest, which has been removed/cleared. There have been increasingly more sites discovered due to increased survey/observation, particularly in and around Kingscliff and Byron areas.	Unlikely	The site is out of the species natural range; not recorded within the LGA (BioNet).
<i>Todiramphus chloris</i>	Collared Kingfisher	Virtually restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves. They sometimes occur in terrestrial forests or woodlands bordering mangroves, where they will nest in holes in trees or in arboreal termitaria. Occasionally observed in streets or gardens in built-up areas bordering mangrove vegetation.	Unlikely	Suitable habitat is absent; the site is isolated from mangroves 800 m to the west at Oyster Channel.
<i>Turnix maculosus</i>	Red-backed Button-quail	In NSW Red-backed Button-quail occur in grasslands, heath and crops, preferring sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass <i>Heteropogon</i> , Blady Grass <i>Imperata cylindrica</i> , <i>Triodia</i> , <i>Sorghum</i> , and Buffel Grass <i>Cenchrus ciliaris</i> .	Unlikely	Suitable habitat is absent; habitats are too disturbed/degraded; no local records (BioNet).
<i>Tyto novaehollandiae</i> (Breeding)	Masked Owl	Dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 500 to 1000 ha. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Will use areas that are quite small, especially as foraging habitat but also as roosting habitat and occasionally as breeding habitat. Dead stags are especially popular for	Unlikely	No hollow trees of suitable dimensions occur; other preferred breeding features are absent.



Scientific name	Common name	Habitat Requirement	Potential Occurrence	Comments
		roosting/breeding habitat and are a limited resource due to natural attrition.		
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Unlikely	Suitable habitat is absent.
<i>Xenus cinereus</i> (Breeding)	Terek Sandpiper	Coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Unlikely	Breeding habitat is absent.

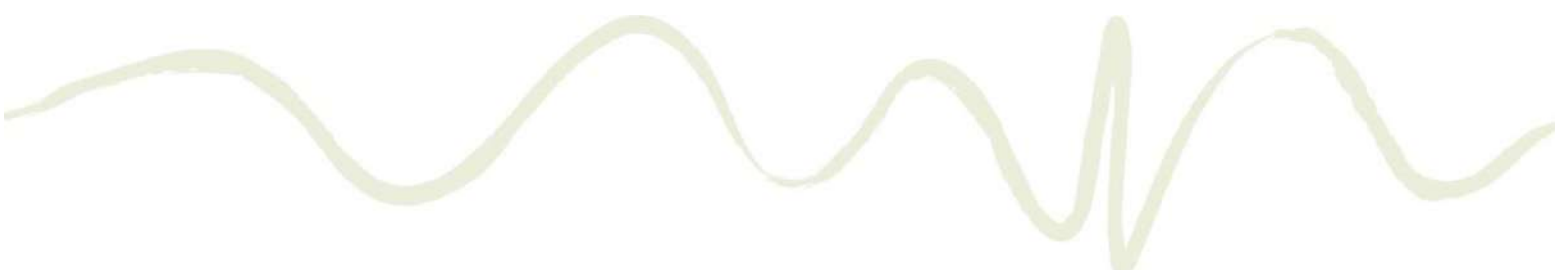
Appendix F

Fauna Inventory

Table F1. Fauna inventory*

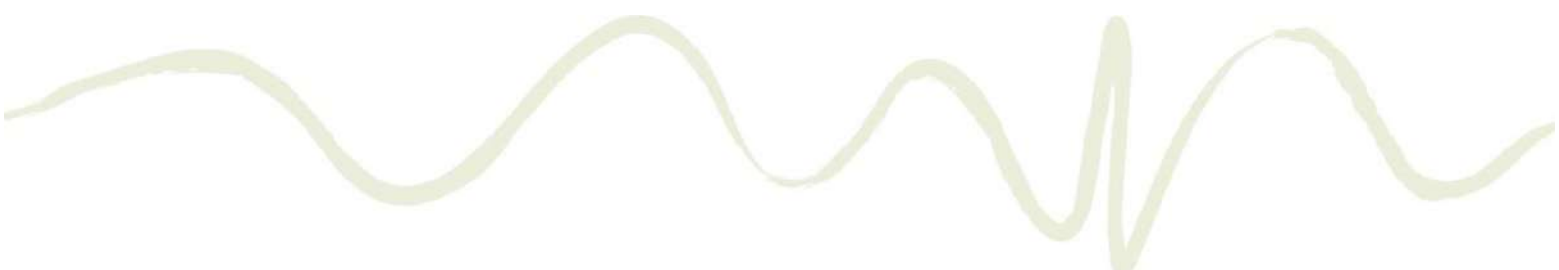
*Based on field assessment over various site visits from July 2018 to present

Scientific name	Common name	Record
Amphibians		
<i>Bufo marinus</i> *	Cane Toad	O
<i>Crinia parinsignifera</i>	Beeping Froglet	C
<i>Crinia signifera</i>	Common Eastern Froglet	C
Reptiles		
<i>Dendrelaphis punctulata</i>	Green Tree Snake	O
<i>Lampropholis delicata</i>	Grass Skink	O
Birds		
<i>Acanthiza pusilla</i>	Brown Thornbill	C
<i>Accipiter fasciatus</i>	Brown Goshawk	O
<i>Acridotheres tristis</i> *	Common Myna	O
<i>Anas superciliosa</i>	Pacific Black Duck	O
<i>Anthus novaeseelandiae</i>	Australasian Pipit	O
<i>Ardea ibis</i>	Cattle Egret	O
<i>Ardea pacifica</i>	White-necked Heron	O
<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	O
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	C
<i>Cacomantis variolosus</i>	Brush Cuckoo	C
<i>Centropus phasianinus</i>	Pheasant Coucal	C
<i>Chenonetta jubata</i>	Australian Wood Duck	O
<i>Chroicocephalus novaehollandiae</i>	Silver Gull	O
<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo	C
<i>Cisticola exilis</i>	Golden-headed Cisticola	O
<i>Colluricincla harmonica</i>	Grey Shrike-Thrush	C
<i>Columba leucomela</i>	White-headed Pigeon	C
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	C
<i>Coracina tenuirostris</i>	Cicadabird	C
<i>Corvus orru</i>	Torresian Crow	O
<i>Coturnix ypsilophora</i>	Brown Quail	O
<i>Cracticus nigrogularis</i>	Pied Butcherbird	O
<i>Cracticus tibicen</i>	Australian Magpie	O
<i>Cracticus torquatus</i>	Grey Butcherbird	O
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	O
<i>Dicaeum hirundinaceum</i>	Mistletoebird	C
<i>Dicrurus bracteatus</i>	Spangled Drongo	O
<i>Egretta novaehollandiae</i>	White-faced Heron	O
<i>Elanus axillaris</i>	Black-shouldered Kite	O
<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	O
<i>Eolophus roseicapilla</i>	Galah	O



Scientific name	Common name	Record
<i>Eopsaltria australis</i>	Eastern Yellow Robin	C
<i>Eudynamys scolopaceus</i>	Eastern Koel	C
<i>Eurystomus orientalis</i>	Dollarbird	O
<i>Falco berigora</i>	Brown Falcon	O
<i>Falco longipennis</i>	Australian Hobby	O
<i>Gallinago hardwickii</i>	Latham's Snipe	O
<i>Gallirallus philippensis</i>	Buff-banded Rail	O
<i>Geopelia humeralis</i>	Bar-shouldered Dove	O
<i>Geopelia placida</i>	Peaceful Dove	O
<i>Grallina cyanoleuca</i>	Magpie Lark	O
<i>Hirundo neoxena</i>	Welcome Swallow	O
<i>Lalage leucomela</i>	Varied Triller	O
<i>Lichmera indistincta</i>	Brown Honeyeater	O
<i>Lopholaimus antarcticus</i>	Topknot Pigeon	O
<i>Malurus cyaneus</i>	Superb Fairy-wren	O
<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	O
<i>Manorina melanocephala</i>	Noisy Miner	O
<i>Meliphaga lewinii</i>	Lewin's Honeyeater	O
<i>Merops ornatus</i>	Rainbow Bee-eater	O
<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	O
<i>Neochmia temporalis</i>	Red-browed Finch	O
<i>Ocyphaps lophotes</i>	Crested Pigeon	O
<i>Oriolus sagittatus</i>	Olive-backed Oriole	O
<i>Pachycephala pectoralis</i>	Golden Whistler	O
<i>Pachycephala rufiventris</i>	Rufous Whistler	C
<i>Pardalotus striatus</i>	Striated Pardalote	C
<i>Pelecanus conspicillatus</i>	Australian Pelican	O
<i>Philemon corniculatus</i>	Noisy Friarbird	O
<i>Platycercus eximius</i>	Eastern Rosella	O
<i>Porphyrio porphyrio</i>	Purple Swamphen	O
<i>Psophodes olivaceus</i>	Eastern Whipbird	C
<i>Rhipidura albiscapa</i>	Grey Fantail	O
<i>Rhipidura leucophrys</i>	Willie Wagtail	O
<i>Rhipidura rufifrons</i>	Rufous Fantail	O
<i>Sphecotheres vieilloti</i>	Australasian Figbird	O
<i>Spilopelia chinensis*</i>	Spotted Turtle-dove	O
<i>Strepera graculina</i>	Pied Currawong	O
<i>Threskiornis molucca</i>	Australian White Ibis	O
<i>Threskiornis spinicollis</i>	Straw-necked Ibis	O
<i>Todiramphus sanctus</i>	Sacred Kingfisher	O
<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet	O
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	O
<i>Vanellus miles</i>	Masked Lapwing	O
<i>Zosterops lateralis</i>	Eastern Silvereye	C
Mammals		
<i>Lepus europaeus*</i>	European Hare	O
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O

C= Call; O = Observed; *Introduced species



Appendix G

SAll Assessment

The Threatened Biodiversity Data Collection (TBDC) identifies *Rotala* as being an SAIL entity. Extinction risks to SAIL species is evidence of:

- rapid decline
- small population size
- limited geographic distribution
- the species being unlikely to respond to management.

Section 10.2 of the BAM 2020 prescribes additional impact assessment provisions for threatened species or populations where an entity is an SAIL species or community. The BAM Operational Manual (Stage 2) and SAIL guidance document (EES 2019b) were consulted to address SAIL matters as below:

***Rotala tripartita* (*Rotala*) - species profile:**

- Status: Endangered (BC Act)
- Impact threshold (TBDC): not stated (under development)
- BioNet records: 309 records (as at 03/05/2021) from six broad locations (Casino [1999], east of Rappville - Ermelo stewardship site [April 2020], Jacky Bulbin Road, Mororo [2014], Yamba [the subject site], Tucabia [2016], Shannondale [2001, 2005]; refer **Figure F1**. One site (Jacky Bulbin Flat, where two plants were recorded) has been lost to redevelopment of the Pacific Highway; it is understood successful translocation of these plants was achieved (pers. comm. Dr Andrew Benwell 2020).
- Other data: *Rotala* has also been recorded at Mongogarrie (SW of Casino) and Dilkoon (north of Grafton); pers. data.
- Population details: The closest record to the site is approximately 20 km to the north (Jacky Bulbin Flat – site cleared and plants translocated). The next closest population at Tucabia is ~33 km south of the site. On the basis of BioNet records, the population at the site is locally significant and unlikely to be related to any known populations of the species. The site is separated from the Casino and Shannondale populations by at least 60 km.

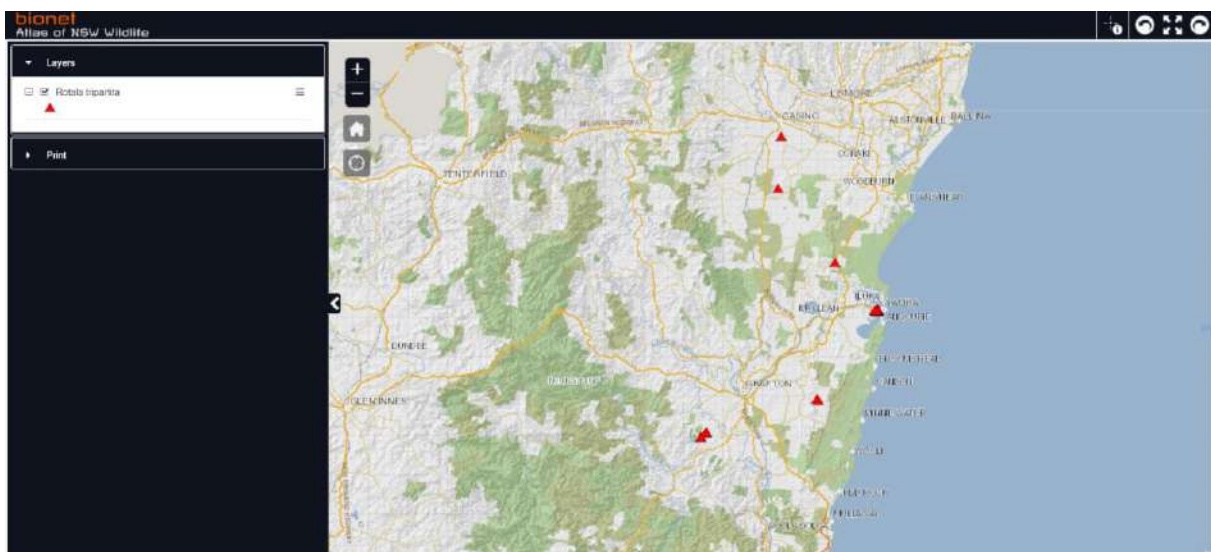
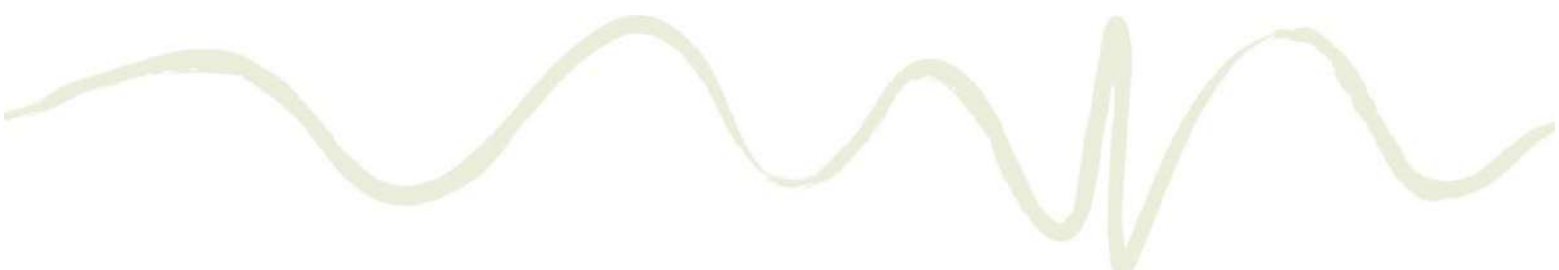


Figure F1. *Rotala* records in the BioNet Atlas



Field records:

Initial survey of sedgeland areas at adjacent Lot 47 detected *Rotala* almost immediately within disturbed sedgeland (slashed and grazed) dominated by *Baumea rubiginosa*. Samples were sent to the NSW Herbarium for confirmation before proceeding with further targeted survey. Following confirmation, targeted survey was completed of all wetland environments in Lots 46 and 47. *Rotala* was recorded extensively in Lot 47 where wetland communities are extensive and moist boggy areas with surface water and a high table water were present. Numerous seedlings were observed growing within tractor wheel ruts at some locations, while other plants also occurred in association with the margins of Broad-leaved Paperbark swamp forest. The concentrated population within the north-east of Lot 47 is extensive and significant in a local context. Within Lot 46, sedgeland areas are less well developed, more disturbed and species poor – a single plant was recorded.

As noted, following a hot and dry summer, all *Rotala* at the site had died, but had flowered and seeded prior to this time, suggesting that future plants are likely to germinate during suitable conditions. The site has been subject to ongoing slashing and grazing for many years (several decades). The fact that a *Rotala* population has persisted during this time suggests the species has some resilience.

It is suspected that other adjacent nearby allotments may also provide habitat for *Rotala* where wetland areas occur. Lot 18 DP1090409 and Lot 2 DP790910 (to the north of the site) support wetland and drainage areas and are considered highly likely to support *Rotala* populations. It is suspected seed from *Rotala* is dispersed in flood events, through surface water dispersal. However, patchy occurrences in the west of the site (Lot 46) which are disconnected from the main drainage area do not support this theory.

Assessment:

An assessment of *Rotala* with regard to the proposed development is provided at **Table G1**.

Table G1. Additional impact assessment provisions for threatened species or populations (as per Section 10.2.3 of the BAM)

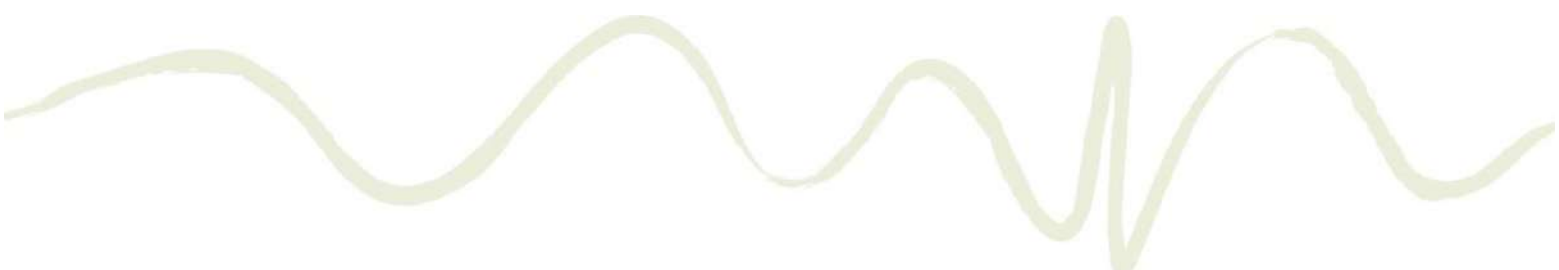
BAM requirement	Response
10.2.3.1 The assessor is required to provide the following further information in the BDAR:	
(a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAI	All known <i>Rotala</i> habitat (inclusive of 30m species buffer) will be retained in-situ, with the development footprint specifically designed to avoid all <i>Rotala</i> habitat. The development footprint comprises more degraded habitats, with the species not recorded in wetland areas (which are less well connected to known population areas at the site). Indirect impacts are largely limited to human trespass, and this threat can be controlled via standard exclusion measures (fencing, signage) with a high level of confidence. Management of <i>Rotala</i> within residue land outside the development would remain the responsibility of the developer (proposed Lot 900) or CVC (proposed Lot 903). Management at each site would depend on the long-term outcomes for these land parcels; in the interim a combination of light grazing and annual slashing (consistent with management regimes over the past decade) would be expected to ensure conditions for <i>Rotala</i> remain suitable for the species to persist. Hydrology of the areas of the site where <i>Rotala</i> occurs would be unaffected from filling and management of stormwater. The north east population will continue to be serviced by surface flows from Golding Street (via a constructed drain) and groundwater, while the western population will be maintained from flows coming off Carrs Drive in combination with groundwater.

BAM requirement	Response
<i>(b) the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification</i>	The local population is all known plants of <i>Rotala</i> at the site. An estimated 650 plants were recorded in Lot 47 in 2018, with an estimated 45 plants recorded in Lot 46 in 2021. Based on species habitat polygon mapping (30m buffer around each plant), 3.28 ha of <i>Rotala</i> habitat is known at the site. None of the known population will be impacted by the proposal directly. While indirect impacts of the proposal could be attributed to the entire <i>Rotala</i> population at the site, appropriate management (including maintenance of surface flows) can be implemented with a high confidence of managing the <i>Rotala</i> population within residue land.
<i>(c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact</i>	No threshold for <i>Rotala</i> has been specified.
<i>(d) the likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to:</i>	
<i>(i) an estimate of the change in habitat available to the local population as a result of the proposed development</i>	No habitat for <i>Rotala</i> would be removed from within the development footprint. All known <i>Rotala</i> habitat would be retained in-situ within residual land (proposed Lots 900 and 903).
<i>(ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and</i>	The proposed development would not modify or destroy known <i>Rotala</i> habitat. Retained <i>Rotala</i> habitat in the eastern and western portions of the site are significantly fragmented and have no hydrological connection. The proposal will not further fragment these populations.
<i>(iii) modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development.</i>	The proposal would be unlikely to modify any habitat required for the maintenance of processes important to life cycle of <i>Rotala</i> . The proposed stormwater discharge into Proposed Lot 903 occurs downstream of known <i>Rotala</i> habitat and so has no potential to alter hydrological regimes which may influence the species' life cycle.
<i>(e) the likely impact on the ecology of the local population:</i>	
<i>(ii) for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available:</i> – <i>pollination cycle</i> – <i>seedbanks</i> – <i>recruitment, and</i> – <i>interactions with other species (e.g. pollinators, host species, mycorrhizal associations)</i>	Due to avoidance of known <i>Rotala</i> habitat; the existing plant population would be retained in-situ within residue land post development. The proposed stormwater discharge into Proposed Lot 903 occurs downstream of known <i>Rotala</i> habitat and so has no potential to disrupt recruitment to this population or alter hydrological regimes for the species.

BAM requirement	Response
<i>(f) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development</i>	The local population (as known) collectively includes the scattered plants within Lot 46 (~ 45 plants) and the significantly larger population (est. 650 plants) at Lot 47. Plants within Lot 46 are already isolated from the core population. The sites do not share hydrology with regard to surface water flow (for seed dispersal) as each occurs within its own micro catchment – Lot 46 receives surface water from Carrs Drive Road reserve; Lot 47 receives surface water from a drainage channel in the north-east corner. The proposed stormwater discharge into Proposed Lot 903 occurs downstream of known <i>Rotala</i> habitat and so has no potential to disrupt recruitment to this population. On this basis, the proposed development would have no impacts on surface flow which may limit <i>Rotala</i> seed recruitment and hence fragment existing populations.
<i>(g) the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range</i>	The local Yamba population (as documented in this BDAR) is ~ 20 km from the closest known population at Jacky Bulbin Flat (now removed). The Yamba population is unlikely to have any interaction with other known populations of the species due to geographic isolation. Based on existing records, the Yamba population is towards the southern distributional limit of the species known range.
<i>(h) the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population</i>	The <i>Rotala</i> populations within residue land would potentially be subject to impacts of adjacent urban development, such as human visitation, disturbance and/or track making. However, both proposed Lots (900, 903) would remain private or Council owned land utilised for stormwater treatment or grazing/agricultural purposes. Erection of boundary fencing and signage is likely to minimise any impacts to the <i>Rotala</i> population from human interference/disturbance.
<i>(i) an estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion</i>	All known BioNet populations occur within the south-eastern Queensland IBRA region (SEQ). Two of the known populations occur within the Clarence Lowlands IBRA Subregion (SEQ13) – the site also occurs within this Subregion. Two populations also occur within the Clarence sandstones IBRA Subregion (SEQ12). The proposed development would affect one of three known <i>Rotala</i> populations within the Clarence Lowlands IBRA Subregion (of which only two exist). Based on BioNet data, the Yamba population is highly significant (few individuals are known from the other two sites). The proposed development would result in intensive urban development adjacent to habitat of the largest known <i>Rotala</i> population within the Clarence Lowlands IBRA Subregion. Other populations in the subregion would not be affected.
<i>(j) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.</i>	No measures are proposed at this stage.

Conclusion

Based on the information above and with consideration of potential direct and indirect impacts on *Rotala*, it is considered unlikely that serious and irreversible impacts to the local *Rotala* population would occur as a result of the development proposal.



Appendix H

BAM Calculator Outputs

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Report Created	BAM Data version *
Ian Colvin	07/06/2021	40
Assessor Number	Assessment Type	BAM Case Status
BAAS18055	Part 4 Developments (General)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
0	07/06/2021	BOS Threshold: Area clearing threshold

* 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.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
---	------	-----	-----------	------	-------------------------	------------------

BAM Vegetation Zones Report

1	837_low	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	low	0.42	1	
2	1064_mod	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	mod	0.16	1	
3	1235_low	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	low	0.33	1	
4	780_mod	780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	mod	0.34	1	
5	1227_derived	1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	derived	0.09	1	
6	837_derived	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	derived	1.59	1	
7	837_derived02	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	derived02	0.02	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Report Created	BAM Data version *
Ian Colvin	07/06/2021	40
Assessor Number	Assessment Type	BAM Case Status
BAAS18055	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
0	BOS Threshold: Area clearing threshold	07/06/2021

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion 1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion 780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Brolga	Grus rubicunda	780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Common Blossom-bat	Syconycteris australis	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Eastern Coastal Free-tailed Bat	<i>Micronomus norfolkensis</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Eastern Grass Owl	<i>Tyto longimembris</i>	780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Hoary Wattled Bat	<i>Chalinolobus nigrogriseus</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Bent-winged Bat	<i>Miniopterus australis</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

BAM Predicted Species Report

Little Bent-winged Bat	Miniopterus australis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Eagle	Hieraaetus morphnoides	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Little Lorikeet	Glossopsitta pusilla	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Magpie Goose	Anseranas semipalmata	780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
Masked Owl	Tyto novaehollandiae	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Northern Free-tailed Bat	Ozimops lumsdenae	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Powerful Owl	Ninox strenua	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Regent Honeyeater	Anthochaera phrygia	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Spotted Harrier	Circus assimilis	780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
Square-tailed Kite	Lophoictinia isura	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Swift Parrot	Lathamus discolor	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Yellow-bellied Sheath-tail-bat	Saccolaimus flaviventris	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Yellow-bellied Sheath-tail-bat	Saccolaimus flaviventris	780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Australasian Bittern	Botaurus poiciloptilus	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Australian Painted Snipe	Rostratula australis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
Barking Owl	Ninox connivens	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Barred Cuckoo-shrike	Coracina lineata	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Black Bittern	Ixobrychus flavicollis	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Black Bittern	<i>Ixobrychus flavicollis</i>	780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Blue-billed Duck	<i>Oxyura australis</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Comb-crested Jacana	<i>Irediparra gallinacea</i>	780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
Common Blossom-bat	<i>Syconycteris australis</i>	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Diamond Firetail	<i>Stagonopleura guttata</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushland, and forbland of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Eastern Chestnut Mouse	<i>Pseudomys gracilicaudatus</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Eastern Chestnut Mouse	<i>Pseudomys gracilicaudatus</i>	780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Eastern Coastal Free-tailed Bat	<i>Micronomus norfolkensis</i>	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Eastern Osprey	<i>Pandion cristatus</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Flame Robin	<i>Petroica phoenicea</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Freckled Duck	<i>Stictonetta naevosa</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Golden-tipped Bat	<i>Phoniscus papuensis</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Hoary Wattled Bat	<i>Chalinolobus nigrogriseus</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Koala	<i>Phascolarctos cinereus</i>	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Eagle	<i>Hieraaetus morphnoides</i>	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushlands, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Lorikeet	<i>Glossopsitta pusilla</i>	1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Northern Free-tailed Bat	Ozimops lumsdenae	780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Powerful Owl	Ninox strenua	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion 1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion 1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Regent Honeyeater	Anthochaera phrygia	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion 1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Scarlet Robin	Petroica boodang	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion 1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion 1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion 780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast 1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Square-tailed Kite	Lophoictinia isura	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion 1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Superb Fruit-Dove	Ptilinopus superbus	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Swift Parrot	Lathamus discolor	1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
Terek Sandpiper	Xenus cinereus	780-Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Varied Sittella	Daphoenositta chrysoptera	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion 1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion 1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

BAM Predicted Species Report

Varied Sittella	Daphoenositta chrysoptera	1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
		780-Coastal floodplain sedgeland, rushlands, and forblands of the North Coast
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Yellow-bellied Glider	Petaurus australis	837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion
		1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
		1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Australasian Bittern	Botaurus poiciloptilus	Refer to BAR
Australian Painted Snipe	Rostratula australis	Refer to BAR
Barred Cuckoo-shrike	Coracina lineata	Refer to BAR
Black Bittern	Ixobrychus flavicollis	Species is vagrant
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	Refer to BAR
Blue-billed Duck	Oxyura australis	Refer to BAR
Comb-crested Jacana	Irediparra gallinacea	Habitat constraints
Diamond Firetail	Stagonopleura guttata	Refer to BAR
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	Refer to BAR
Eastern False Pipistrelle	Falsistrellus tasmaniensis	Refer to BAR
Eastern Osprey	Pandion cristatus	Refer to BAR
Flame Robin	Petroica phoenicea	Refer to BAR
Freckled Duck	Stictonetta naevosa	Refer to BAR

BAM Predicted Species Report

Glossy Black-Cockatoo	<i>Calyptrorhynchus lathamii</i>	Refer to BAR
Golden-tipped Bat	<i>Phoniscus papuensis</i>	Refer to BAR
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	Refer to BAR
Koala	<i>Phascolarctos cinereus</i>	Refer to BAR
Scarlet Robin	<i>Petroica boodang</i>	Refer to BAR
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Refer to BAR
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	Refer to BAR
Terek Sandpiper	<i>Xenus cinereus</i>	Refer to BAR
Varied Sittella	<i>Daphoenositta chrysoptera</i>	Refer to BAR
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Refer to BAR
Yellow-bellied Glider	<i>Petaurus australis</i>	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Report Created	BAM Data version *
Ian Colvin	07/06/2021	40
Assessor Number	Assessment Type	BAM Case Status
BAAS18055	Part 4 Developments (General)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
0	07/06/2021	BOS Threshold: Area clearing threshold

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
<i>Centranthera cochinchinensis</i> Swamp Foxglove	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☒ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☒ Survey month outside the specified months?
<i>Cyperus aquatilis</i> Water Nutgrass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☒ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Dendrobium melaleucaphilum</i> Spider orchid	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☒ Aug ☒ Sep ☒ Oct ☐ Nov ☐ Dec ☒ Survey month outside the specified months?

BAM Candidate Species Report

<i>Eleocharis tetraquetra</i> Square-stemmed Spike-rush	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☒ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☒ Survey month outside the specified months?
<i>Lichenostomus fasciogularis</i> Mangrove Honeyeater	No (surveyed)	☐ Jan ☐ Feb ☒ Mar ☒ Apr ☐ May ☒ Jun ☒ Jul ☐ Aug ☐ Sep ☒ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Maundia triglochinoides</i> Maundia triglochinoides	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Myotis macropus</i> Southern Myotis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Persicaria elatior</i> Tall Knotweed	No (surveyed)	☐ Jan ☐ Feb ☒ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Petalura litorea</i> Coastal Petaltail	No (surveyed)	☒ Jan ☒ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Rotala tripartita</i> Rotala tripartita	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☒ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec
		☒ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Ancistrachne maidenii	Ancistrachne maidenii	Refer to BAR
Bailey's Indigo	Indigofera baileyi	Refer to BAR
Barking Owl	Ninox connivens	Habitat constraints
Basket Fern	Drynaria rigidula	Refer to BAR
Brown Fairy-chain Orchid	Peristeranthus hillii	Geographic limitations
Brush Sauropus	Phyllanthus microcladus	Refer to BAR
Brush-tailed Phascogale	Phascogale tapoatafa	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat degraded Habitat constraints
Collared Kingfisher	Todiramphus chloris	Habitat constraints Geographic limitations
Common Planigale	Planigale maculata	Habitat degraded
Cotton Pygmy-Goose	Nettapus coromandelianus	Habitat degraded Species is vagrant
Davidson's Plum	Davidsonia jerseyana	Refer to BAR
Dwarf Heath Casuarina	Allocasuarina defungens	Geographic limitations
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints
Eastern Osprey	Pandion cristatus	Habitat constraints
Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	Dromaius novaehollandiae - endangered population	Refer to BAR
Giant Barred Frog	Mixophyes iteratus	Habitat degraded Habitat constraints

BAM Candidate Species Report

Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	Habitat constraints
Green and Golden Bell Frog	<i>Litoria aurea</i>	Habitat degraded
Green-leaved Rose Walnut	<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	Refer to BAR
Green-thighed Frog	<i>Litoria brevipalmata</i>	Habitat degraded
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Habitat degraded Habitat constraints
Hairy Jointgrass	<i>Arthraxon hispidus</i>	Refer to BAR
Koala	<i>Phascolarctos cinereus</i>	Habitat constraints
Laced Fritillary	<i>Argynnis hyperbius</i>	Habitat degraded Habitat constraints Geographic limitations
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	Habitat constraints
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Habitat constraints
Lemon-scented Grass	<i>Elionurus citreus</i>	Refer to BAR
Little Bent-winged Bat	<i>Miniopterus australis</i>	Habitat constraints
Little Eagle	<i>Hieraaetus morphnoides</i>	Habitat constraints
Long-nosed Potoroo	<i>Potorous tridactylus</i>	Habitat degraded Habitat constraints
Masked Owl	<i>Tyto novaehollandiae</i>	Habitat constraints
Mason's Grevillea	<i>Grevillea masonii</i>	Habitat constraints
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	Habitat degraded
Native Milkwort	<i>Polygala linariifolia</i>	Habitat degraded
Netted Bottle Brush	<i>Callistemon linearifolius</i>	Refer to BAR
Noah's False Chickweed	<i>Lindernia alsinoides</i>	Habitat degraded
Oldenlandia galioides	<i>Oldenlandia galioides</i>	Refer to BAR
Olongburra Frog	<i>Litoria olongburensis</i>	Geographic limitations
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	Habitat degraded
Pink Nodding Orchid	<i>Geodorum densiflorum</i>	Refer to BAR
Powerful Owl	<i>Ninox strenua</i>	Habitat constraints

BAM Candidate Species Report

Red Lilly Pilly	<i>Syzygium hodgkinsoniae</i>	Refer to BAR
Red-backed Button-quail	<i>Turnix maculosus</i>	Habitat degraded
Red-flowered King of the Fairies	<i>Oberonia titania</i>	Habitat degraded
Red-tailed Black-Cockatoo (coastal subspecies)	<i>Calyptorhynchus banksii banksii</i>	Refer to BAR
Regent Honeyeater	<i>Anthochaera phrygia</i>	Habitat constraints
Ripple-leaf Muttonwood	<i>Myrsine richmondensis</i>	Refer to BAR
Rough-shelled Bush Nut	<i>Macadamia tetraphylla</i>	Refer to BAR
Rufous Bettong	<i>Aepyprymnus rufescens</i>	Habitat degraded
Scented Acronychia	<i>Acronychia littoralis</i>	Geographic limitations
Slaty Red Gum	<i>Eucalyptus glaucina</i>	Refer to BAR
Slender Screw Fern	<i>Lindsaea incisa</i>	Habitat degraded
Small-leaved Tamarind	<i>Diploglottis campbellii</i>	Refer to BAR
Southern Ochrosia	<i>Ochrosia moorei</i>	Refer to BAR
Southern Swamp Orchid	<i>Phaius australis</i>	Refer to BAR
Square-fruited Ironbark	<i>Eucalyptus tetrapleura</i>	Refer to BAR
Square-stemmed Olax	<i>Olax angulata</i>	Refer to BAR
Square-tailed Kite	<i>Lophoictinia isura</i>	Habitat constraints
Squirrel Glider	<i>Petaurus norfolcensis</i>	Refer to BAR
Sweet Myrtle	<i>Gossia fragrantissima</i>	Refer to BAR
Swift Parrot	<i>Lathamus discolor</i>	Habitat constraints
Terek Sandpiper	<i>Xenus cinereus</i>	Refer to BAR
Thorny Pea	<i>Desmodium acanthocladum</i>	Refer to BAR
Wallum Froglet	<i>Crinia tinnula</i>	Geographic limitations
Weeping Paperbark	<i>Melaleuca irbyana</i>	Refer to BAR
White Lace Flower	<i>Archidendron hendersonii</i>	Refer to BAR
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Habitat constraints
White-crowned Snake	<i>Cacophis harriettae</i>	Habitat degraded Habitat constraints

BAM Candidate Species Report

White-eared Monarch	<i>Carterornis leucotis</i>	Refer to BAR
Yellow-flowered King of the Fairies	<i>Oberonia complanata</i>	Habitat degraded



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Assessor Number	BAM Data version *
Ian Colvin	BAAS18055	40
Proponent Names	Report Created	BAM Case Status
Neil Garrard	07/06/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	07/06/2021
BOS entry trigger	* 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.	
BOS Threshold: Area clearing threshold		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

Botaurus poiciloptilus / Australasian Bittern

Calyptorhynchus lathami / Glossy Black-Cockatoo

Coracina lineata / Barred Cuckoo-shrike

Dasyurus maculatus / Spotted-tailed Quoll

Falsistrellus tasmaniensis / Eastern False Pipistrelle

Irediparra gallinacea / Comb-crested Jacana

Ixobrychus flavicollis / Black Bittern

Phoniscus papuensis / Golden-tipped Bat

Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)

Ptilinopus superbus / Superb Fruit-Dove

Rostratula australis / Australian Painted Snipe

Stagonopleura guttata / Diamond Firetail

Stictonetta naevosa / Freckled Duck

Xenus cinereus / Terek Sandpiper

Oxyura australis / Blue-billed Duck

BAM Biodiversity Credit Report (Like for like)

Pandion cristatus / Eastern Osprey
Petaurus australis / Yellow-bellied Glider
Phascolarctos cinereus / Koala
Pseudomys gracilicaudatus / Eastern Chestnut Mouse
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Daphoenositta chrysoptera / Varied Sittella
Haliaeetus leucogaster / White-bellied Sea-Eagle
Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	Not a TEC	2.0	0	35	35
1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Not a TEC	0.2	0	7	7
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.3	0	5	5
780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast	Not a TEC	0.3	0	6	6
1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.1	0	1	1

780-Coastal floodplain sedgeland, rushland, and forblands of the North Coast	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	780_mod	No	6	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

**780-Coastal floodplain
sedgelands, rushlands, and
forblands of the North Coast**

**837-Forest Red Gum - Swamp
Box of the Clarence Valley
lowlands of the NSW North
Coast Bioregion**

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_low	No	11	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_derived	No	23	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_derived02	No		1 Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	1064_mod	No	7	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	1227_derived	No	1	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	1235_low	No	5	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	837_low, 1064_mod, 1235_low, 780_mod, 1227_derived, 837_derived, 837_derived02	2.4	47.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Assessor Number	BAM Data version *
Ian Colvin	BAAS18055	40
Proponent Name(s)	Report Created	BAM Case Status
Neil Garrard	07/06/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	07/06/2021
BOS entry trigger	* 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.	
BOS Threshold: Area clearing threshold		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name
Botaurus poiciloptilus / Australasian Bittern
Calyptorhynchus lathami / Glossy Black-Cockatoo
Coracina lineata / Barred Cuckoo-shrike
Dasyurus maculatus / Spotted-tailed Quoll
Falsistrellus tasmaniensis / Eastern False Pipistrelle
Irediparra gallinacea / Comb-crested Jacana
Ixobrychus flavicollis / Black Bittern
Phoniscus papuensis / Golden-tipped Bat
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Ptilinopus superbus / Superb Fruit-Dove
Rostratula australis / Australian Painted Snipe
Stagonopleura guttata / Diamond Firetail
Stictonetta naevosa / Freckled Duck
Xenus cinereus / Terek Sandpiper
Oxyura australis / Blue-billed Duck
Pandion cristatus / Eastern Osprey
Petaurus australis / Yellow-bellied Glider
Phascolarctos cinereus / Koala
Pseudomys gracilicaudatus / Eastern Chestnut Mouse
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Daphoenositta chrysoptera / Varied Sittella
Haliaeetus leucogaster / White-bellied Sea-Eagle

BAM Biodiversity Credit Report (Variations)

Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	Not a TEC	2.0	0	35	35.00
1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Not a TEC	0.2	0	7	7.00
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.3	0	5	5.00
780-Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	Not a TEC	0.3	0	6	6.00
1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.1	0	1	1.00

780-Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	780_mod	No	6	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Variations)

	Forested Wetlands	Tier 2 or higher threat status	780_mod	No	6	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
837-Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_low	No	11	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_derived	No	23	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

	Coastal Valley Grassy Woodlands This includes PCT's: 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692	Coastal Valley Grassy Woodlands >=50% and <70%	837_derived02	No		1	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options						
	Formation	Trading group	Zone	HBT	Credits	IBRA region	
	Grassy Woodlands	Tier 3 or higher threat status	837_low	No	11	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
	Grassy Woodlands	Tier 3 or higher threat status	837_derived	No	23	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Grassy Woodlands	Tier 3 or higher threat status	837_derived02	No	1	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
	Like-for-like credit retirement options						
	Class	Trading group	Zone	HBT	Credits	IBRA region	

BAM Biodiversity Credit Report (Variations)

	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	1064_mod	No	7	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 2 or higher threat status	1064_mod	No	7	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1227-Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	1227_derived	No	1	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 2 or higher threat status	1227_derived	No	1	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	1235_low	No	5	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 2 or higher threat status	1235_low	No	5	IBRA Region: South Eastern Queensland, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	837_low, 1064_mod, 1235_low, 780_mod, 1227_derived, 837_derived, 837_derived02	2.4	47.00

BAM Biodiversity Credit Report (Variations)

Credit Retirement Options Like-for-like options

Myotis macropus/ Southern Myotis	Spp		IBRA region
	Myotis macropus/Southern Myotis		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014715/BAAS18055/19/00014716		31/05/2021
Assessor Name	Report Created	BAM Data version *
Ian Colvin	07/06/2021	40
Assessor Number	BAM Case Status	Date Finalised
BAAS18055	Finalised	07/06/2021
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* 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.

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast											
4	780_mod	Not a TEC	33.8	33.8	0.34			High Sensitivity to Potential Gain	2.00		6
										Subtotal	6
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion											
1	837_low	Not a TEC	61.8	61.8	0.42			High Sensitivity to Potential Gain	1.75		11

BAM Credit Summary Report

6	837_derived	Not a TEC	33.6	33.6	1.6		High Sensitivity to Potential Gain	1.75	23
7	837_derived02	Not a TEC	17.4	17.4	0.02		High Sensitivity to Potential Gain	1.75	1
								Subtotal	35
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion									
2	1064_mod	Not a TEC	91	91.0	0.16		High Sensitivity to Potential Gain	2.00	7
								Subtotal	7
Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion									
5	1227_derived	Not a TEC	31.7	31.7	0.09		High Sensitivity to Potential Gain	2.00	1
								Subtotal	1
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion									
3	1235_low	Not a TEC	32.2	32.2	0.33		High Sensitivity to Potential Gain	2.00	5
								Subtotal	5
								Total	54

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAll	Species credits
<i>Myotis macropus</i> / <i>Southern Myotis</i> (Fauna)								
837_low	61.8	61.8	0.4	Vulnerable	Not Listed	2	False	12
1064_mod	91.0	91.0	0.02	Vulnerable	Not Listed	2	False	1

BAM Credit Summary Report

1235_low	32.2	32.2	0.04	Vulnerable	Not Listed	2	False	1
780_mod	33.8	33.8	0.23	Vulnerable	Not Listed	2	False	4
1227_derived	31.7	31.7	0.09	Vulnerable	Not Listed	2	False	1
837_derived	33.6	33.6	1.6	Vulnerable	Not Listed	2	False	27
837_derived02	17.4	17.4	0.02	Vulnerable	Not Listed	2	False	1
							Subtotal	47



Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00014715/BAAS18055/19/00014716		0	07/06/2021
Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Ian Colvin	BAAS18055		Finalised
Assessment Type	Date Finalised	BOS entry trigger	
Part 4 Developments (General)	07/06/2021	BOS Threshold: Area clearing threshold	

PCT list

Price calculated	PCT common name	Credits
Yes	837 - Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	35
Yes	1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	7
Yes	1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	5
Yes	780 - Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	6
Yes	1227 - Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	1

Species list

Price calculated	Species	Credits
Yes	<i>Myotis macropus</i> (Southern Myotis)	47

Biodiversity payment summary report

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

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Clarence Lowlands	837 - Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	No	Coastal Valley Grassy Woodlands ≥50% and <70%	20.69%	\$80.00	2.3666	\$1,247.40	35	\$43,659.02
Clarence Lowlands	1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	No	Coastal Swamp Forests ≥70% and <90%	20.69%	\$177.36	1.9201	\$5,528.81	7	\$38,701.67
Clarence Lowlands	1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	No	Coastal Floodplain Wetlands ≥70% and <90%	20.69%	\$245.39	2.1468	\$7,649.42	5	\$38,247.09
Clarence Lowlands	780 - Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	No	Coastal Floodplain Wetlands ≥70% and <90%	20.69%	\$245.39	2.1468	\$7,649.42	6	\$45,896.50



Biodiversity payment summary report

Clarence Lowlands	1227 - Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion	No	Coastal Swamp Forests >=70% and <90%	20.69%	\$177.36	1.9201	\$5,528.81	1	\$5,528.81
Subtotal (excl. GST)									\$172,033.09
GST									\$17,203.31
Total ecosystem credits (incl. GST)									\$189,236.40

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10549	<i>Myotis macropus</i> (Southern Myotis)	Vulnerable	\$741.31	20.6900%	\$80.00	47	\$45,810.29
Subtotal (excl. GST)							\$45,810.29
GST							\$4,581.03
Total species credits (incl. GST)							\$50,391.32
Grand total							\$239,627.72