Stage 71 & 72 Waterford Living Biodiversity Development Assessment Report

Lot 4 DP1145348, Lot 3098 DP1246288 & Lot 5200 DP1247841 Raymond Terrace Road, Chisholm NSW

20213959

14 December 2021





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TABLE OF CONTENTS

1	IN	TROD	UCTION	4
	1.1	Sco	OPE	4
	1.2		CAL CONTEXT	
	1.3		OPOSED DEVELOPMENT	
	1.4		ORMATION SOURCES	
	1.5	LEC	GISLATIVE CONTEXT	6
	1.5		Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	
	1.5 1.5		Biodiversity Conservation Act 2016 (NSW) Koala Habitat Protection State Environmental Planning Policy (SEPP 2021)	
	1.5		Biosecurity Act 2015	
	1.5		Coastal Management Act 2016	
	1.5	5.6	Water Management Act 2000	10
2	SI	TE CC	DNTEXT	11
	2.1	LAN	NDSCAPE FEATURES	11
3	NA	TIVE	VEGETATION	14
	3.1	ME	THODOLOGY	14
	3.1		Data Review	
	3.1	1.2	Vegetation Mapping Surveys	14
	3.2	Ass	SESSMENT RESULTS	16
	3.2	2.1	Vegetation within the Development Site	16
4	TH	IREA 1	TENED SPECIES	29
	4.1	Ass	SESSING HABITAT SUITABILITY	29
	4.1		Habitat Assessment	
	4.1 4.1		Ecosystem Credit Species	
			REATENED SPECIES SURVEYS	
	4.2		Candidate Threatened Flora Candidate Threatened Fauna	
	4.3	IDE	NTIFIED THREATENED SPECIES	
5	IM	PACT	ASSESSMENT	49
	5.1	Avo	DIDING AND MINIMISING IMPACTS	49
	5.1	1.1	Impacts on Native Vegetation and Habitat	
	5.1		Prescribed Biodiversity Impacts	
	5.2		SESSMENT OF IMPACTS	
	5.2 5.2		Impacts on Native Vegetation and Habitat Prescribed Biodiversity Impacts	
	5.3	Міт	IGATE AND MANAGE IMPACTS ON BIODIVERSITY VALUES	52
6	IM	PACT	SUMMARY	55
	6.1	SEF	RIOUS AND IRREVERSIBLE IMPACTS	55
	6.2		NTIFICATION OF IMPACTS REQUIRING OFFSETS	
	6.2	2.1	Impacts on Native Vegetation	55
	6.3	IMP	ACTS NOT REQUIRING OFFSETS	

7 ASSESSMENT OF BIODIVERSITY LEGISLATION	
7.1 Environment Protection and Biodiversity Conservation Act 1999	56
7.1.1 Assessment Requirements	
7.2 BIOSECURITY ACT 20157.3 KOALA HABITAT PROTECTION STATE ENVIRONMENTAL PLANNING POLICY (SE	
8 REFERENCES	

TABLES

Table 1:	Landscape Features relevant to the Development Site.	11
Table 2:	Composition, Structure and Function components of vegetation integrity	
Table 3:	Plant Community Types (PCTs) mapped within the Development Site	16
Table 4:	Vegetation Zones within the Development Site	16
Table 5:	Current vegetation integrity score for the vegetation zones	28
Table 6:	Survey of requirements and timing conducted for candidate flora species	34
Table 7:	Survey of requirements and timing conducted for candidate fauna species	40
Table 8:	Summary of mitigation and management measures for direct, prescribed and indirect impacts	of
	the Project	53
Table 9:	Summary of ecosystem credit requirements	55
Table 10:	Summary of species credit requirements	55

FIGURES

Figure 1:	Development Site and Study Area	5
Figure 2:	Landscape Assessment	
Figure 3:	Plant Community Types, Vegetation Zones and Plot Transect Locations	
Figure 4:	Habitat Features	
Figure 5:	Flora Survey Effort – August 2019	
Figure 6:	Flora Survey Effort - November 2019 and October 2021	
Figure 7:	Flora Survey Effort – February 2020	
Figure 8:	Fauna Survey Effort	
Figure 9:	Threatened Fauna Observations	
	Southern Myotis Species Polygon	

PLATES

Plate 1:	PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open
	forest of the lower Hunter (Moderate-Good)
Plate 2:	PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open
	forest of the lower Hunter (Moderate) - Zone 2
Plate 3:	PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open
	forest of the lower Hunter (Low-Moderate) - Zone 3
Plate 4:	PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open
	forest of the lower Hunter (Grassland_regen) - Zone 4
Plate 5:	PCT 1737: Typha Rushland (Moderate) - Zone 526



APPENDICES

Appendix A - THREATENED SPECIES DATABASE SEARCH Appendix B - FLORA SPECIES LIST

- Appendix C FAUNA SPECIES LIST
- Appendix D PREDICTED AND CANDIDATE SPECIES REPORTS
- Appendix E BIODIVERSITY CREDIT REPORTS
- Appendix F BAM PLOT DATASHEETS Appendix G STAFF CONTRIBUTIONS
- Appendix H LICENSES



1 INTRODUCTION

1.1 SCOPE

Kleinfelder was engaged by AVID Property Group to undertake a Biodiversity Development Assessment Report (BDAR) within part Lot 4 DP1145348, part Lot 5200 DP1247841 and part Lot 3098 DP1246288, Raymond Terrace Rd, Chisholm NSW. This assessment has been undertaken in accordance with the Biodiversity Assessment Method 2020 (BAM) to support a Development Application for a proposed residential subdivision.

The following terms are used throughout this report to describe particular geographical areas:

- Study Area part Lot 4 DP1145348, part Lot 5200 DP1247841, and part 3098 DP1246288, Raymond Terrace Rd, Chisholm (25.81 hectares [ha]) (Figure 1).
- **Development Site** the area to be directly impacted due to the proposed development (15.56 ha).
- Locality Land within a 5 kilometre (km) radius of the Study Area.
- Assessment Area Land within a 1,500 metre (m) buffer of the Development Site.

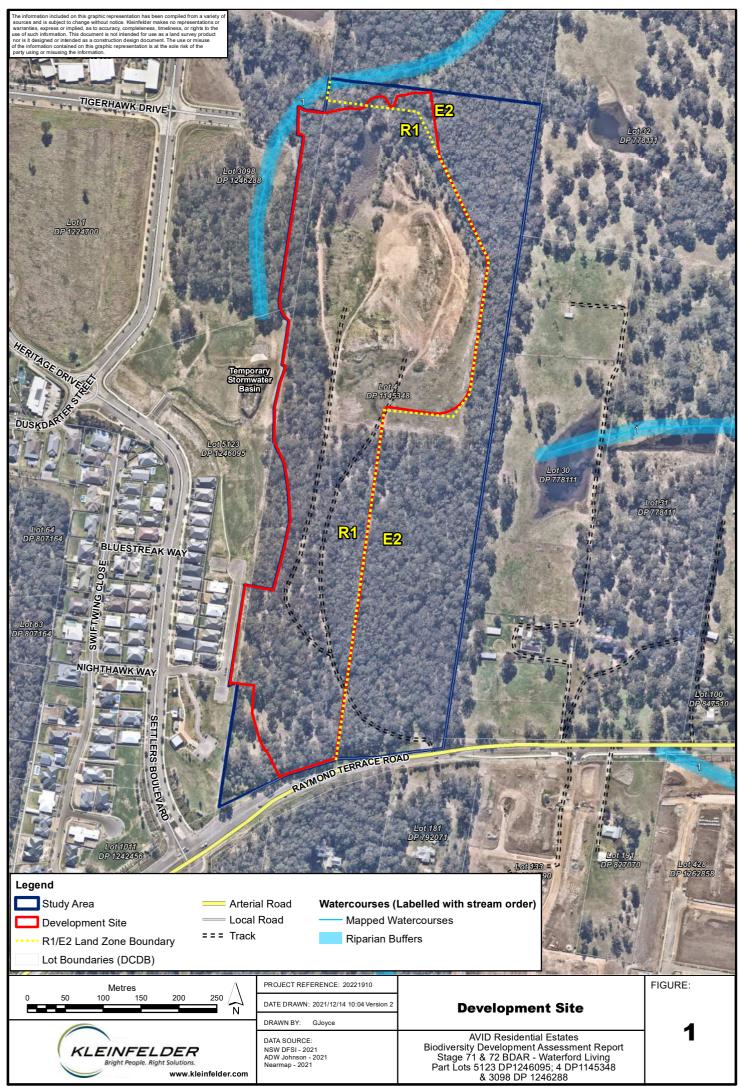
1.2 LOCAL CONTEXT

The Study Area occurs within the Maitland City Council local government area (LGA) within the Hunter area. Currently, 9.82 ha of the Study Area is zoned E3 – Environmental Management while the remainder (15.95 ha) is zoned R1 – General Residential under the Maitland Local Environmental Plan 2011 (**Figure 2**).

1.3 **PROPOSED DEVELOPMENT**

The proposed development is largely concentrated within the R1 zoned land of the Study Area. As a result, the majority of the R1 area is proposed to be developed (residential subdivision). The eastern and northern extent of the Study Area is zoned E3 and is not proposed for development. A small area within the E3 zoned land, in the north of the Study Area, is proposed for development for the purposes of road easements.

The total area of disturbance (including proposed lots, roads and APZs) is 15.56 ha. The majority of the land surrounding the Study Area is zoned R1 and has been historically cleared, with some regeneration observed. A parcel of land to the north of the Study Area is zoned RU2 – Rural Landscape. Raymond Terrace Road runs along the southern boundary of the Study Area. Land on the southern side of Raymond Terrace Road is zoned RU2. Previously the Study Area was used as a quarry (O'Brien's Quarry). A void created from quarrying activities remains in the centre of the site, lacking topsoil and is in a disturbed state.



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1.4 INFORMATION SOURCES

The following sources of information were used in to appropriately inform the Chisholm Biodiversity Assessment Report:

- The NSW DPIE, BioNet Atlas (DPIE 2021a) for previous records of threatened species, populations and ecological communities within 5 km radius of the Development Site.
- The Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) (DAWE 2021a) for Matters of National Environmental Significance (MNES) including predicted threatened species, populations and ecological communities
- Lower Hunter and Central Coast Regional vegetation survey VIS_ID 2227 (DPIE 2018a) (NSW National Parks and Wildlife Service [NPWS] 2003) for existing vegetation community mapping within the locality.
- The NSW DPIE, BioNet Vegetation Classification Database (DPIE 2021b) for identification and allocation of Plant Community Types (PCTs) to vegetation zones on site.
- The NSW DPIE, BioNet Threatened Biodiversity Data Collection (DPIE 2021c), Threatened Species Profiles (DPIE 2021d) and Final Determinations (DPIE 2021e) for information on threatened species, populations, and ecological communities.
- The Final Determination for the *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* EEC (Threatened Species Scientific Committee [TSSC] 2019)
- Relevant published literature.

1.5 LEGISLATIVE CONTEXT

This assessment was undertaken in accordance with and/or in consideration of the following Acts and Policies:

- Commonwealth:
 - Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
- NSW:
 - Biodiversity Assessment Method (BAM) (DPIE 2020a).
 - Biodiversity Conservation Act 2016 (NSW) (BC Act).
 - Biodiversity Conservation Regulation 2017 (NSW) (BC Regulation).
 - Biosecurity Act 2015 (NSW).
 - Coastal Management Act 2016.
 - Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act).
 - State Environmental Planning Policy (Koala Habitat Protection) 2021 (NSW) (Koala SEPP).
 - State Environmental Planning Policy (Coastal Management) 2018 (NSW) (SEPP Coastal Management).
 - State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (NSW).
 - Water Management Act 2000 (NSW) (WM Act).
- Local:
 - Maitland Local Environmental Plan 2011 (Maitland LEP); and
 - Maitland Development Control Plan 2011.

1.5.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, an approval is required for actions that are likely to have a significant impact on MNES. An action includes a project, development, undertaking, activity or series of activities. When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for the Environment. The Act identifies nine MNES:

- World Heritage properties.
- National heritage places.
- Wetlands of international importance (Ramsar Convention).
- Listed threatened species and communities.
- Migratory species listed under international agreements.
- Great Barrier Reef Marine Park.
- Commonwealth marine areas.
- Nuclear actions; and
- Water resources in respect to CSG and large coal mines.

While this BDAR is not required to address MNES, the proponent is required to address the EPBC Act as part of their development application to Council. Items 4 and 5 are relevant to the current proposal.

Refer to Section 7.1 for a summary of the assessment.

1.5.2 Biodiversity Conservation Act 2016 (NSW)

The NSW *Biodiversity Conservation Act 2016* (NSW BC Act), the NSW *Biodiversity Conservation Regulation 2017* (NSW BC Regulation) and amendments to the NSW *Local Land Services Act 2013* (LLS Act) commenced on 25 August 2017. The legislation aims to "maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development". The NSW BC Act repeals several pre-existing Acts, most notably the NSW *Threatened Species Conservation Act 1995* (TSC), the NSW *Nature Conservation Trust Act 2001* and the NSW *Native Vegetation Act 2003*.

The NSW BC Act together with the NSW BC Regulation outlines the framework for addressing impacts on biodiversity from development and clearing. The framework details a pathway to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offset Scheme (The BOS).

1.5.2.1 Entry into the Biodiversity Offset Scheme

Entry into the NSW Biodiversity Offset Scheme (BOS) is triggered by developments, projects and activities that meet criteria or certain thresholds for significant impacts on biodiversity in accordance with Section 6.3 of the BC Act. Alternatively, the BOS can be entered into on an opt-in basis.

Criteria to which the BOS applies includes the following:

• Local Development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers the BOS threshold, or is "likely to significantly affect threatened species" (based on a test of

significance pursuant to Section 7.3 of the BC Act). The BOS Threshold has two parts, and is triggered by the following:

- Clearing of vegetation that exceeds an area threshold (based on the minimum lot size), or
- Impacts are predicted to occur within an area mapped on the Biodiversity Values Map (the BV Map).
- State Significant Development (SSD) and State Significant Infrastructure projects (SSI), unless "the Secretary of the Department of Planning, Industry and Environment and the environment agency head determine that the project is not likely to have a significant impact".
- Biodiversity certification proposals.
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require development consent.
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013.*
- Activities assessed and determined under Part 5 of the EP&A Act (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

The NSW biodiversity values map was reviewed on 03 December 2021 and no areas of biodiversity value are mapped within the proposed Development Site. The proposed development does not occur within an AOBV. Under clause 7.2 of the BC Regulation, the area of native vegetation clearing threshold for the proposed development is 0.25 ha, as the minimum lot size of the Development Site is 0.04 ha. The proposed development will directly impact approximately 13.31 ha of native vegetation, triggering entry into the BOS. As such, a BDAR is required to support the proposed development.

The Project has been assessed in accordance with the BAM (DPIE 2020a). The Biodiversity Accredited Assessor System (BAAS) Case number for the Project is 00019114/BAAS18041/20/00019115. Dr Gilbert Whyte (Assessor Number BAAS18041) is the BAM Accredited Assessor for the project.

1.5.3 Koala Habitat Protection State Environmental Planning Policy (SEPP 2021)

The Koala SEPP 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 applies to each Local Government Area listed in Schedule 1 of the SEPP. Where a Koala Plan of Management (KPoM) applies to the land, Clause 8 of the Koala SEPP applies to the development. In this case the proposed development must be consistent with the approved KPoM that applies to the land.

Maitland Council LGA is listed in Schedule 1 of the Koala SEPP 2021. As the site is currently zoned as R1 – General Residential the Koala SEPP 2021 applies to the Study Area. Therefore, it was deemed appropriate that a suitably qualified and experienced person assess the site to determine if the land contains 'Core Koala Habitat' as defined by the SEPP.

See Section 7.2 for a summary of the Koala habitat assessment.

1.5.4 Biosecurity Act 2015

Under the *Biosecurity Act 2015* (NSW) all plants are regulated with a general biosecurity duty "to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable." Under the Act, a biosecurity impact "is an adverse effect on the economy, environment, or the community that arises, or has the potential to arise, from a biosecurity matter." This legislation is addressed in **Section 7.2**.

1.5.5 Coastal Management Act 2016

The *Coastal Management Act 2016* replaces the *Coastal Protection Act 1979* and establishes a strategic framework and objectives for managing coastal issues in NSW. The Act promotes a focus on ecologically sustainable development in relation to the 'coastal zone' as defined by the Act comprising of four coastal management areas:

- Coastal wetlands and littoral rainforests area areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26
- Coastal vulnerability area areas subject to coastal hazards such as coastal erosion and tidal inundation
- Coastal environment area areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included
- Coastal use area land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The Coastal Management SEPP (commenced on 3 April 2018) updates and consolidates into one integrated policy: SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The Coastal Management SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the

coastal zone. It defines the four coastal management areas in the Act through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The four coastal management areas are:

- Coastal wetlands and littoral rainforests area areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
- **Coastal vulnerability area** areas subject to coastal hazards such as coastal erosion and tidal inundation.
- Coastal environment area areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
- Coastal use area land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The Study Area does not contain areas mapped as any of the four coastal management areas above. As such, the Coastal Management Act 2016 does not apply to this development.

1.5.6 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the WM Act. 'Waterfront land' is defined as the bed of any river, lake or estuary, and the land within 40 m of the river banks, lake shore or estuary mean high water mark. A first order stream is mapped within the Study Area and the Proposed Development will impact the first order stream and associated riparian habitat.

The Project therefore is likely to constitute a 'controlled activity' under the WM Act and approval through the NSW Dept of Natural Resources Access Regulator is required.

2 SITE CONTEXT



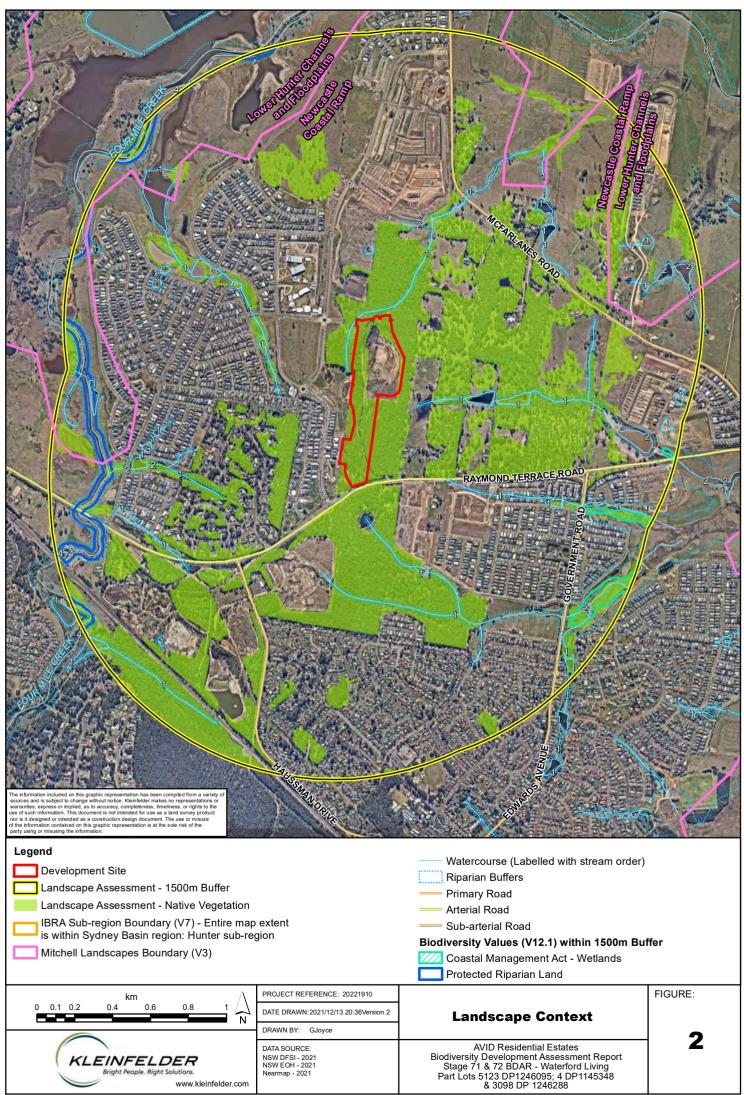
2.1 LANDSCAPE FEATURES

The landscape features detailed in Section 3 of the BAM (DPIE 2020f) and applicable to the Development Site are described in **Table 1**. These landscape features are also shown on **Figure 2**.

Table 1:	Landscape Features relevant to the Development Site.
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	· · ·
KLF Table Heading	KLF Table Heading
IBRA Region	Sydney Basin
IBRA Sub Region	Hunter
Local Government Area (LGA)	Maitland City Council
Mitchell Landscapes	Newcastle Coastal Ramp - Undulating lowlands and low to steep hills on complex patterns of faulted and gently folded Carboniferous conglomerate, lithic sandstone, felspathic sandstone, and mudstone, general elevation 50 to 275m, local relief 40 to 150m. Stony red texture-contrast soils on steep slopes, yellow and brown texture-contrast soils on lower slopes and deep dark clay loams along streams. Woodland of <i>Corymbia maculata</i> (Spotted Gum), <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Eucalyptus sideroxylon</i> (Red Ironbark), <i>Eucalyptus acmenoides</i> (White Mahogany), <i>Eucalyptus canaliculata</i> (Large-fruited Grey Gum), with sub-tropical rainforest elements in sheltered gullies. Similar eucalypts with <i>Allocasuarina torulosa</i> (Forest Oak) and grasses on lower slopes, merging to forest of <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood), Blackbutt (<i>Eucalyptus pilularis</i>) with <i>Pteridium esculentum</i> (Bracken) and grasses nearer the coast. (DECC 2002).
Rivers, streams and estuaries	There is one mapped unnamed water course (first order stream), which dissects the north- western corner of the Development Site (Figure 2).
Wetlands	Coastal Wetlands occur 1.2km south-east of the site. The wetlands are known locally as Woodberry Swamp. Wetland areas also lie 700m the north of the Study Area which include floodlands associated with Saltwater Gully.
Connectivity of different areas of habitat	The Study Area forms part of Wildlife 'Opportunity' Corridor as mapped in the Maitland City Council Greening Plan. The corridor is approximately 3kms wide and extends from Millers Forest in the east to Metford in the West. The Study Area comprises intact native vegetation which provides potential linking habitats perpendicular to the wildlife corridor (north-south). An opportunity corridor is defined as a voluntary agreement requiring liaison between Maitland Council and a landholder which aims to promote the management and retention or the re- establishment of native vegetation communities.
Areas of geological significance and soil hazard features	There are no areas of geological significance (karst, caves, crevices, cliffs or other features) within the Study Area. The Beresfield residual landscape in which the Study Area occurs is described as having a high foundation hazard, water erosion hazard, seasonal waterlogging and high run-on on localised lower slopes, highly acid soils of low fertility.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value mapped within the Development Site or Study Area.

KLF Table Heading	KLF Table Heading
Geology and Soils	The Study Area is mapped as occurring on the Beresfield residual soil landscape (Matthei, 1995). The Beresfield (be) soil landscape is described as occurring on undulating low hills and rises on Permian sediments in the East Maitland Hills region. Slope gradients 3–15%, local relief to 50 m, elevation is 20–50 m. Partially cleared tall open-forest. Soils are moderately deep, and the dominant materials include: friable brownish black loam, hard-setting dull yellowish brown sandy loam, pedal brown plastic mottled clay, reddish brown plastic pedal clay and gleyed "puggy" silty clay. This soil landscape occurs over the Permian Tomago Coal Measures and Permian Mulbring Siltstone geology (Matthei, 1995).
Native Vegetation Cover	The 1,500 m site buffer has an area of 1,092 ha which has a native vegetation cover of 291 ha, or 27%. There are native vegetation patches surrounding the development in all directions, though the majority of which are highly disturbed.



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3 NATIVE VEGETATION

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3.1 METHODOLOGY

Native vegetation at the Development Site was assessed in accordance with Section 4 of the BAM (DPIE 2020f).

3.1.1 Data Review

The Maitland LGA vegetation map (Hill, 2003) and Lower Hunter Central Coast Region Environmental Management Strategy (LHCCREMS) vegetation mapping project conducted by National Parks and Wildlife Service (NPWS) (NPWS, 2003) both provide regional vegetation mapping for the Study Area. These mapping projects were reviewed to assist with the determination of Plant Community Types (PCTs) within the study area.

3.1.2 Vegetation Mapping Surveys

Vegetation Mapping and Surveys

Detailed vegetation surveys were conducted across the Study Area on 16/05/2019 and 17/05/2019 while vegetation conditions/extents were updated following survey on 24/10/21. The boundaries of each of the identified vegetation communities within the study area were mapped using a combination of rapid data points (RDP) and walking transects, using the polygons produced through aerial photo interpretation (API) to assist in targeting survey effort. RDPs involved collecting waypoints over the study area using a hand-held TrimbleTM GPS unit and recording dominant species, structure and condition. Walking transects involved verifying polygons where homogenous in floristic composition and condition, as well as walking vegetation ecotones and using the recorded tracks to define vegetation community boundaries. The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries.

3.1.2.1 Linework and Attribution

RDPs and plots were classified and tagged with a PCT by field surveyors. Polygons produced from the API work adopted the PCT of the sample point that they intersected.

3.1.2.2 Plant Community Type and Determination

Each vegetation community identified within the Study Area was assigned to the closest equivalent PCT from those listed in the BioNet Vegetation Classification database (DPIE 2020b). The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot / transect data collected from the site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the site were compared to the descriptions in the database to determine the most suitable PCT. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation were also identified if present.

3.1.2.3 Vegetation Zones

Vegetation zones were identified and delineated on the Development Site in accordance with Section 4.3 of the BAM (DPIE 2020f). A vegetation zone is defined in the BAM as a relatively homogenous area that is the same vegetation type and broad condition.

3.1.2.4 Assessing Vegetation Integrity (Site Condition)

Following stratification of the Development Site into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in **Table 2** in accordance with Section 4.3 of the BAM (DPIE 2020f). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.

Table 2:	Composition, Structure and Function components of vegetation integrit	у

Growth form groups used to assess composition (species richness) and structure (percent foliage cover)	Function attributes
 Tree (TG) Shrub (SG) Grass and grass-like (GG) Forb (FG) Fern (EG) Other (OG) 	 Number of large trees Tree regeneration (presence/absence) Tree stem size class (presence/absence) Total length of fallen logs Litter cover High threat exotic vegetation cover (HTE) Hollow-bearing trees (HBT)

The number of plots/transects undertaken across the site meets the minimum number of transects required for each vegetation zone area as detailed in Section 4.3.4, Table 3 of the BAM (DPIE 2020f). Eight plots were undertaken within the Development Site (see **Figure 3**).

3.1.2.5 Floristic Identification and Nomenclature

Floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (<u>http://plantnet.rbgsyd.nsw.gov.au</u>).

3.2 ASSESSMENT RESULTS



3.2.1 Vegetation within the Development Site

3.2.1.1 Vegetation Description

The Study Area contains two PCTs: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrubgrass open forest of the lower Hunter (i.e. in varying condition) and a smaller area of Typha Rushland. An area within the centre of the site and associated access tracks to the south has been cleared during previous quarrying activities.

Table 3: Plant Community Types (PCTs) mapped within the Development Site

РСТ	Vegetation Formation	Vegetation Class	Area (ha)
PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub- grass open forest of the lower Hunter (Moderate_Good)	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	12.63
PCT 1737: Typha Rushland (Moderate)	Freshwater Wetlands	Coastal Freshwater Lagoons	0.50
Exotic / Highly Degraded Vegetation	-	-	1.07
Cleared	-	-	1.36
Total.			15.56

3.2.1.2 Vegetation Zones

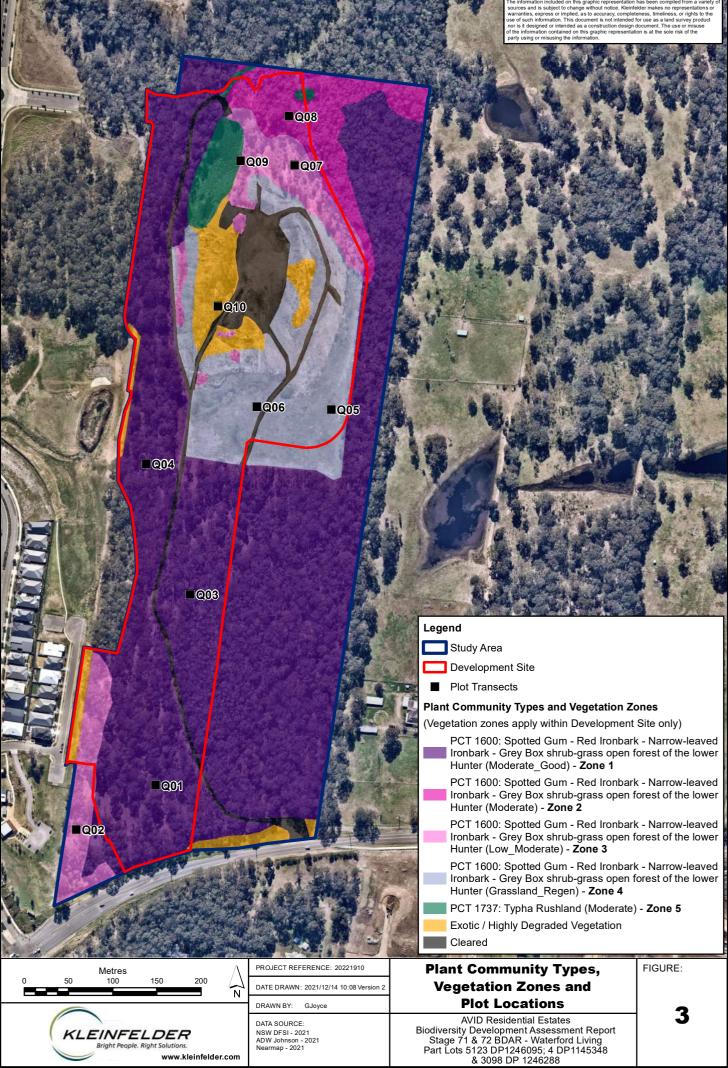
The two PCTs identified within the Development Site were allocated to five vegetation zones based on condition and structural variation. **Figure 3** shows the distribution of PCTs and vegetation zones within the Development Site, details on the vegetation zones (including condition class, area, patch size, survey effort and vegetation integrity score) are outlined in **Table 4**.

РСТ	Vegetation Zone	Condition Class	Area (ha)
PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box	Zone 1	Moderate-Good	7.52
shrub-grass open forest of the lower	Zone 2	Moderate	0.55
Hunter (Moderate_Good)	Zone 3	Low-Moderate	1.32
	Zone 4	Grassland_Regen	3.25
PCT 1737: Typha Rushland (Moderate)	Zone 5	Moderate	0.50
Exotic / Highly Degraded Vegetation	Exotic	NA	1.07
Cleared	Cleared	NA	1.36
Total.			15.56

Table 4: Vegetation Zones within the Development Site

Full descriptions of each vegetation zone are provided in the following sub-sections, floristic and structural plot data is provided in **Appendix I**.

The information included on this graphic representation has be sources and is subject to change without notice. Kleinfelder n



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Plate 1: PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Moderate-Good)

PCT 1600	Vegetation Formation
Vegetation Formation and Class	Dry Sclerophyll Forest (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	7.52 ha
Survey Effort	Required: 3 plot/transect Conducted: 3 plot/transect (Q1, Q3, Q4).
Floristic description	 The canopy within this vegetation zone was dominated by <i>Corymbia maculata</i> (Spotted Gum) with <i>Eucalyptus moluccana</i> (Grey Box) and <i>E. fibrosa</i> (Red Ironbark). <i>Eucalyptus acmenoides</i> (White Mahogany) occurred occasionally within this zone. The shrub layer was dominated by <i>Bursaria spinosa</i> and sparse patches of <i>Bossiaea rhombifolia</i>, <i>Ozothamnus diosmifolius</i> and <i>Acacia falcata</i>. <i>Acacia parvipinnula occurred sporadically throughout this zone</i>. The ground layer was dominated by <i>Lomandra filiformis</i>, <i>Brunoniella australis</i>, <i>Lobelia purpurascens</i>, <i>Microlaena stipoides var. stipoides</i>, <i>Entolasia stricta</i>, <i>Themeda triandra Lomandra longifolia</i>, <i>Lomandra multiflora subsp. multiflora</i>, <i>Cheilanthes sieberi Opercularia diphylla</i>, <i>Arthropodium milleflorum</i>, <i>Dianella revoluta var. revoluta</i>, <i>Oxalis perennans</i> and <i>Dichondra repens</i>. Common climbing species included: <i>Desmodium varians</i>, <i>Glycine clandestina</i>, <i>Desmodium rhytidophyllum</i>, <i>Glycine tabacina</i> and <i>Hardenbergia violacea</i>.
Condition within Development Site	This vegetation zone is relatively intact with a native canopy, shrub and ground layer. It is evident that this area has been under-scrubbed in the past. Exotic species occurring within this vegetation community include <i>Ehrharta erecta</i> (Panic Veldt Grass), <i>Plantago lanceolata</i> (Lamb's Tongues), <i>Sida rhombifolia Bidens</i> <i>pilosa</i> (Cobblers Pegs), <i>Lantana camara</i> (Lantana) and occasional patches of <i>Paspalum dilatatum</i> (Paspalum), <i>Senecio madagascariensis</i> (Fireweed) and <i>Solanum nigrum</i> (Black-berry Nightshade).

PCT 1600	Vegetation Formation
Justification for PCT selection	The vegetation within the study area most closely resembles a Dry Sclerophyll Forest within the shrub/grass sub-formation due to the presence of a semi- continuous cover of grasses and a sparse shrub layer. Other Spotted Gum – Ironbark dominated Dry Sclerophyll Forests in the shrub/grass sub-formation which occur within the Hunter IBRA sub-region were considered; a total of 5 PCTs were considered - 1590, 1592, 1593, 1600 and 1601. All of the above PCTs contained two of the dominant canopy species in this zone, <i>C</i> <i>maculata</i> and <i>E fibrosa</i> . PCT 1600 was the only PCT of the five which contained <i>E</i> <i>moluccana</i> which was observed consistently throughout this zone. Therefore, PCT 1600 was considered to be the most representative of the community observed on site.
Status	BC Act: This community forms part of the <i>Lower Hunter Spotted Gum – Ironbark</i> <i>Forest in the Sydney Basin Bioregion</i> Endangered Ecological Community (EEC) listed under the BC Act. Inclusion of this community within the study area within this EEC was determined through comparison with the NSW Scientific Committee's Determination (2011). The community conforms in locality, position in the landscape, and dominant floristic composition and structure. EPBC Act: Not Listed.
SAII	No
PCT % Cleared	71%





Plate 2:	PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest
	of the lower Hunter (Moderate) - Zone 2

PCT 1600	Vegetation Formation
Vegetation Formation and Class	Dry Sclerophyll Forest (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	0.55 ha
Survey Effort	Required: 1 plot/transect Conducted: 1 plot/transect (Q8).
	The canopy was dominated by Corymbia maculata, Eucalyptus fibrosa, Eucalyptus moluccana and occasional Eucalyptus acmenoides and Eucalyptus tereticornis subsp. tereticornis.
Floristic description	The native shrub layer species included: <i>Bursaria spinosa, Ozothamnus diosmifolius</i> and occasional occurrences of Acacia <i>parvipinnula.</i> The ground stratum was dominated by native species such as: <i>Lobelia</i> <i>purpurascens, Lomandra filiformis, Brunoniella australis, Imperata cylindrica</i> and <i>Microlaena stipoides var. stipoides.</i>
Condition within Development Site	All strata are present within this zone however there is a consistent midstorey of Lantana camara which ranges in density across this zone. This area is considered to be of moderate condition due to the coverage of Lantana.
Justification for PCT selection	This vegetation was determined to be the same PCT as Vegetation Zone 1 This was determined through assessment of the adjacent vegetation both within the Study Area and the presence of three of the dominant canopy trees, <i>C maculata,</i> <i>Eucalyptus fibrosa,</i> and <i>E moluccana</i> and three of the dominant shrub species, <i>Bursaria spinosa, Ozothamnus diosmifolius</i> and <i>Acacia parvipinnula.</i>

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PCT 1600	Vegetation Formation	
Status	BC Act: This community forms part of the <i>Lower Hunter Spotted Gum – Ironbark</i> <i>Forest in the Sydney Basin Bioregion</i> Endangered Ecological Community (EEC) listed under the BC Act. Inclusion of this community within the study area within this EEC was determined through comparison with the NSW Scientific Committee's Determination (2011). The community conforms in locality, position in the landscape, and dominant floristic composition and structure. EPBC Act: Not Listed.	
SAII	No	
PCT % Cleared	71%	

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Plate 3: PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Low-Moderate) - Zone 3

PCT 1600	Vegetation Formation
Vegetation Formation and Class	Dry Sclerophyll Forest (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	1.32 ha
Survey Effort	Required: 1 plot/transect Conducted: 2 plot/transect (Q2, Q7).
Floristic description	 This zone has a sparse presence of all strata due to past clearing. The canopy is dominated by <i>Eucalyptus tereticornis subsp. tereticornis</i> in the northern area and <i>Corymbia maculata</i> in the southern area. The shrub layer contains sparse occurrences of <i>Bursaria spinosa</i>, <i>Ozothamnus diosmifolius</i>, and <i>Acacia parvipinnula</i>. The ground stratum is dominated by native species such as: <i>Microlaena stipoides var. stipoides</i>, <i>Cynodon dactylon</i>, <i>Lobelia purpurascens</i>, <i>Goodenia paniculata</i>, <i>Dianella revoluta var. revoluta</i>, <i>Lomandra longifolia</i> and <i>Plectranthus parviflorus</i>. Other commonly occurring species include <i>Entolasia stricta</i> and <i>Paspalidium distans</i>.
Condition within Development Site	This zone lacks structural complexity with a reduced shrub and midstory. However, there is some evidence of regeneration Common exotic species include: <i>Paspalum dilatatum, Bidens pilosa, Senecio madagascariensis, Chloris ventricosa, Sida rhombifolia</i> and <i>Isolepis prolifera.</i>

PCT 1600	Vegetation Formation
Justification for PCT selection	This vegetation was determined to be the same PCT as Vegetation Zone 1 but has been modified due to past clearing. This was determined through assessment of the adjacent vegetation both within the Study Area and the presence of one of the dominant canopy trees, <i>C maculata</i> and three of the dominant shrub species, <i>Acacia parvipinnula, Ozothamnus diosmifolius</i> and <i>Bursaria spinosa.</i> The northern area is within an area previously cleared for the quarry which is dominated by regenerating Eucalyptus <i>tereticornis subsp. tereticornis.</i> This was still considered to be a variation of PCT due to the occasional presence of <i>E tereticornis occurs</i> along the edges of the quarry in association with the dominant species which define PCT 1600. It is likely that <i>E tereticornis</i> has colonised this area more quickly than the other species associated with PCT 1600 and that other species will establish in time.
Status	BC Act: This community forms part of the <i>Lower Hunter Spotted Gum – Ironbark</i> <i>Forest in the Sydney Basin Bioregion</i> Endangered Ecological Community (EEC) listed under the BC Act. Inclusion of this community within the study area within this EEC was determined through comparison with the NSW Scientific Committee's Determination (2011). The community conforms in locality, position in the landscape, and dominant floristic composition and structure. EPBC Act: Not Listed.
SAII	No
PCT % Cleared	71%



Plate 4: PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Grassland_regen) - Zone 4

PCT 1600	Vegetation Formation
Vegetation Formation and Class	Dry Sclerophyll Forest (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	3.25 ha
Survey Effort	Required: 2 plot/transect Conducted: 2 plot/transect.
Floristic description	This zone is a mixed exotic and native grassland within some minor regeneration which contains similar species to PCT 1600. This area adjoins the quarry and has been cleared of all shrub and canopy layer species in the past. This zone contained occasional <i>Corymbia maculata</i> and <i>Eucalyptus moluccana</i> saplings and sparse patches of regenerating <i>Acacia parvipinnula</i> and <i>Bursaria</i> <i>spinosa</i> . The dominant ground layer species included <i>Entolasia stricta</i> , <i>Microlaena stipoides</i> <i>var. stipoides</i> , <i>Cynodon dactylon</i> , <i>Lobelia purpurascens</i> , <i>Goodenia</i> <i>heterophylla subsp. heterophylla</i> , <i>Hypericum gramineum</i> and <i>Oxalis perennans</i> .
Condition within Development Site	This vegetation community has been actively mown in the past and contains a scattered regenerating canopy and shrub layer. Additionally, this area has a higher occurrence of weeds in the ground stratum. Dominant exotic species included <i>Hypochaeris radicata, Bidens pilosa, Sonchus oleraceus, Senecio madagascariensis, Paspalum dilatatum, Plantago lanceolata, Verbena bonariensis</i> and <i>Bidens pilosa.</i>
Justification for PCT selection	This vegetation was determined to be the same PCT as Vegetation Zone 1 but has been modified due to clearing. This was determined through assessment of the adjacent vegetation both within the Study Area and the presence of two of the dominant canopy trees, <i>C maculata</i> and <i>E moluccana</i> and two of the dominant shrub species, <i>Acacia parvipinnula</i> and <i>Bursaria spinosa</i> .

PCT 1600	Vegetation Formation
Status	BC Act: This community is considered to be too degraded to represent the Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion Endangered Ecological Community (EEC) listed under the BC Act. Exclusion of this community within the study area within this EEC was determined through comparison with the NSW Scientific Committee's Determination (2011). EPBC Act: Not Listed.
SAII	No
PCT % Cleared	71%



Vegetation Zone 5



Plate 5:

PCT 1737: Typha Rushland (Moderate) - Zone 5

PCT 1737	Vegetation Formation
Vegetation Formation and Class	Freshwater Wetlands Coastal Freshwater Lagoons
Area within Development Site	0.50ha
Survey Effort	Required: 1 plot/transect Conducted: 1 plot/transect.
Floristic description	This vegetation community occurs in a modified dam within the quarry and a small dam in the north of the study area. This zone is dominated by <i>Typha orientalis, Juncus usitatus, Persicaria decipiens, Cynodon dactylon</i> and <i>Schoenoplectiella mucronata.</i> No exotic species were observed within this zone.
Condition within Development Site	This vegetation community has likely established since the quarry ceased operating. Although no exotic species occur in this area this area was considered to be in moderate condition due to its derived origin.
Justification for PCT selection	This vegetation occurs in a freshwater dam which is within the cleared quarry area. It is likely that this dam has been created by earthworks associated with the quarry operations. PCT 1737 was considered appropriate for this community due to the dominance of Typha orientalis and the permanent standing freshwater. PCT 1600 is defined by tall Rushlands dominated by Typha which typically occurs at the margins of standing fresh water along the coast from Woy Woy to Hexham. All other freshwater wetlands which occurred within the Hunter sub IBRA region were considered but were discounted due to the dominance of the Typha as a species in this community. As such, this vegetation community was considered to most resemble PCT 1737.

PCT 1737	Vegetation Formation
Status	BC Act: Not Listed
	EPBC Act: Not Listed.
SAII	No
PCT % Cleared	70%



3.2.1.3 Assessment of Patch Size

The patch size for all vegetation zones were assessed as >100 ha as this zone is connected to large intact areas of native vegetation extending to the north and south. Any gaps in the vegetation patches are less than 100 m.

3.2.1.4 Vegetation Integrity Score

The current vegetation integrity score of the vegetation zones is outlined in Table 5.

Zone	РСТ	Condition class	Area (ha)	Condition scores (Current Score)			Vegetation integrity
				Composition	Structure	Function	score
1	1600	Moderate-Good	8.52	73.5	50.1	47	55.7
2	1600	Moderate	0.55	76.2	48.2	45.9	55.3
3	1600	Low-Moderate	1.32	42.9	39.8	44.9	42.5
4	1600	Grassland_Regen	3.25	51.3	39.6	0.2	7.2
5	1737	Moderate	0.5	38.1	86.5	-	57.4
	Exotic	Exotic	1.36	2.68	0.01	0.01	0.02

Table 5: Current vegetation integrity score for the vegetation zones

4 THREATENED SPECIES



4.1 ASSESSING HABITAT SUITABILITY

To inform the assessment of suitable habitat for threatened species and populations within the Study Area, a database search of the NSW DPIE BioNet Atlas (DPIE 2021a) and the Commonwealth DAWE Protected Matters Search Tool (PMST) (DAWE 2021a) were conducted. Results of the database search and 'likelihood of occurrence' assessment are provided in **Appendix A**.

4.1.1 Habitat Assessment

4.1.1.1 Flora

The areas mapped as Cleared and Exotic / Highly Degraded Vegetation within the Study Area were assessed as not containing suitable habitat for any threatened flora species due to the level of disturbance. These areas comprise the historic quarry area and access roads.

The Grassland and Regenerating vegetation zones have been historically cleared and lack the structure of a woodland or forest vegetation type. These areas were assessed as representing marginal habitat for threatened flora species. The low-moderate condition vegetation zone, while disturbed, still comprises a woodland-like structure. This area was assessed as representing marginal habitat for threatened flora species. The three Moderate and Moderate-Good vegetation zones were considered to represent suitable habitat for candidate threatened flora species.

4.1.1.2 Fauna

Habitat Assessment

The fauna habitat (predominantly canopy trees) is likely to provide foraging habitat for a range of bird species, the Grey-headed Flying-fox, arboreal mammals, and Microchiropteran bat species. A habitat tree survey identified a total of 20 habitat trees (hollow-bearing trees and dead stags; see section below) and two avian nests within the Development Site. Habitat trees have the potential to provide roosting habitat for Microchiropteran bats, native parrot species, cockatoos, owls, gliders and parrots. One large dam and one small dam are located within the Development Site. The dams contain areas of dense emergent vegetation (*Typha orientalis*). This vegetation represents suitable habitat for local frog species, fishing bat species and some water bird species.

Forest vegetation is broadly suitable for arboreal fauna, including hollow-dependent mammals and birds. Generally, the Development Site has limited groundcover and shrub layers which would provide habitat and refugia for terrestrial fauna. Areas to the north and east of the Development Site within the E3 zone has the potential to provide habitat for a greater number of species as a result of its structural complexity.

Habitat Tree Survey

A survey of trees within the Study Area was undertaken to locate hollow bearing trees, dead standing stags and trees containing nests was conducted on 18 June 2019 and 18 August 2021. The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS. For trees with hollows the number and size of hollows was recorded. Hollow size was classified as either small (< 5 cm diameter), medium (5 – 20 cm diameter) based on the size of the hollow entrance.

Additional surveys for raptor nests was conducted on 7 - 8 August 2019, 20 November 2019 and 18 August 2021. The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS.

A total of 62 hollow-bearing trees/dead stags were identified within the Study Area, of which 20 occur within the Development Site (**Figure 4**). These habitat trees contain a range of potential hollows sizes. Hollows were assessed as either potentially suitable for large forest owls, or not suitable due to size, height or type of hollow. Potentially suitable hollows were stag-watched as part of nocturnal surveys (Section 4.2.3.1). Three avian nests, one glider bowl, and three excavated arboreal termite mounds were observed during the habitat tree survey (**Figure 4**).

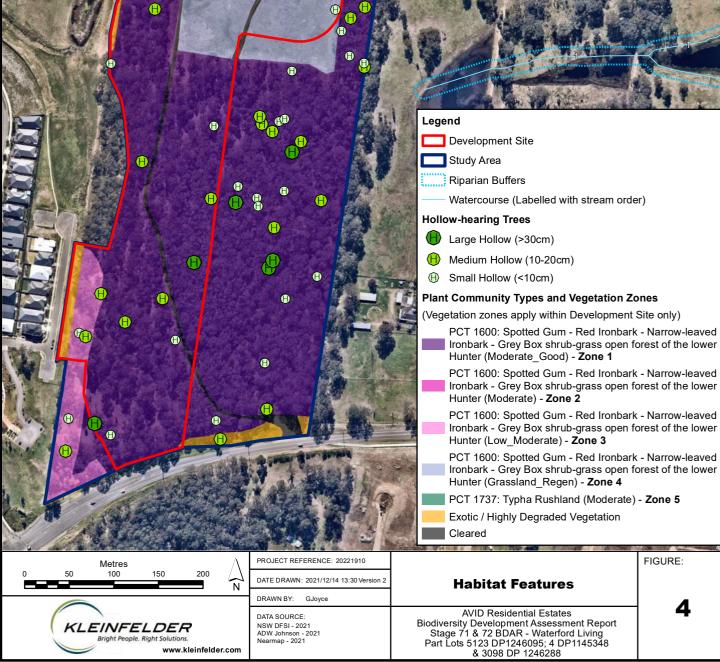
Koala Habitat

No koalas were recorded within the Study Area during field surveys. Furthermore, only one historical record was found (<18 years old) although was not within 2.5 km of the Study Area (as per the definition of 'site area' for the Central Coast KMA) were identified (DPIE 2021a) (Note BioNet records with a locational accuracy of more than 1,000 metres are not to be considered under the SEPP).

Vegetation within this site constitutes 'Highly Suitable Habitat' as trees species listed under Schedule 2 of SEPP comprise greater than 15% of trees within the Study Area. However, as no koalas, or evidence thereof, were detected during surveys and no koala records occur within 2.5kms of the Study Area, the land does not meet the definition of 'Core Koala Habitat' under the Koala SEPP 2021.

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4.1.2 Ecosystem Credit Species

The following assessment of habitat suitability for ecosystem credit species was conducted in accordance with Section 6.2 of the BAM. Ecosystem credits represent threatened species that can be predicted to be present by the type and condition of vegetation at the Development Site. Targeted survey is not required for ecosystem credit species.

Step 1: Identify threatened species for assessment

A list of predicted ecosystem credit species for the Development Site was reviewed in the BAM calculator, according to PCTs present on the subject land. Predicted Species Report is within **Appendix D**.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified ecosystem credit species to occur on the Development Site was assessed according to species specific habitat requirements. The following ecosystem credit species were deemed to not require further assessment within all vegetation zones due to the lack of habitat constraints across the Study Area:

- Curlew Sandpiper (*Calidris ferruginea*) (Foraging) Habitat constraint not met as per mapped areas.
- Great Knot (*Calidris tenuirostris*) (Foraging) Habitat constraint not met as per mapped areas.
 Geographic constraint not met within 5 km of the coast and tidal influenced water bodies.
- Broad-billed Sandpiper (*Limicola falcinellus*) (Foraging) Habitat constraint not met as per mapped areas.
- Black-tailed Godwit (*Limosa limosa*) (Foraging) Habitat constraint not met as per mapped areas.
- Terek Sandpiper (*Xenus cinereus*) Habitat constraint not met as per mapped areas.

All remaining Ecosystem Credit species were confirmed as Predicted Species (predicted species report is provide in **Appendix 3**).

4.1.3 Species Credit Species

Step 1: Identify threatened species for assessment

A list of predicted species credit species for the Development Site was reviewed in the BAM calculator. Species credits pertain to threatened species that cannot be predicted by the vegetation present. Candidate Species Report is within **Appendix D**.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified species credit species to occur on the Development Site was assessed according to species specific habitat requirements. Kleinfelder worked with AVID Property Group and ADW Johnson to position the proposed development within areas that would minimise biodiversity impact.

4.1.3.1 Step 3: Identify candidate species credit species for further assessment

A number of species credit species were excluded as candidate species due to their geographic or habitat constraints not being met by the Study Area, and no further assessment of these species was required.

- Black-tailed Godwit (*Limosa limosa*) Habitat constraint not met As per mapped areas.
- Broad-billed Sandpiper (*Limicola falcinellus*) Habitat constraint not met As per mapped areas.
- Brush-tailed Rock-wallaby (*Petrogale penicillata*) Habitat constraint not met Study Area not within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff-lines.
- Common Planigale (*Planigale maculate*) Species is vagrant Does not occur within the IBRA subregion.

- Curlew Sandpiper (Calidris ferruginea) (Breeding) Habitat constraint not met As per mapped areas.
- Diurus praecox (Rough Doubletail) Species is vagrant outside species range (not within Newcastle LGA).
- *Diuris tricolor* (Pine Donkey Orchid) Species is vagrant outside of species range (has not been found within 70kms of the coast).
- Eastern Cave Bat (*Vespadelus troughtoni*) Habitat constraint not met Study Area not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within 2 km of old mines or tunnels.
- Great Knot (*Calidris tenuirostris*) (Breeding) Habitat constraint not met As per mapped areas.
- Large Bent-winged Bat (*Miniopterus* orianae oceanensis) (Breeding) Habitat constraint not met Study Area not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within 2 km of old mines or tunnels.
- Large-eared Pied Bat (*Chalinolobus dwyeri*) Habitat constraint not met Study Area not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within 2 km of old mines or tunnels.
- Little Bent-winged Bat (*Miniopterus australis*) (Breeding) Habitat constraint not met Study Area not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within 2 km of old mines or tunnels.
- Ozothamnus tesselatus Species is vagrant only occurs further to the west (restricted to a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth).
- Pale-headed Snake (*Hoplocephalus bitorquatus*) Species is vagrant Does not occur within the IBRA subregion.
- Persoonia pauciflora (North Rothbury Persoonia) Distribution constraint not met Within 10 km of North Rothbury.
- Pink-tailed Legless Lizard (*Aprasia parapulchella*) Habitat constraint not met Rocky Areas. Geographic limitations also preclude the likelihood of the species occurring.
- *Prostanthera cineolifera* (Singleton Mint Bush) Species is vagrant only occurs further to the south-west (restricted to only a few localities near Scone, Cessnock and St Albans).
- Regent Honeyeater (*Anthochaera phrygia*) (Breeding) Habitat constraint not met As per mapped areas.
- Striped Legless Lizard (Delma impar) Species is vagrant only occurs further to the west.
- Swift Parrot (*Lathamus discolor*) (Breeding) Habitat constraint not met As per mapped areas.
- Terek Sandpiper (Xenus cinereus) Habitat constraint not met As per mapped areas.

4.2 THREATENED SPECIES SURVEYS

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Step 4: Determine presence or absence of candidate species credit species.

4.2.1 Candidate Threatened Flora

The following candidate threatened flora species (**Table 6**) were surveyed in accordance with the *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020h). As discussed above, flora surveys were conducted over a broader Study Area in order to assess indirect impacts and allow for design changes regarding the location of the proposed development.

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Scientific name	Common name	Survey Requirements	Survey Timing	Survey Effort
Acacia bynoeana	Bynoe's Wattle	All year	February, October	Figure 6, 7
Asperula asthenes	Trailing Woodruff	October-December	November, October	Figure 6
Callistemon linearifolius	Netted Bottle Brush	October - January	November, October	Figure 6
Cryptostylis hunteriana	Leafless Tongue Orchid	November - January	November	Figure 6
Cynanchum elegans	White-flowered Wax Plant	All year	November, October	Figure 6
Eucalyptus castrensis	Singleton Mallee	All year	February, October	Figure 6, 7
Eucalyptus glaucina	Slaty Red Gum	All year	February, October	Figure 6, 7
Eucalyptus parramattensis subsp. decadens	Eucalyptus parramattensis subsp. decadens	All year	February, October	Figure 6, 7
Eucalyptus pumila	Pokolbin Mallee	All year	February, October	Figure 6, 7
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	August - November	November, October	Figure 6
Maundia triglochinoides	Maundia triglochinoides	November - March	February	Figure 7
Melaleuca biconvexa	Biconvex Paperbark	All year	February, October	Figure 6
Monotaxis macrophylla	Large-leafed Monotaxis	August - February	February, October	Figure 6
Persicaria elatior	Tall Knotweed	December - May	February	Figure 7
Pomaderris queenslandica	Scant Pomaderris	All year	August, October	Figure 5, 6
Pterostylis chaetophora	Pterostylis chaetophora	September - November	November, October	Figure 6
Rutidosis heterogama	Heath Wrinklewort	All year	August, October	Figure 5, 6
Thesium australe	Austral Toadflax	November - February	February, November	Figure 6, 7
Zannichellia palustris	Zannichellia palustris	October - January	November, October	Figure 6

Table 6:	Survey of requirements and timing conducted for candidate flora species
	ourvey or requirements and timing conducted for candidate nora species



4.2.1.1 Survey Methodology

The candidate threatened flora species were surveyed in accordance with the *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020h). All surveys were conducted using systematic parallel transects. Parallel field traverses were separated by 5 to 10 m for orchids, herbs and forbs, 10 to 15 m for sub-shrubs, and 10 to 20 m for species in all other life forms (shrubs and trees).

Surveys were undertaken across the Study Area by suitably qualified ecologists. Known reference populations were inspected for two species: *Cryptostylis hunteriana* and *Pterostylis chaetophora*. Survey tracks for each round of targeted surveys are shown on **Figure 5**, **Figure 6** and **Figure 7**.

For two orchid species, surveys were conducted when known reference populations were flowering:

- *Cryptostylis hunteriana* was confirmed to be flowering 29/10/2019 at local reference population (Email from Danielle Allen at Central Coast Council).
- Pterostylis chaetophora confirmed to be flowering on 03/10/2019 (Email from Paul Hillier from SoS Department of Planning, Industry and Environment [DPIE]).



4.2.1.2 Flora Survey Results

A total of 148 flora species were identified during field surveys, 33 of these were exotic species, of which 11 are considered 'High Threat Exotics" and six are listed Priority Weeds for the Hunter Local Land Services Region under the *Biosecurity Act 2015* (NSW).

No threatened flora species were identified within the Study Area. A list of species identified during the vegetation surveys is provided in **Appendix 1**.

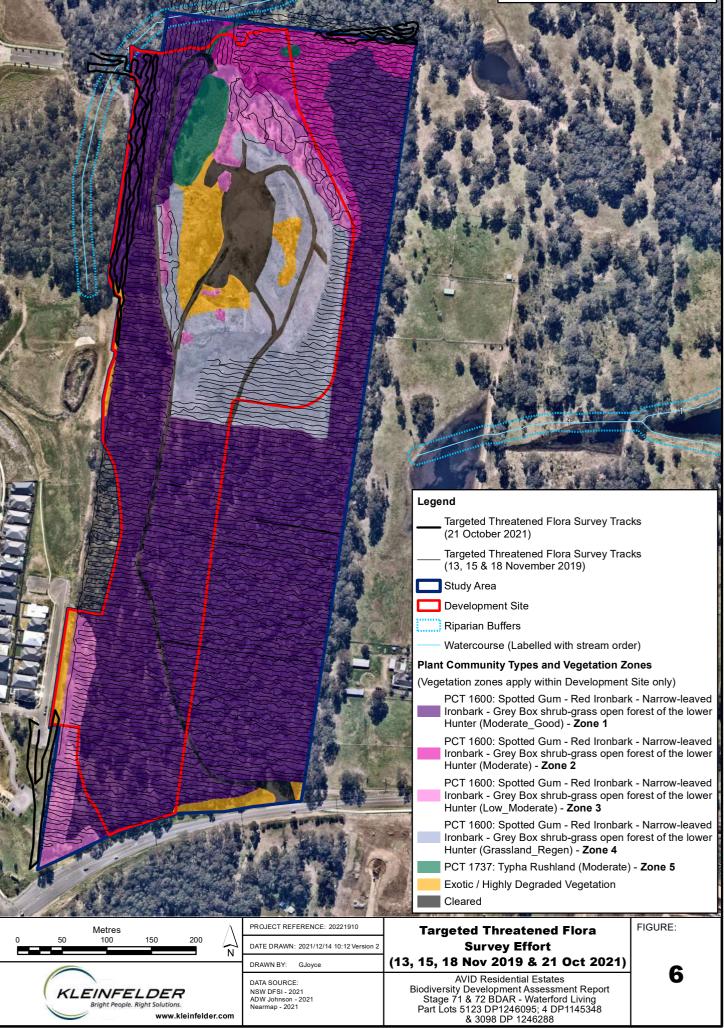
A list of the flora species identified within the Study Area is provided in Appendix B.

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Legend Targeted Threatened Flora Survey Tracks (13, 23 & 27 August 2019) Study Area Development Site **Riparian Buffers** Watercourse (Labelled with stream order) Plant Community Types and Vegetation Zones (Vegetation zones apply within Development Site only) PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Moderate_Good) - Zone 1 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Moderate) - Zone 2 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Low Moderate) - Zone 3 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Grassland_Regen) - Zone 4 PCT 1737: Typha Rushland (Moderate) - Zone 5 Exotic / Highly Degraded Vegetation Cleared PROJECT REFERENCE: 20221910 **Targeted Threatened Flora** FIGURE: Metres 150 200 100 Survey Effort DATE DRAWN: 2021/12/14 10:08 Version 2 N (13, 23 & 27 August 2019) DRAWN BY: GJoyce 5 AVID Residential Estates DATA SOURCE: NSW DFSI - 2021 ADW Johnson - 2021 Nearmap - 2021 Biodiversity Development Assessment Report Stage 71 & 72 BDAR - Waterford Living Part Lots 5123 DP1246095; 4 DP1145348 & 3098 DP 1246288 KLEINFELDER Bright People, Right Soluti www.kleinfelder.com

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Legend Targeted Threatened Flora Survey Tracks (11-12 February 2020) Study Area Development Site **Riparian Buffers** Watercourse (Labelled with stream order) Plant Community Types and Vegetation Zones (Vegetation zones apply within Development Site only) PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Moderate_Good) - Zone 1 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Moderate) - Zone 2 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Low Moderate) - Zone 3 PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Grassland_Regen) - Zone 4 PCT 1737: Typha Rushland (Moderate) - Zone 5 Exotic / Highly Degraded Vegetation Cleared PROJECT REFERENCE: 20221910 FIGURE: **Targeted Threatened Flora** Metres 150 200 100 **Survey Effort** DATE DRAWN: 2021/12/14 10:13 Version 2 N (11-12 February 2020) DRAWN BY: GJoyce 7 AVID Residential Estates DATA SOURCE: NSW DFSI - 2021 ADW Johnson - 2021 Nearmap - 2021 Biodiversity Development Assessment Report Stage 71 & 72 BDAR - Waterford Living Part Lots 5123 DP1246095; 4 DP1145348 & 3098 DP 1246288 KLEINFELDER

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4.2.2 Candidate Threatened Fauna

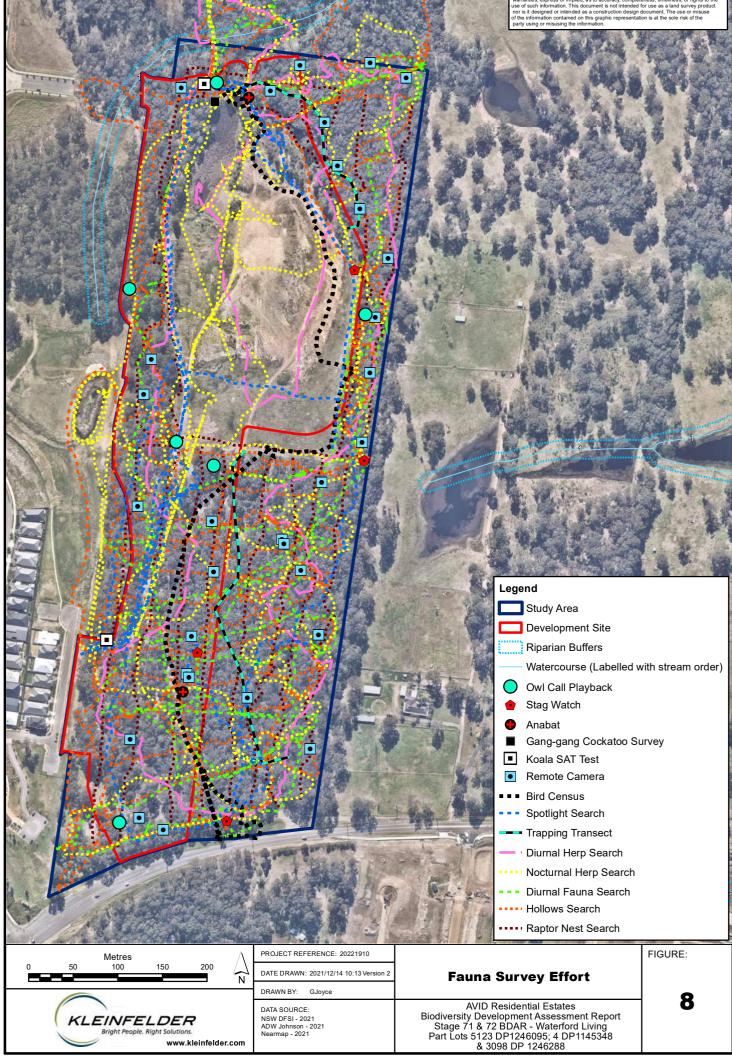
The following candidate threatened fauna species were surveyed in the appropriate season as per the BAM (**Table 7**). Surveys were undertaken across the Study Area by suitably qualified ecologists. Survey methodologies for each round of targeted surveys are shown on **Figure 8**.

Scientific name	Common name	Survey Requirements	Survey Timing
Amphibian			
Crinia tinnula	Wallum Froglet	All year	Spotlighting/ Call Playback 20 and 21 January 2020 and 10 and 11 November 2021
Litoria aurea	Green and Golden Bell Frog	November to March	Spotlighting/ Call Playback 20 and 21 January 2020 and 10 and 11 November 2021
Litoria brevipalmata	Green-thighed Frog	October to March	Spotlighting/ Call Playback 20 and 21 January 2020 and 10 and 11 November 2021
Uperoleia mahonyi	Mahony's Toadlet	October - March	Spotlighting/ Call Playback 20 and 21 January 2020 and 10 and 11 November 2021
Mammals			
Cercartetus nanus	Eastern Pygmy-possum	October to March	Remote Camera survey November December 2019, December 2021 Spotlighting January 2020 and August 2021
Myotis macropus	Southern Myotis	October to March	Anabat surveys November 2019
Petaurus norfolcensis	Squirrel Glider	All Year	Remote Camera survey December 2021 Trapping (Arboreal and Remote Cameras) November and December 2019 Spotlighting August 2019, January 2020 and August 2021
Petauroides volans	Greater Glider	All Year	Remote Camera survey December 2021 Trapping (Arboreal and Remote Cameras) November and December 2019 Spotlighting August 2019, January 2020 and August 2021

 Table 7:
 Survey of requirements and timing conducted for candidate fauna species

Scientific name	Common name	Survey Requirements	Survey Timing	
Phascogale tapoatafa	Brush-tailed Phascogale	December to June	Remote Camera survey December 2021 Trapping (Arboreal and Remote Cameras) November and December 2019 Spotlighting August 2019, January 2020 and August 2021	
Phascolarctos cinereus	Koala	All Year	Remote Camera surveys December 2021 SAT November Spotlighting August 2019, January 2020 and August 2021	
Pteropus poliocephalus	Grey-headed Flying-fox	October to December	Camp Searches November 2019 and August 2021	
Birds				
Burhinus grallarius	Bush Stone-curlew	All Year	Spotlighting/Call Playback Spotlighting August 2019, January 2020 and August 2021	
Callocephalon fimbriatum	Gang-gang Cockatoo	October to January	Bird Surveys November 2019 and August 2021	
Calyptorhynchus lathami	Glossy Black-Cockatoo	April to August	Stag Watching August 2019 and August 2021	
Haliaeetus leucogaster	White-bellied Sea-Eagle	July to December		
Hieraaetus morphnoides	Little Eagle	August to October	Nest Survey	
Lophoictinia isura	Square-tailed Kite	September to January	August, November 2019 and August 2021	
Pandion cristatus	Eastern Osprey	April - November		
Ninox connivens	Barking Owl	May to December	Owl Call Playback and Stag	
Ninox strenua	Powerful Owl	May to August	Owl Call Playback and Stag Watching August 2019 and	
Tyto novaehollandiae	Masked Owl	May to August	August 2021	





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4.2.2.1 Survey Methodology

The following sub-sections outline the methods for all fauna surveys conducted across the Study Area. Surveys were completed in accordance with published BAM survey guidelines or the Threatened Biodiversity Database Collection (TBDC) where published BAM guidelines are not available. Fauna Survey Effort is summarised in **Figure 8.**

Arboreal Mammals

Twenty (20) Elliott B traps were placed in trees at heights of 3 m or above, along two transects and baited with a mixture of rolled oats, honey, peanut butter and treacle. The trunks of trees containing the traps were sprayed with a mixture of honey and water. The transect was established within Zone 1 – PCT 1600 Moderate-Good condition and Zone 3 – PCT 1600 Low-Moderate. Traps were established on 18 November 2019 and checked daily for arboreal species for four consecutive nights (traps collected 22 November 2019; total 40 trap nights).

Spotlighting was undertaken within the larger area via random meanders for one-person hour using high-powered torches, on six separate nights (total 6 person hours) on 19 - 20 August, 20 – 21 January 2020, 26 and 30 August 2021. Nocturnal spotlighting also included searches of blossoming trees to detect Megachiropteran bats.

Two remote cameras were established within the site at approximately 1 m high (targeting Pygmy Possum) and two cameras at 3 m high (targeting Brush-tailed Phascogale). The cameras were set up on site from 18 November to 9 December 2019 (84 camera nights). Due to updates to the survey guidelines for the Brush-tailed Phascogale (within the TBDC), a further 28 arboreal remote cameras have been installed on 1 December 2021, to be collected in late December 2021 (4-week deployment). Results from the final round of remote camera surveys will be incorporated into the BDAR, following collection and review of imagery.

Koala

Spotlighting and call playback surveys were conducted for Koalas within the Development Site on the 27 October, 17 and 19 November, and 16 December 2020, 26 and 30 August 2021 (**Figure 8**). Call playback surveys were completed during spotlighting through the broadcast of recorded calls through a megaphone to attract individuals or to incite a response. After an initial listening period of 15 minutes calls were broadcast for 5 minutes. Directly after the final broadcast, a quiet listening period of 5 minutes was conducted followed by 1-2 minutes of stationary spotlighting.

Six SAT surveys (as per Phillips and Callaghan, 2011) were undertaken across the Development Site on 10 December 2020 ensuring at least one SAT was undertaken within each vegetation zone and targeting suitable Koala habitat.

Terrestrial Mammals

Fifty (50) Elliott A traps were placed along two transects (25 each), as above, at regular intervals to capture small terrestrial mammal species. Traps were baited with a mix of rolled oats, honey, peanut butter and treacle and set for seven consecutive nights with checks for captures occurring each morning (timing as per arboreal trapping; total 200 trap nights).

Spotlighting was undertaken within the Study Area via random meanders for one-person hour using high-powered torches, on six separate nights (total 8 person hours) on 19 - 20 August, 20 – 21 January 2020, 26 and 30 August

2021. Searches targeted areas which had been identified during daytime observations as containing signs of recent terrestrial mammal activity such as diggings, droppings or scratch marks.

Bats

Two AnaBat[™] ultrasonic recorders (Titley Scientific, Lawnton QLD) were used to passively record the calls of any Microchiropteran bats in the area, one within the Development Site. The units were set up adjacent to open flyway areas which are likely to be favoured by foraging bats. Each Anabat was set-up to record over four consecutive nights (18-22/11/2019) of continuous recording from dusk. For Megachiropteran Bats (Fruit Bats), searches for camps were undertaken throughout the Study Area on the 20 November 2019.

Birds

Visual and auditory bird surveys was conducted within the site, focusing on the dam area of an evening and along the two transects in the morning. Five surveys were conducted within the Study Area, on the 19 - 22 July 2019 and 26 August 2021. Three surveys were conducted at dawn, and four surveys were conducted at dusk (peak activity periods) to maximise detection probability. Species were identified visually with the aid of binoculars or aurally from call identification. Suitable hollows for threatened cockatoos were stag-watched on dusk to identify any individuals returning to roost/breeding hollows (dates 7 - 11, 19, 20 July 2019, 26 and 30 August 2021).

Nocturnal Birds

Within the Study Area, stag-watching and owl call-playback was conducted over nine nights on 7 – 11, 19, 20 July 2019, 26 and 30 August 2021. During these surveys, hollows identified as being potentially suitable for Large Forest Owls were stag watched from dusk (30-minutes prior to sunset) for a period of 1.5-hours. After stag watching was completed, owl call-playback was conducted. Calls of large forest owls (Powerful Owl, Masked Owl and Barking Owl) were broadcast through a megaphone to attract individuals or to incite a response. After an initial listening period of 15-minutes, recorded calls of threatened species were broadcast for 5-minutes each, followed by 1-2 minutes of stationary spotlighting. Directly after the final broadcast, a quiet listening period of 5 minutes was conducted followed by a 30-minute spotlighting survey.

Amphibians and Reptiles

Amphibian and nocturnal reptile surveys were carried out on the 20 and 21 January 2019, 10 and 11 November 2021 totaling 8 hours over four nights. Approximately 30 mm of rainfall was recorded in the 7 days prior or during the January surveys while 41mm of rainfall was recorded in 4 days prior to the November surveys. Surveys were conducted via a general meander over the larger area and targeted searches (including quiet listening points) around the waterbodies within the larger area. Additionally, call playback for the Green and Golden Bell Frog (GGBF) was conducted at the dams on all nights with a megaphone and pre-recorded GGBF calls to encite a response.

4.2.2.2 Fauna Survey Results

A total of 71 species of fauna were detected within the study area during field surveys (Appendix 1). This includes Nine (9) amphibians, 41 birds, 18 mammals and three (3) reptiles.

Fauna surveys detected Southern Myotis (*Myotis macropus*) through AnaBat[™] detection adjacent to the Typha Rushland (potential foraging habitat). As such, this species required further assessment. The species polygon for this species is mapped as all areas of PCT 1737 (foraging habitat) and all areas of PCT 1600 within 200m of the edge of PCT 1737 (**Figure 9**).

Five mammals and one bird species detected within the Study Area are listed as Vulnerable under the BC Act:

- Little Bent-winged Bat (*Miniopterus australis*) was identified via Anabat recordings at both AnaBat[™] locations within the Development Site.
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) was identified via Anabat recordings at both AnaBat[™] locations within the Development Site.
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) was identified via Anabat recordings at the dam AnaBat[™] location within the Development Site.
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) was identified via Anabat recordings at the dam AnaBat[™] location within the Development Site.
- Southern Myotis (*Myotis macropus*) was identified via Anabat recordings at the dam AnaBat[™] location within the Development Site.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) was identified during spotlighting surveys feeding within the canopy adjacent to the dam.
- Wompoo Fruit Dove (*Ptilinopus magnificus*) was identified during birds surveys adjacent to the dam (PCT 1737).
- Masked Owl (*Tyto novaehollandiae*) was tentatively identified onsite (opportunistic detection) on

 December 2021 (outside of the breeding season) during nocturnal surveys within the north-western
 portion of the site. The Owl was sighted to fly to the west, outside of the Study Area. Call playback was
 initiated to attract the owl back to confirm suspected identification, however, attempts were unsuccessful.
 Further call play back surveys were undertaken on the following night (2 December 2021) for the suspected
 Masked Owl but was not heard/observed. Previous surveys during the breeding season consisting of call
 playback and stag watching did not detect the species or any evidence of breeding. As such, the Subject
 Site is considered to provide potential foraging habitat.

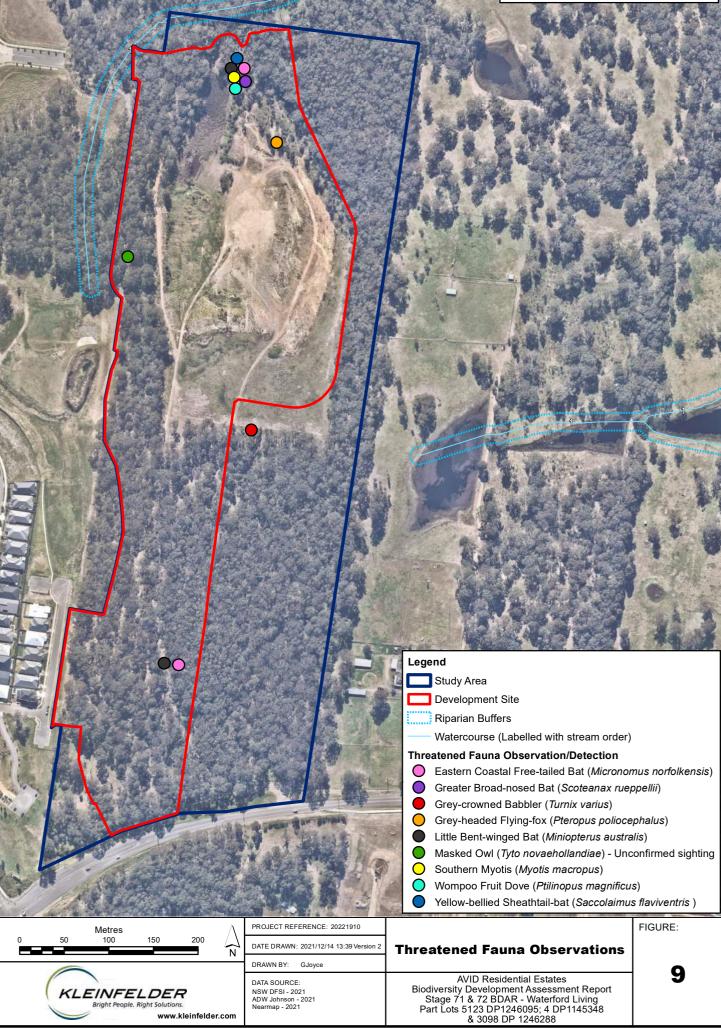
The Little Bentwing-bat and the Grey-headed Flying-fox are both dual Species and Ecosystem Credit Species while the Greater Broad-nosed Bat, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail-bat and Wompoo Fruit Dove are Ecosystem Credit Species only. The Little Bentwing-bat is a species credit species for breeding habitat, and an ecosystem credit species for foraging habitat. The habitat constraint listed for this species in the Threatened Biodiversity Data Collection (TBDC) (habitat constraint: Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding), is not present on or within 2kms of the Development Site. The Grey-headed Flying-fox is a species credit species for breeding habitat, and an ecosystem credit species for foraging habitat. The habitat constraint: breeding camps) is not present within the Study Area. As such, these species credit species was determined to not be a candidate species and no further assessment of impacts was conducted.

In addition, no credit obligation for the Masked Owl was generated as the species was not detected during targeted surveys during the breeding season (Masked Owl is a Species Credit species for breeding habitat). The species was detected (suspected identification) outside of the breeding season. As such, foraging habitat for the species is accounted through the generation of ecosystem credits.

Stage 71 & 72 Waterford Living Biodiversity Development Assessment Report Kleinfelder | 45



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4.3 IDENTIFIED THREATENED SPECIES



Step 5: Determine the area or count, and location of suitable habitat for species credit species and Step 6: Determine the habitat condition within the species polygon for species assessed by area

One species credit species generates Species Credits within the Development Site: *Myotis macropus* (Southern Myotis). The location and condition of suitable habitat for the identified species credit species is discussed below:

Myotis macropus (Southern Myotis)

The species was detected within the Development Site during Anabat surveys within the Study Area within PCT 1737: Typha Rushland (Moderate). As per the BAM guidelines, a 200 m species polygon was generated around areas of suitable Myotis habitat (areas of open water >3 m in diameter) and included the foraging habitat (PCT 1737), with a combined total of 6.4 ha. This includes mapped habitat within: Zone 1 (1.90 ha), Zone 2 (0.99 ha), Zone 3 (0.54 ha), Zone 4 (1.91 ha) and Zone 5 (Foraging habitat) (0.49 ha). (Figure 10).

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		Legend Study Area Development Site Riparian Buffers	
		 Watercourse (Labelled with stream ord Southern Myotis (<i>Myotis macropus</i>) Habi Foraging Habitat Species Polygon 200m Buffer from Foraging Habitat Plant Community Types and Vegetation Z (Vegetation zones apply within Development) 	tat ones
		PCT 1600: Spotted Gum - Red Ironbar Ironbark - Grey Box shrub-grass open Hunter (Moderate_Good) - Zone 1 PCT 1600: Spotted Gum - Red Ironbar Ironbark - Grey Box shrub-grass open Hunter (Moderate) - Zone 2 PCT 1600: Spotted Gum - Red Ironbar Ironbark - Grey Box shrub-grass open	k - Narrow-leaved forest of the lower k - Narrow-leaved forest of the lower k - Narrow-leaved
		Hunter (Low_Moderate) - Zone 3 PCT 1600: Spotted Gum - Red Ironbar Ironbark - Grey Box shrub-grass open Hunter (Grassland_Regen) - Zone 4 PCT 1737: Typha Rushland (Moderate Exotic / Highly Degraded Vegetation Cleared	forest of the lower) - Zone 5
Metres 0 50 100 150 200 N N N N N N N N N N N N N	PROJECT REFERENCE: 20221910 DATE DRAWN: 2021/12/14 10:16 Version 2 DRAWN BY: GJoyce DATA SOURCE: NSW DFSI - 2021 ADW Johnson - 2021 Nearmap - 2021 DAR. Chickelm: Lat5200(Manapiae)/20221810, BD	Southern Myotis (Myotis macropus) Species Polygon AVID Residential Estates Biodiversity Development Assessment Report Stage 71 & 72 BDAR - Waterford Living Part Lots 5123 DP1246095; 4 DP1145348 & 3098 DP 1246288	FIGURE:

5 IMPACT ASSESSMENT



5.1 AVOIDING AND MINIMISING IMPACTS

AVID has reviewed a range of options regarding the proposed development. Avoidance and minimisation measures considered during the planning stages of the Project in relation to site selection, project design and alternative technologies are outlined in the following sections.

5.1.1 Impacts on Native Vegetation and Habitat

Steps to avoid, minimise and mitigate impacts to native vegetation, threatened species, threatened ecological communities and their habitat in the planning stage were informed by an initial biodiversity assessment (constraints assessment) completed by Kleinfelder in 2019. Key avoidance and mitigation measures considered in selecting a final proposed location and design with the least biodiversity impact are outlined below.

Site Selection

AVID has reviewed various options regarding the location and layout of the Project.

The Study Area occurs within the Maitland district, in which there is a high demand for housing. The area has been experiencing rapid growth in recent years with a number of housing developments approved in the immediate vicinity of the Study Area. The southern portion of the site is zoned R1 – General Residential. The northern and eastern boundary portion of the site is zoned E3 – Environmental Management.

The lots to the east, west, north-west and south-east of the Study Area are also zoned R1 – General Residential. Lots to the north-east and south-west are zoned RU2 – Rural Landscape. A number of residential subdivisions have been approved to the west of the Study Area.

The 'Do Nothing' option was considered for the Project. A large area within the Development Site is zoned for General Residential use, as are the majority of the adjacent lots. There is a high demand for housing within the locality and high-density housing developments have been approved to the west. The mostly cleared nature of site provides a suitable location for housing in the locality.

Areas of intact vegetation, current land use, location of approved developments, location of existing (or approved) roads and services and land zoning were all considered when selecting the location of the Project. Service infrastructure can be connected to mains approved as part of adjacent developments, again avoiding the need for clearing to access mains elsewhere. The proposed location is located almost entirely within an area zoned for General Residential under the Maitland City Council LEP, largely avoiding impacts to areas zoned for Environmental Management. As such the use of this site was considered the best opportunity to minimise environmental impacts and meet council objectives, while also reducing the extent of ancillary works.

Areas of land zoned E3 have largely been avoided, within minimal impacts to E3 boundary within the northern extent of the Development Site. Almost all E3 zoned land has been avoided through the design of the development. Importantly, a strip of vegetation (E3 zoned land) is to be retained along the eastern boundary of the Study Area allowing for continued movement of fauna through the site. The fauna corridor will maintain connectivity to the north and south of the Study Area. Furthermore, a smaller strip of vegetation along Raymond Terrace Road (in the southern-eastern corner of the Study Area) is to be retained to maintain fauna connectivity

across Raymond Terrace Road from vegetation to the south. As part of this retained vegetation, a Spotted Gum (Hollow-bearing tree) is to be retained to maintain habitat connectivity for gliding mammals across the road.

5.1.2 Prescribed Biodiversity Impacts

The following are prescribed impacts which need to be considered as per section 8.3 of the BAM (DPIE 2020f).

Impact of development on the habitat of threatened species or ecological communities associated with significant geological features, human made structure or non-native vegetation

No significant geological features, human made structures or non-native vegetation associated with threatened species habitat or ecological communities occur within the Study Area.

Impacts of the development on the connectivity of different habitat which facilitates movement of threatened species

The Study Area has a movement corridor (zoning to be maintained as E3) along the eastern boundary, joining to the larger patch of vegetation at the northern end of the lot (approximately 14 ha in area). The site is connected to vegetation to the south, albeit fragmented by various roads and developments. The land to the south is zoned rural, hence does not have the same level of protections of the onsite E3 zoned land. To the north east, the land is connected to rural zoned land, that is predominately cleared of native vegetation.

The NSW 2036 Hunter Regional Plan has no proposed Biodiversity corridor encompassing the study site. Furthermore, the Hunter Regional Plan has identified Maitland and its surrounding suburbs as an urban growth area. No other state or regionally significant biodiversity links were identified in this area.

The Maitland Council 2002 Greening Plan has mapped the site in its entirety as an 'opportunity corridor.' An opportunity corridor is defined as a voluntary agreement requiring liaison between Maitland Council and a landholder which aims to promote the management and retention or the re-establishment of native vegetation communities.

A corridor of vegetation connects this site to a woody vegetated area, greater than 100 ha, located 2.8 kilometres to the south-west of the site. This route moves through privately-owned forested land (predominately zoned Rural) with points where the corridor is a minimum of 30 metres and widens out to larger patches of bushland up to approximately 1 kilometre across. The route is dissected by Raymond Terrace Rd (adjoining the southern boundary), Haussman Drive, a powerline easement, the railway line and the New England Highway. None of these gaps in woody vegetation is greater than 100 metres and therefore does not preclude the possible movement of fauna species to this site although it is likely that species which rely on dispersing terrestrially will find the gaps to be too hostile to cross due to the high risk of traffic and predation.

The closest forested reserve, Sugarloaf State Conservation Area, is located 14 kilometres to the south-west of the site and requires a further crossing of the Hunter Expressway and George Booth Drive.

As previously discussed, the 'opportunity corridor' that is mapped within the locality includes the Study Area (Maitland Council Greening Plan 2002). However, the corridor is designed to connect habitats within the landscape further to the east and west. The corridor is approximately 3kms wide and extends from Millers Forest in the east to Metford in the West. The Study Area is located along the north edge of the corridor. The vegetation within the Study Area provides potential linking habitats perpendicular (north-south) to the direction of opportunity

corridor (east-west). As such, the removal of vegetation within the Development Site is unlikely to impede movement to the east-west, as there is very little vegetation to the direct west of the Study Area, or further north of the Lot (Four Mile Creek and Saltwater Gully are barries to movement further to the north). The retention of vegetation with the Study Area is designed to maintain connectivity to areas of vegetation directly to the north, east and south.

The minimum 30m wide and maximum 130m retained strip of vegetation along the eastern boundary is well vegetated with mature trees (including hollow-bearing trees) and groundcover >50% along the length of the corridor. These features would allow for continued movement of birds, mammals, reptiles and amphibians. The trees within the retained strip is likely to maintain connectivity for arboreal fauna, such as the threatened Squirrel Glider, through the Study Area and across Raymond Terrace Road (mature trees along the edge of the road to be retained).

Impact of the development on movement of threatened species that maintains their life cycle

As outlined above, fauna connectivity through the Study Area will be maintained through the retention of a minimum 30m and maximum 130m wide strip of vegetation along the eastern boundary. As such, the Project would not cause the fragmentation of any portions of habitat necessary for the life cycle of a threatened species.

Impacts of the development on water quality, bodies and hydrological processes that sustain threatened species or ecological communities.

The Study Area contains a 1st order stream, however, field surveys have indicated this is a poorly defined drainage line within minimal riparian vegetation. This drainage line is within the north-western corner of the Development Site. Additional 1st order streams occur in adjacent lots to the east and west of the Study Area. Mitigation Measures proposed in Section 5.3 would minimise the risk of impacts to these drainage lines.

The area of Zone 5 vegetation (PCT 1737 - Typha Rushland - Moderate) within the Development Site contains an area of open water and would be removed by the Project. This vegetation may provide foraging habitat for the threatened Southern Myotis which predates on fish and aquatic invertebrates by flying over the surface of the water dragging their feet to catch prey. Given the high density of Typha and lack of open water, it is unlikely that the waterbody sustains the Southern Myotis and its foraging habits within the locality. It is unlikely that any other threatened species utilise this water body on a regular basis such that it is necessary to sustain the survival of the species.

Impact of wind turbine strikes on protected animals

Not applicable to the current application.

Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

A number of small internal roads are proposed as part of the project. Vehicle movements are likely to increase as a result of the project, which may have the potential to increase vehicle strike rates on local fauna. Measures to minimise any potential impacts will be through the implementation of fauna signage and reduced vehicle speeds, and construction of fauna exclusion fencing where necessary.

Vehicle and machinery movements will be required as part of the construction phase of the Development. Measures to minimise any potential impacts will be through the implementation of reduced vehicle speeds within construction zones.

5.2 ASSESSMENT OF IMPACTS

5.2.1 Impacts on Native Vegetation and Habitat

5.2.1.1 Direct Impacts

Within the Development Site, the proposal will impact on 13.13 ha of native vegetation comprising 7.52 ha Moderate-Good vegetation, 0.55 ha of Moderate vegetation, 1.32 ha of Low-Moderate vegetation, 3.25 ha of Grassland-Regen vegetation and 0.5 ha of wetland vegetation. Each vegetation zone equates to one management zone; and the future value of each attribute (composition, structure, and function) and the vegetation integrity score for all management zones will be zero.

5.2.1.2 Indirect Impacts

The proposal has the potential for edge effects on the retained intact and modified vegetation in the north of the Study Area, and also to modified vegetation adjacent to the site in the east. Potential indirect impacts include:

- Increased weed invasion due to edge effects.
- Accidental incursions during clearing.
- Increase in dust during clearing works.
- Increase in noise during clearing works and operational phase.
- Sedimentation and run-off into adjacent drainage lines.

5.2.2 Prescribed Biodiversity Impacts

The proposal has the potential to impact on one prescribed impact, waterbodies. The area of Zone 5 vegetation (PCT 1737 - Typha Rushland - Moderate) within the Development Site contains semi-permanent water and would be removed by the Project. Targeted threatened species surveys conducted for the Project identify one threatened species (Southern Myotis), which may utilise this waterbody as foraging habitat. However, as discussed above, the density of Typha is likely to limit the suitably of the aquatic habitats as a foraging resource. Therefore, it is unlikely any threatened species utilise this water body on a regular basis such that they are dependent on this feature.

Connectivity through the site has also been maintained through the retention of a minimum 30m wide vegetated corridor along the eastern boundary.

5.3 MITIGATE AND MANAGE IMPACTS ON BIODIVERSITY VALUES

The measures outlined in **Table 8** are proposed to minimise and avoid potential impacts associated with the Project.

Table 8: Summary of mitigation and management measures for direct, prescribed and indirect impacts of the Project

Impact	Action and Outcome	Responsibility	Timing
Direct impact /	prescribed impact		
Clearing of native vegetation	 Avoid and minimise clearing impacts to native vegetation where possible. Clearly delineate the boundaries of the project footprint to prevent any unnecessary clearing beyond its extent. Ensure vehicle and equipment parking areas and stockpile areas are identified and positioned to avoid areas containing ecological value. Appropriate signage such as 'no go zone' or 'environmental protection area' should be installed. Identify and communicate the location of any 'no go zones' in site inductions. 	Construction site manager	Prior to and during vegetation clearing
Removal of hollow-bearing trees / habitat trees, resulting in fauna injury and mortality	 Limit removal of trees to that required within the project footprint where possible. A pre-clearing protocol will be implemented during clearing works, as follows: Pre-clearance surveys will be undertaken to determine if any inhabiting fauna are present; A suitably qualified and trained fauna handler will be present during hollow-bearing tree clearing to rescue and relocate displaced fauna. Appropriate exclusion fencing around any trees and woodland that are to be retained within the Development Site should be erected, considering allowance for Tree Protection Zones in accordance with AS4970 (Standards Australia, 2009). 	Construction site manager and suitably qualified/ trained fauna handler	Prior to and during tree clearing
Impacts to surface and groundwater quality and quantity due to sediment run- off and/or contaminant runoff into adjacent watercourses	 Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate. Site-based vehicles will carry spill kits. Erosion and sediment control will be required for the development in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) prior to commencement of construction. Given the proximity of the proposed development to a coastal wetland, a Water Cycle Management Plan should be prepared for the proposed development. Limit the use of pesticides in the project footprint where possible to avoid contamination of nearby watercourses/wetland areas. 	Construction site manager	During vegetation clearing, construction and operation
Vehicle collision with fauna	 Speed limits within the Development Site should be limited to 40 km/hr. This limit should be clearly signed at all entry points to site. 	Construction site manager	During construction and operation
Indirect Impact			

Impact	Action and Outcome	Responsibility	Timing
Transfer of weeds and pathogens to and from site	 The fungal pathogens <i>Phytophora cinnamomi</i> and Myrtle Rust (<i>Puccinia psidii</i>) are known to occur in the Maitland LGA however, it is unknown if they occur within the Development Site. These pathogens can have devastating impacts on native plant communities and inhabiting fauna if not properly managed. Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival on-site and prior to departure. Ensure soil and seed material is not transferred in accordance with measures outlined in the CEMP. Weed infestations within the construction footprint are to be identified and mapped prior to construction. A Plan of Management for the control of weeds is to be prepared for the proposed development. 	Construction site manager	During vegetation clearing and construction
Noise, vibration, lighting, waste and air pollution impacts to adjacent sensitive habitat areas	 Increased human activity (from workers and traffic levels) directly adjacent to sensitive habitat areas may cause disturbance to flora and fauna species in adjoining habitat. Impacts from operational activities, such as disturbance to an animal's normal behaviour patterns due to noise, vibration, lighting or dust may cause areas of previously suitable habitat to become sub-optimal and may cause fauna species to vacate areas of previously suitable habitat. Measures to mitigate impacts on flora and fauna from noise, vibration, waste, light and air pollution such as: Enforce 'carry-in, carry-out' policy regarding rubbish and waste materials generated on-site during construction to avoid waste materials entering adjacent vegetation. Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction. Fence sensitive areas to delineate 'no go' zones. Levels of lighting that will accompany the access road will be reduced to a minimal level to reduce any adverse effects upon the essential behavioural patterns of light-sensitive fauna. Lighting should comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting. Noise minimisation practices in accordance with DPIE recommendations. Dust control measures such as covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water tankers as required, to control dust; rehabilitation through vegetation of surfaces to be left unsealed; and, truck wheel washes or other dust removal measures. 	Construction site manager	During construction and operation

6 IMPACT SUMMARY



6.1 SERIOUS AND IRREVERSIBLE IMPACTS

No threatened flora species, or threatened ecological communities were identified within the Study Area that are at risk of serious and irreversible impacts (SAII). Nine threatened fauna species was identified onsite, and none are listed entities at risk of serious and irreversible impacts. As such, no further assessment of Serious and Irreversible Impacts is required.

6.2 IDENTIFICATION OF IMPACTS REQUIRING OFFSETS

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10.1 of the BAM (DPIE 2020a).

6.2.1 Impacts on Native Vegetation

A summary of the impacts on native vegetation and the required ecosystem credit is provided in **Table 9**.

Vegetation Zone	Vegetation Zone Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Credits Required
1	1600 Moderate-Good	7.52	55.7	0	209
2	1600 Moderate	0.55	55.3	0	15
3	1600 Low-Moderate	1.32	42.5	0	28
4	1600 Grassland-Regen	3.25	7.2	0	0
5	1737 Moderate	0.50	57.4	0	14
			Total (Credit Requirement	266

Table 9: Summary of ecosystem credit requirements

The Biodiversity Credit Reports detailing like-for-like and variation options for credit retirement is provided in **Appendix E**.

Table 10: Summary of species credit requirements

Vegetation Zone	Vegetation Zone Name	Area (ha)	Biodiversity Risk Weighting	Credits Required
Southern Myotis (Myotis macropus)			
1	1600 Moderate-Good	2.02	2	53
2	1600 Moderate	0.99	2	15
3	1600 Low-Moderate	0.99	2	21
4	1600 Grassland-Regen	1.91	2	7
5	1737 Moderate	0.50	2	14
			Total	110

6.3 IMPACTS NOT REQUIRING OFFSETS

The prescribed impact on connectivity of habitat facilitating movement of threatened species (i.e. identified wildlife corridors) has also been considered but does not require offsetting. Impacts to 1.07 ha of exotic vegetation will also be cleared for the proposed development.

7 ASSESSMENT OF BIODIVERSITY LEGISLATION

7.1 Environment Protection and Biodiversity Conservation Act 1999

7.1.1 Assessment Requirements

A database search of relevant threatened species databases and an assessment of the likelihood of occurrence of threatened and migratory species is provided in Appendix 2. No threatened or migratory species or ecological communities listed under the EPBC Act were identified within the Study Area.

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is known to occur within the Study Area given the presence of suitable foraging habitat onsite and the large number of database records for this species within the locality. Targeted species searches and camp searches were undertaken for this species. Surveys did not detect camps or individuals of this species within the Study area. As the proposal will only impact on a small area of foraging habitat for this highly mobile species, it is unlikely there will be a significant impact on this species.

Additionally, two migratory species, the Cattle Egret (*Ardea ibis*) and White-throated Needletail (*Hirundapus caudacutus*) were considered to have a moderate and Low-Moderate likelihood of occurrence within the Study Area given the presence of suitable habitat onsite and the large number of database records within the locality (of the Cattle Egret). As the proposal will only impact on a small area of foraging habitat for the Cattle Egret, and with the understanding that the White-throated Needletail is an aerial forager unlikely to utilise habitats within the Study Area, it is unlikely there will be a significant impact on these species. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

7.2 **BIOSECURITY ACT 2015**

Species which require control within the retained vegetation in the Study Area, and which will require control to ensure they are not spread due to works, include the high threat species; *Bidens pilosa* (Cobblers Pegs), *Senecio madagascariensis* (Fireweed), *Cenchrus clandestinus* (Kikuyu), *Ehrharta erecta* (Panic Veldtgrass), *Paspalum dilatatum* (Paspalum), *Stenotaphrum secundatum* (Buffalo Grass) and *Lantana camara* (Lantana).

7.3 KOALA HABITAT PROTECTION STATE ENVIRONMENTAL PLANNING POLICY (SEPP 2021)

The Study Area is located within Maitland Council, within the Central Coast Koala Management Area (KMA) of the Koala SEPP 2021 (Schedule 1). The policy does apply to the proposed development, the vegetation was assessed as to whether it constitutes 'Core Koala Habitat' in accordance with the SEPP, defined as the following:

- 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
- 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.

As such, the presence of 'highly suitable koala habitat' and records of koala habitation within the 'area of land' associated with the proposed development is detailed below.



Presence of Highly Suitable Koala Habitat

Two (2) Koala use tree species listed under Schedule 2 of the Koala SEPP were identified within the Study Area: *Eucalyptus moluccana* (Grey Box), *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Red Ironbark) *Eucalyptus acmenoides* (White Mahogany) and *Eucalyptus Tereticornis* (Forest Red Gum). These species constitute over 15% of the total number of trees within the vegetation community. As such, the vegetation within the Study Area constitutes "highly suitable habitat" under the SEPP.

Records of Koala Habitation

No koalas were recorded within the Study Area as present at the time of the site assessment. Furthermore, no historical records (<18 years old) within 2.5 km of the Study Area (as per the definition of 'site area' for the Central Coast KMA) were identified (DPIE 2021a).

As such, the vegetation within the Study Area does not constitute 'Core Koala Habitat' under the Koala SEPP 2021.

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APPENDIX A - THREATENED SPECIES DATABASE SEARCH





THREATENED SPECIES DATABASE SEARCH

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a five-kilometre radius of the Study Area was obtained from the following databases:

- NSW DPIE BioNet Atlas: (<u>http://www.bionet.nsw.gov.au/</u>); and
- Commonwealth DAWE Protected Matters search tool: (<u>https://www.environment.govSPRAT.au/epbc/protected-matters-search-tool</u>).

Further resources used to inform the threatened species database search included:

- The BAM Calculator (<u>BAM Calculator (nsw.gov.au)</u>), and
- NSW DPIE BioNet Threatened Biodiversity Profiles: (<u>NSW BioNet Quick Guides and Manuals | NSW</u> Environment, Energy and Science/).
- DAWE (2020b). Species Profile and Threats Database (SPRAT). Available at: <u>http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl</u>

An assessment was then made of the likelihood of the threatened species, populations, and ecological communities reported or modelled to occur in the locality occurring within the Development Site or using the habitat within the Development Site as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Development Site based on the habitat requirements of each species.

A brief definition of the likelihood of occurrence criteria is provided below:

- Known species identified within the site during surveys;
- High species known from the area (DPIE BioNet Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site;
- Moderate species may be known from the area, potential habitat is present within the site;
- Low species not known from the area and/or marginal habitat is present within the site; and
- Nil habitat requirements not met for this species within the site

Table A1 'Likelihood of Occurrence' table

	Species	Sta	atus*	Decende**	Habitat	LoO	Summary	
		BC	EPBC	Records**	Source***			
Flora								
1.	<i>Acacia bynoeana</i> Bynoe's Wattle	E	V	Ρ	BAM	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Occurs in heath or dry sclerophyll forest on sandy soils	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
2.	<i>Asperula asthenes</i> Trailing Woodruff	V	v	Ρ	BAM	This small herb occurs only in NSW. It is found in scattered locations from the Central Coast north to near Kempsey, with several records from the Port Stephens / Wallis Lakes area / Forster (including Myall Lakes NP, New England NP, Wallingat NP and Darawnk NR). Occurs in damp sites, often along river banks.	Low	Marginal habitat present onsite. No known records of this species within locality.
3.	<i>Caladenia tessellata</i> Thick Lip Spider Orchid	E	V	Ρ	PMST	In NSW this species is found sporadically on the coast from Swansea and extends onto the Tablelands further south. <i>Caladenia tessellata</i> is normally found on clay or sandy soils in grassy sclerophyll woodlands, although it has been recorded on stony soil. The species is now known with certainty from only two populations on the NSW Southern Tablelands.	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
4.	<i>Callistemon linearifolius</i> Netted Bottle Brush	V	-	1	BioNet Atlas, BAM	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Low	Marginal habitat potentially present onsite. However, only one known record of this species within locality.

	Species	Status*		Doorado**	0	Habitat	LoO	Summary
		вС	EPBC	Records**	Source***			
5.	<i>Cryptostylis hunteriana</i> Leafless Tongue-orchid	V	V	Ρ	PMST, BAM	In New South Wales the species occupies a variety of habitats. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E.</i> <i>sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>). The species grows most often on the flat plains close to the coast, favouring moist soils.	Low	Marginal habitat present onsite. No known records of this species within locality.
6.	<i>Cynanchum elegans</i> White - flowered Wax Plant	E	E	Ρ	PMST, BAM	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; <i>Leptospermum laevigatum</i> (Coastal Tea-tree) – <i>Banksia</i> <i>integrifolia</i> subsp. <i>integrifolia</i> (Coastal Banksia) coastal scrub; <i>Eucalyptus tereticornis</i> (Forest Red Gum) aligned open forest and woodland; <i>Corymbia maculata</i> (Spotted Gum) aligned open forest and woodland; and <i>Melaleuca</i> <i>armillaris</i> scrub (Bracelet Honeymyrtle) to open scrub.	Low	Marginal habitat present onsite. However, no known records of this species within locality.
7.	<i>Diuris praecox</i> Rough Doubletail	v	V	13	BioNet, PMST	Occurs between Ourimbah and Nelson Bay on the NSW north coast. This species has also been identified on the Wallarah Peninsula, near Lake Macquarie in NSW. Grows on hills and slopes of near-coastal districts, in open heathy forests which have a grassy to fairly dense understorey.	Low	Marginal habitat present onsite. However, no known records of this species within locality.
8.	<i>Diurus tricolor</i> Pine Donkey Orchid	v	-	Ρ	BAM	Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW. The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises.	Low	No suitable habitat present onsite. No known records of this species within locality.

	Species	Status*		Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records	Source					
9.	<i>Eucalyptus</i> <i>camaldulensis</i> population in the Hunter catchment	E	-	1	BioNet Atlas	May occur with Eucalyptus tereticornis, Eucalyptus melliodora, Casuarina cunninghamiana subsp. cunninghamiana and Angophora floribunda	Nil	No suitable habitat present onsite. One record of this species within locality.		
10.	<i>Eucalyptus castrensis</i> Singleton Mallee	E	-	Ρ	BAM	Known only from a single dense stand near Singleton in the lower Hunter Valley. Very restricted in range, but locally dominant, occurring as a dense mallee stand over about three hectares, on a low broad ridgetop on loam over sandstone.	Nil	No suitable habitat present onsite. No known records of this species within locality.		
11.	<i>Eucalyptus glaucina</i> Slaty Red Gum	V	V	Ρ	PMST, BAM	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Low	No suitable habitat present onsite. No known records of this species within locality.		
12.	Eucalyptus parramattensis subsp. decadens Earp's Gum	V	V	Ρ	PMST	Occurs in low-lying, often swampy areas and in woodlands with associates such as <i>Eucalyptus</i> <i>racemosa</i> (Narrow-leaved Scribbly Gum), <i>E.</i> <i>globoidea</i> (White Stringybark) and <i>Angophora</i> <i>bakeri</i> (Narrow-leaved Apple) on poor sandy soils.	Nil	No suitable habitat present onsite. No known records of this species within locality.		
13.	<i>Eucalyptus pumila</i> Pokolbin Mallee	V	V	Ρ	BAM	Currently known only from a single population west of Pokolbin in the Hunter Valley. Historical records also exist for Wyong and Sandy Hollow, however, has not been recorded recently in these areas. The single known population occupies north-west- facing slopes derived from sandstone.	Nil	No suitable habitat present onsite. No known records of this species within locality.		
14.	Euphrasia arguta	CE	CE	Ρ	PMST	Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'.	Nil	No suitable habitat present onsite. No known records of this species within locality.		

	Species	Status*		De se se de tt	0 + + +	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
15.	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	v	V	Ρ	PMST, BAM	The species occurs in heath and shrubby woodland, in sandy or lightly clay soils usually over thin shales.	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
16.	Maundia triglochinoides	v	-	1	BioNet Atlas, BAM	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	Low	Marginal habitat potentially present onsite. One record of this species within locality.
17.	<i>Melaleuca biconvexa</i> Biconvex Paperbark	V	V	Ρ	BAM	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford- Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
18.	<i>Monotaxis macrophylla</i> Large-leaf Monotaxis	E	-	Ρ	BAM	The distribution and supposed rarity of Monotaxis macrophylla within NSW is related to the occurrence of fire. At least within NSW, the species has not been found in the absence of fire. Grows on rocky ridges and hillsides.	Nil	No suitable habitat present onsite. No known records of this species within locality.
19.	Ozothamnus tesselatus	v	V	Ρ	BAM	Restricted to a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth.	Nil	No suitable habitat present onsite. No known records of this species within locality.
20.	<i>Persicaria elatior</i> Tall Knotweed	V	V	Ρ	PMST, BAM	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Nil	No suitable habitat present onsite. No known records of this species within locality.

	Species	Status*		Status*		Status*		ipecies Status*		Decendo**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records**	Source									
21.	<i>Persoonia pauciflora</i> North Rothbury Persoonia	CE	CE	Ρ	BAM	Extremely restricted distribution; all but one of the plants which make up the only known population occur within a 2.5 km radius of the original specimen at North Rothbury in the Cessnock local government area.	Nil	Marginal habitat present onsite. Not know to occur within the locality.						
22.	<i>Pomaderris queenslandica</i> Scant Pomaderris	E	-	Ρ	BAM	Widely scattered but not common in north-east NSW and in Queensland. Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks.	Nil	No suitable habitat present onsite. No known records of this species within locality.						
23.	Prasophyllum sp. Wybong (C.Phelps ORG 5269) (EPBC Act) / Prasophyllum petilum (BC Act) A Leek-orchid	V	CE	Ρ	PMST	Known from open eucalypt woodland and grassland.	Low	Suitable habitat potentially present onsite. However, the species is not known to occur within locality.						
24.	<i>Prostanthera cineolifera</i> Singleton Mint Bush	V	V	Ρ	BAM	Restricted to only a few localities near Scone, Cessnock and St Albans. Grows in open woodlands on exposed sandstone ridges.	Nil	No habitat present onsite. Not know to occur within the locality.						
25.	Pterostylis chaetophora	V	-	Ρ	BAM	In NSW it is currently known from 18 scattered locations in a relatively small area between Taree and Kurri Kurri, extending to the south-east towards Tea Gardens and west into the Upper Hunter, with additional records near Denman and Wingen. The preferred habitat is seasonally moist, dry sclerophyll forest with a grass and shrub understorey.	Low	Marginal habitat potentially present onsite. However, the species is not known to occur within locality.						
26.	<i>Pterostylis gibbosa</i> Illawarra Greenhood	Е	E	Ρ	PMST	In the Hunter region, this species grows in open woodland dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>E. tereticornis</i> (Forest Red Gum) and <i>Callitris endlicheri</i> (Black Cypress Pine).	Low	Marginal habitat potentially present onsite. However, the species is not known to occur within locality.						

	Species	Status*		- Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records	Source			
27.	<i>Rhizanthella slateri</i> Underground Orchid	v	E	Ρ	PMST	Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed.	Nil	No suitable habitat present onsite. The species is not known to occur within locality.
28.	<i>Rhodamnia rubescens</i> Scrub Turpentine	-	E	1	BioNet Atlas, PMST	Often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation. The species occupies a range of volcanically derived and sedimentary soils and is also a common pioneer species in eucalypt forests.	Nil	No suitable habitat present onsite. Species last sighted within locality in 2010.
29.	<i>Rhodomyrtus psidioides</i> Native Guava	CE	-	Ρ	BioNet Atlas	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland.	Low	Marginal habitat present onsite. However, the species is not known to occur within locality.
30.	<i>Rutidosis heterogama</i> Heath Wrinklewort	V	V	Ρ	PMST, BAM	Grows in dry sclerophyll forests, native grasslands, grassy woodlands and heathlands. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Low	Suitable habitat potentially present onsite. However, the species is not known to occur within locality.
31.	<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E	V	Ρ	PMST	Grows on sandy soils in subtropical and littoral rainforest near the coast from Bulahdelah to Jervis Bay.	Nil	No suitable habitat onsite. No records within the locality.
32.	<i>Tetratheca juncea</i> Black-eyed Susan	V	V	Ρ	PMST	Grows in sandy, occasionally swampy heath and in dry sclerophyll forest; chiefly in coastal districts from Bulahdelah to Lake Macquarie.	Low	Marginal habitat present onsite. However, the species is not known to occur within locality.
33.	<i>Thesium austral</i> Austral Toadflax	V	V	Ρ	PMST, BAM	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Low	Suitable habitat potentially present onsite. However, the species is not known to occur within locality.

	Species	Status*		De se se de **	0 + + + +	Habitat	LoO	Summary	
		BC	EPBC	Records**	Source***				
34.	Zannichellia palustris	E	-	Ρ	BAM	In NSW, known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing water.	Nil	No suitable habitat onsite. No records within the locality.	
Birds	Birds								
1.	<i>Anthochaera phrygia</i> Regent Honeyeater	E	CE	3	BioNet Atlas, PMST, BAM	Mostly recorded in box-ironbark eucalypt associations. At times of food shortage, the species also uses other woodland types and wet lowland coastal forest dominated by <i>Eucalyptus</i> <i>robusta</i> (Swamp Mahogany) or <i>Corymbia maculata</i> (Spotted Gum).	Low	Marginal foraging habitat present onsite. However, only three known records of this species within locality.	
2.	Artamus cyanopterus cyanopterus Dusky Woodswallow	V	-	1	BioNet Atlas	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has 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.	Low	Low habitat suitability within the study area, however, not known from the locality in recent years. Last sighted in locality in 1998.	
3.	<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	Ρ	PMST	Occurs in reeds and marshes in terrestrial freshwater wetlands and, occasionally estuarine habitats. Nests in stands of <i>Phragmites, Typha</i> , and rushes (<i>Juncus, Baumea</i> spp.).	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.	
4.	<i>Burhinus grallarius</i> Bush Stone-curlew	E	-	Ρ	BAM	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Nil	No suitable habitat within the Development Site. No records within the locality.	
5.	<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE	Ρ	PMST, BAM	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	Nil	No habitat present onsite. No known records of this species within locality.	

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	Species	Status*			0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
6.	<i>Calidris tenuirostris</i> Great Knot	V	CE	Ρ	BAM	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Nil	No habitat present onsite. No known records of this species within locality.
7.	<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	V	-	1	BioNet Atlas, BAM	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box- gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	Low-moderate	Low habitat suitability within the study area. Last sighted in locality in 2004. Species not detected during targeted field surveys.
8.	Calyptorhynchus lathami Glossy Black-Cockatoo	V	-	2	BioNet Atlas, BAM	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of she- oak occur. Roosts in tree hollows 15cm or greater at least 5 m above ground level.	Low-moderate	No suitable foraging habitat within the study area. Marginal roosting habitat present within the study area. Species not detected during targeted field surveys. No stands of She-oak present.
9.	<i>Circus assimilis</i> Spotted Harrier	V	-	2	BioNet Atlas	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Low	Low habitat suitability within the study area. Last sighted in locality in 2016. Species not detected during targeted field surveys.
10.	Daphoenositta chrysoptera Varied Sittella	V	-	4	BioNet Atlas	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Moderate	Suitable habitat within the study area. Last sighted in locality in 2016. Species not detected during targeted field surveys.

	Species	Status*				Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
11.	<i>Dasyornis brachypterus</i> Eastern Bristlebird	E	E	Ρ	PMST	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey; all of these vegetation types are fire prone.	Low	Low habitat suitability within the study area. Species not known from the locality.
12.	Ephippiorhynchus asiaticus Black-necked Stork	E	-	24	BioNet Atlas	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. Occasionally individuals will stray into open grass, woodland areas or flooded paddocks in search of food.	Low	Marginal habitat within the study area. Density of Typha reduces habitat suitability. Not detected during surveys.
13.	<i>Erythrotriorchis radiatus</i> Red Goshawk	CE	v	Ρ	PMST	Occurs in tropical and warm-temperate woodlands and forests. Mostly occurs in northern Australia with populations also occurring in the southeast of QLD and northeast of NSW.	Nil	No suitable habitat onsite. No known records of this species within locality.
14.	<i>Falco hypoleucos</i> Grey Falcon	E	V	Ρ	PMST	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Nil	No suitable habitat onsite. No known records of this species within locality.
15.	<i>Glossopsitta pusilla</i> Little Lorikeet	V	-	18	BioNet Atlas	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.	Moderate	Potential foraging habitat present within study area, when desired eucalypt species are flowering. A database record for this species exists within the immediate surrounds of the study area.
16.	<i>Grantiella picta</i> Painted Honeyeater	V	V	Ρ	PMST	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. The primary food source for this bird is the fruit and flowers of mistletoes in the genus <i>Amyema</i> , though it will also take some nectar and insects.	Low	Low habitat suitability within the study area. Species not known from the locality.

	Species	Sta	atus*	Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records	Source			
17.	<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V	-	7	BioNet Atlas, BAM	This species hunts for fish, turtles and sea snakes however will feed on carrion along the waterline. The White-bellied Sea-Eagle most often nests in trees 30 m above the ground.	Low - Moderate	May fly over study area. Waterbody unlikely to provide suitable foraging habitat due to density of Typha. No large stick nests recorded during surveys. Species not detected during targeted bird surveys.
18.	Hamirostra melanosternon Black-breasted Buzzard	V	-	1	BioNet Atlas	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands.	Low	Marginal foraging habitat present within the study area. Species prefers more inland habitats with less rainfall. Last sighted within the locality in 1990.
19.	<i>Hieraaetus morphnoides</i> Little Eagle	V	-	Ρ	BAM	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Low	Marginal foraging habitat present within the study area. Species prefers more inland habitats with less rainfall. No records within the locality.
20.	<i>Hirundapus caudacutus</i> White-throated Needletail	-	V	1	BioNet Atlas, PMST	Forages in high open spaces over varied habitat types although probably recorded most often above wooded or partly wooded areas, including open forest and rainforest, and may also fly between trees or in clearings.	Low-Moderate	Habitat onsite may provide aerial foraging opportunities. Unlikely to utilise habitats within the Study Area. Species last recorded within locality in

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2018.

Species Status* Habitat LoO Summarv Records** Source*** BC **EPBC** 21. Suitable foraging habitat potentially present onsite (wintering flowering **BioNet** This migratory species has been recorded on the Eucalypt species). Species Lathamus discolor Atlas. mainland from a variety of habitat types including E CE 2 Low last sighted within the Swift Parrot PMST. dry and wet sclerophyll forest, forested wetlands, locality in 2010. Study Area BAM coastal swamp forests and heathlands. does not occur within Important Habitat areas for the species 22. Marginal foraging habitat In NSW, scattered records of the species present within the study throughout the state indicate that the species is a regular resident in the north, north-east and along area. Species prefers more Lophoictinia isura V Р BAM Low inland habitats with less the major west-flowing river systems. Found in a Square-tailed Kite rainfall. No records within variety of timbered habitats including dry the locality. woodlands and open forests. Shows a particular preference for timbered watercourses. 23. Low habitat suitability Occupies mostly upper levels of drier open forests within the study area. Last or woodlands dominated by box and ironbark sighted within the locality eucalypts, especially Eucalyptus sideroxylon Melithreptus gularis in 2004. Species not (Mugga Ironbark), E. albens (White Box), E. gularis detected during targeted microcarpa (Inland Grey Box), E. melliodora **BioNet** Black-chinned V field surveys. 2 (Yellow Box), E. blakelyi (Blakely's Red Gum) and Low Atlas Honeyeater (eastern E. tereticornis (Forest Red Gum). Also inhabits subspecies) open forests of smooth-barked gums, stringybarks, ironbarks, river she-oaks (nesting habitat) and teatrees. 24. Low habitat suitability The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, within the study area. Only Neophema pulchella **BioNet** two records detected from the coastal plains to the western slopes of the V 2 Low **Turquoise Parrot** Atlas within the locality. Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.

	Species	Sta	atus*	Decende**	0	Habitat	LoO	Summary
		вС	EPBC	Records**	Source***			
25.	<i>Ninox connivens</i> Barking Owl	V		1	BioNet Atlas	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.	Low	Potential foraging habitat and marginal roosting habitat present within the study area. However, not sighted within the locality within recent years. Last sighted within the locality in 1964. Not detected during surveys
26.	<i>Ninox strenua</i> Powerful Owl	V	-	9	BioNet Atlas	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 Syncarpia glomulifera (Turpentine), Allocasuarina littoralis (Black She-oak), Acacia melanoxylon (Blackwood), Angophora floribunda (Rough-barked Apple), Exocarpos cupressiformis (Cherry Ballart) and a number of eucalypt species. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Low	Potential foraging habitat and marginal roosting habitat present within the study area. Last sighted within the locality in 2017. Species not detected during targeted field surveys.
27.	<i>Numenius madagascariensis</i> Eastern Curlew	-	CE	Ρ	PMST	Generally occupies coastal lakes, inlets, bays and estuarine habitats mainly in intertidal mudflats and sometimes saltmarsh of sheltered coasts.	Nil	No habitat present onsite. No known records of this species within locality.

	Species	Sta	atus*	Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records	Oburce			
28.	<i>Oxyura australis</i> Blue-billed Duck	V	-	1	BioNet Atlas	Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. Forages far from the shore, particularly if dense cover is available in the central parts of the wetland, on the bottom of swamps. Usually nest solitarily in Cumbungi over deep water.	Nil	No suitable habitat present within the study area.
29.	<i>Pandion cristatus</i> Eastern Osprey	V	-	3	BioNet Atlas, BAM	It favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Nil	No suitable habitat within the study area.
30.	<i>Petroica boodang</i> Scarlet Robin	V	-	1	BioNet Atlas	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber. Over Autumn and Winter often lives in open grassy woodlands, and grasslands or grazed paddocks with scattered trees.	Low	Low habitat suitability within the study area. Not known from the locality within recent years. Last sighted within the locality in 1995.
31.	Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	V	-	30	BioNet Atlas	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Forages on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses.	Known	Potential habitat within the study area. A database record for this species exists within the study area.

Species Status* Habitat LoO Summarv **Records**** Source*** BC **EPBC** 32. Preferred habitat types do not occur within the Study Occurs in, or near rainforest, low elevation moist Ptilinopus magnificus Area. No records known V 1 eucalypt forest and brush box forests. Known (Wompoo Fruit-Dove) from the locality. Species was detected during surveys however. 33. Prefers fringes of swamps, dams and nearby Marginal habitat potentially Rostratula australis marshy areas where there is a cover of grasses, present onsite. However, Е Е Р PMST Low no known records of this lignum, low scrub or open timber. Australian Painted Snipe species within locality. 34. Prefer permanent freshwater swamps and creeks Marginal suitable habitat with heavy growth of Cumbungi, Lignum or Teawithin the study area. tree. During drier times they move from ephemeral Stictonetta naevosa **Density of Typha reduces** V **BioNet** breeding swamps to more permanent waters such Low-Moderate 4 habitat suitability. Species Freckled Duck as lakes, reservoirs, farm dams and sewage not detected during ponds. targeted field surveys. 35. Mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek Thinornis rubricollis mouths and inlet entrances. Nests are found above No suitable habitat within CE Р V PMST Nil rubricollis the high water mark on flat beaches, on stony the study area. Hooded Plover (eastern) terraces, or on sparsely vegetated dunes. 36. Lives in dry eucalypt forest and woodlands from Potential foraging habitat sea level to 1100m. Optimal habitat includes an and marginal roosting open understory and a mosaic of sparse (grassy) habitat present within the and dense (shrubby) ground cover on gentle study area. Last sighted Moderate Tyto novaehollandiae **BioNet** V 6 terrain. Masked Owls nest in large hollow eucalypts (unconfirmed within the locality in 2018. Atlas. BAM Masked Owl (diameter at breast height at minimum 90 cm), with sighting) Species not detected hollows greater than 40cm wide and 100cm deep during targeted field surveys during breeding and at least 3m above the ground. season.

	Species	Sta	atus*	Records**	Source***	Habitat	LoO	Summary		
		BC	EPBC							
Mammals										
1.	<i>Cercartetus nanus</i> Eastern Pygmy-possum	V	-	Ρ	BAM	Found in 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. Prefers dry forest close to sandstone ridgelines.	Nil	Marginal habitat present onsite. However, no known records of this species within locality.		
2.	<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	Ρ	PMST, BAM	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle- shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid- elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	Low	Potential foraging habitat present onsite if roosting habitat present in the surrounds. However, no known records of this species within locality and lack of cliffs/overhang areas in the locality.		
3.	<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E	1	BioNet Atlas, PMST	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.	Low	Marginal foraging habitat present onsite and no denning habitat present in the surrounds.		
4.	<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V	-	23	BioNet Atlas	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.	Low-Moderate	Marginal suitable habitat within the study area. Last sighted within the locality in 2018. Species not detected during targeted field surveys.		

	Species	Sta	atus*	Decende**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records**	Source			
5.	<i>Micronomus norfolkensis</i> Eastern Coastal Freetail- bat	V	-	38	BioNet Atlas	Tall open forest, Melaleuca, dry sclerophyll forest, River Red Gum and Yellow Box woodlands and riparian open forest. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Known	Suitable foraging and roosting habitat present within the study area. Four database records for this species exists within the study area. Species not detected during targeted field surveys.
6.	<i>Miniopterus australis</i> Little Bent-winged Bat	V	-	58	BioNet Atlas, BAM	Occupies 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. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	Known	Suitable foraging habitat present within the study area. A database record for this species exists within the study area. Species detected during targeted field surveys.
7.	Miniopterus orianae oceanensis Large Bent-winged Bat (recently renamed from Miniopterus schreibersii oceanensis Eastern Bentwing-bat)	V	-	29	BioNet Atlas, BAM	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	High	Suitable foraging habitat present within the study area. No caves present within the study area. A database record for this species exists within the immediate surrounds of the study area. Species not detected during targeted field surveys.
8.	<i>Myotis macropus</i> Southern Myotis	V	-	19	BioNet Atlas, BAM	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Known	Suitable roosting and foraging habitat present within the study area. A database record for this species exists within the study area. Species not detected during targeted field surveys.

	Species	St	atus*	Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records""	Source			
9.	<i>Petauroides Volans</i> Greater Glider	-	V	Ρ	PMST	Open woodland and tall remnant forests where there is suitable eucalypt trees. Rests in hollow trees during the day and feeds at night. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows	Low	Marginal habitat present onsite. However, no known records of this species within locality.
10.	<i>Petaurus norfolcensis</i> Squirrel Glider	v	-	25	BioNet Atlas	Inhabits mature or old growth Box, Box-Ironbark woodlands and Eucalyptus tereticornis (River Red Gum) forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	High	Suitable habitat present within the study area. A database record for this species exists within the study area. Species not detected during targeted field surveys.
11.	Petrogale penicillata Brush-tailed Rock wallaby	E	V	-	BAM	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	Nil	No habitat present onsite. The species is not known to occur within locality.
12.	<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	V	-	5	BioNet Atlas, BAM	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	Moderate	Suitable habitat present within the study area. Last sighted within the locality in 2009. Species not detected during targeted field surveys.
13.	Phascolarctos cinereus Koala	V	V	2	BioNet Atlas, PMST, BAM	Found in a variety of forest types with suitable feed tree species. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Low - Moderate	Marginal habitat potentially present onsite. However, only two records of this species within locality greater than 2.5kms away.

	Species	Sta	atus*	D **	0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
14.	<i>Planigale maculata</i> Common Planigale	V	-	Ρ	BAM	The species reaches its confirmed southern distribution limit on the NSW lower north coast however there are reports of its occurrence as far south as the central NSW coast west of Sydney. Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
15.	Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland Population)	V	v	Ρ	PMST	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. A sandy loam soil is also a common feature.	Low	Suitable habitat potentially present onsite. However, no known records of this species within locality.
16.	<i>Pseudomys novaehollandiae</i> New Holland Mouse	-	V	Ρ	PMST	Inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	Marginal habitat present onsite due to time since fire. No known records of this species within locality.
17.	<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	45	BioNet Atlas, PMST, BAM	Occurs across a wide range of habitat types along the eastern seaboard of Australia, depending on food availability. Fruit from myrtaceous trees and rainforest trees form the major components of their diet.	Known	Suitable foraging habitat potentially present onsite in eucalypts. No roost sites present.
18.	Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	V	-	7	BioNet Atlas	Roosts in tree hollows and buildings. In treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees.	Known	Suitable habitat present within the study area. Last sighted within the locality in 2005. Species not detected during targeted field surveys.

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Species Status* Habitat LoO Summary Records** Source*** BC **EPBC** 19. Suitable habitat present within the study area. A This species occurs in a variety of habitats Scoteanax rueppellii database record for this **BioNet** including rainforest, dry and wet sclerophyll forest Greater Broad-nosed V 21 Known species exists within the Atlas and eucalypt woodland. study area. Species not Bat detected during targeted field surveys. 20. A cave-roosting species that is usually found in dry Suitable foraging habitat open forest and woodland, near cliffs or rocky may be present within the overhangs; has been recorded roosting in disused study area. Last sighted Vespadelus troughtoni **BioNet** V 6 mine workings, occasionally in colonies of up to Moderate within the locality in 2013. Atlas, BAM Eastern Cave Bat 500 individuals. Occasionally found along cliff-lines Species not detected during targeted field in wet eucalypt forest and rainforest. surveys. Amphibians 1. Wallum Froglets are found in a wide range of No suitable habitat within habitats, usually associated with acidic swamps the Development Site. on coastal sand plains. They typically occur in No records within locality. sedgelands and wet heathlands. They can also be Crinia tinnula V Р BAM Low Species not detected found along drainage lines within other vegetation Wallum Froglet within Development Site communities and disturbed areas, and during targeted surveys. occasionally in swamp sclerophyll forests. 2. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species is No suitable within the Heleioporus australiacus PMST. generally soaks or pools within first or second order study area. However, the v V Ρ Nil streams. They are also commonly recorded from Giant Burrowing Frog BAM species is not known to 'hanging swamp' seepage lines and where small occur within locality. pools form from the collected water.

	Species	Sta	atus*	Records**	Source***	Habitat	LoO	Summary
		BC	EPBC	Records	Source			
3.	<i>Litoria aurea</i> Green and Golden Bell Frog	E	V	1	BioNet Atlas, PMST	Prefers open water bodies, fringed by reeds and other aquatic vegetation for breeding and foraging purposes. Needs fallen logs and debris for shelter and over-wintering purposes. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.).	Low	Marginal habitat potentially present onsite (Dam contains <i>Typha orientalis</i> however, minimal areas of open water). Species not sighted within the locality since 1976. Not found during surveys.
4.	<i>Litoria brevipalmata</i> Green-thighed Frog	V	-	Ρ	BAM	Green-thighed Frogs occur 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. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland.	Low	Marginally suitable habitat within the Development Site. No Records within the locality. Species not detected within the Development Site during targeted surveys.
5.	<i>Mixophyes balbus</i> Stuttering Frog	E	V	Ρ	PMST	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. Tadpoles require deep permanent pools and take approximately 12 months to metamorphose.	Nil	No habitat present onsite. The species is not known to occur within locality.

	Species	Sta	atus*	Decende**	0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
6.	<i>Uperoleia mahonyi</i> Mahony's Toadlet	E	-	Ρ	BAM	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species.	Nil	No suitable habitat within the Development Site. Species not detected within the Development Site during targeted surveys.
Repti	les							
1.	<i>Aprasia parapulchella</i> Pink-tailed Lizard	V	V	Ρ	BAM	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (Themeda australis).	Nil	No suitable habitat within the Development Site. No know records of this species within the locality.
2.	<i>Delma impar</i> Striped Legless Lizard	V	V	Ρ	BAM	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component.	Nil	No suitable habitat within the Development Site. No know records of this species within the locality.

Species Status* Habitat LoO Summary Records** Source*** BC **EPBC** 3. No suitable habitat within Found mainly in dry eucalypt forests and the Development Site. No woodlands, cypress forest and occasionally in records within locality. Hoplocephalus V Р BAM rainforest or moist eucalypt forest. In drier Nil Species not detected bitorquatus environments, it appears to favour habitats close within the Development Pale-headed Snake to riparian areas. Site during targeted surveys. **Migratory Species** 1. Utilises a wide range of coastal wetlands and some No suitable habitat present onsite. No known records inland wetlands, with varying levels of salinity, and of this species within is mostly found around muddy margins or rocky locality. shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on Actitis hypoleucos Μ Ρ PMST banks farther upstream; around lakes, pools, Nil **Common Sandpiper** billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. 2. Forages in high open spaces over varied habitat Habitat onsite may provide aerial foraging types. mostly occur over dry or open habitats, Apus pacificus opportunities. However, no Р Μ PMST including riparian woodland and tea-tree swamps, Low Fork- tailed Swift known records of this low scrub, heathland or saltmarsh. species within locality. 3. Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. High Suitable foraging habitat Ardea ibis numbers have been observed in moist, low-lying Ρ PMST Moderate Μ present within the study poorly drained pastures with an abundance of high Cattle Egret area. grass; it avoids low grass pastures.

	Species	Sta	atus*	De se sud sta	0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
4.	<i>Calidris acuminata</i> Sharp-tailed Sandpiper	-	М	7	BioNet Atlas, PMST	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. Also occur in saltworks and sewage farms. Use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. Use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	Nil	No suitable habitat present onsite. Species not recorded within locality since 1996.
5.	<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE, M	Ρ	PMST	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	Nil	No suitable habitat present onsite. No known records of this species within locality.
6.	<i>Calidris melanotos</i> Pectoral Sandpiper	-	М	2	BioNet Atlas, PMST	Prefers shallow fresh to saline wetlands. Found in coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. Has also been recorded in swamp overgrown with lignum. Forage in shallow water or soft mud at the edge of wetlands.	Nil	No suitable habitat present onsite.

	Species	Sta	atus*	De se se de tt	0 + + +	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
7.	<i>Calidris ruficollis</i> Red-necked Stint	-	М	1	BioNet Atlas	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. Sometimes use flooded paddocks or damp grasslands.	Nil	No suitable habitat present onsite. Species not sighted within locality since 1996.
8.	<i>Chlidonias leucopterus</i> White-winged Black Tern		М	1	BioNet Atlas	Non-breeding visitor, inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. Frequents tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited.	Low	Marginal suitable habitat potentially present onsite (dams). However, species not sighted within locality since 1988.
9.	<i>Cuculus optatus</i> Oriental Cuckoo	-	М	Ρ	PMST	Occurs at rainforest edges, leafy trees in paddocks, river flats, roadsides and mangroves.	Nil	No suitable habitat present onsite. No known records of this species within locality.
10.	<i>Gallinago hardwickii</i> Latham's Snipe	-	М	5	BioNet Atlas, PMST	Often recorded in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	Low	Marginal suitable habitat potentially present onsite (vegetation within dams). Species last sighted within locality in 2005.

	Species	Sta	atus*	D **	0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
11.	<i>Gelochelidon nilotica</i> Gull-billed Tern	-	Μ	2	BioNet Atlas	Found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands.	Nil	No suitable habitat present onsite.
12.	<i>Hirundapus caudacutus</i> White-throated Needletail	-	М	1	BioNet Atlas, PMST	Forages in high open spaces over varied habitat types although probably recorded most often above wooded or partly wooded areas, including open forest and rainforest, and may also fly between trees or in clearings.	Low-Moderate	Habitat onsite may provide aerial foraging opportunities. Unlikely to utilise habitats within the Study Area. Species last recorded within locality in 2018.
13.	<i>Limosa lapponica</i> Bar-tailed Godwit	V	М	Ρ	PMST	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Forages at low to mid tide in shallow water or along the water's edge on sandy substrates on intertidal flats, banks and beaches or on soft mud substrates.	Nil	No suitable habitat present onsite. No known records of this species within locality.
14.	<i>Monarcha melanopsis</i> Black-faced Monarch	-	М	Ρ	PMST	Found in rainforests, moist eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low	Marginal habitat along potentially present onsite. However, no known records of this species within locality.
15.	<i>Monarcha trivirgatus</i> Spectacled Monarch	-	Μ	Ρ	PMST	Inhabits the understorey of mountain/ lowland rainforests, thickly wooded gullies and waterside vegetation including mangroves.	Nil	No suitable habitat present onsite. No known records of this species within locality.

	Species	Sta	atus*	Decerde**	C	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
16.	<i>Motacilla flava</i> Yellow Wagtail	-	М	Ρ	PMST	Found in a variety of habitats including short grass and bare ground, swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns.	Low	Marginal habitat potentially present onsite. However, no known records of this species within locality.
17.	<i>Myiagra cyanoleuca</i> Satin Flycatcher	-	Μ	Ρ	PMST	Found in tall forests, preferring wetter habitats such as heavily forested gullies.	Nil	No suitable habitat within present onsite. No known records of this species within locality.
18.	<i>Numenius madagascariensis</i> Eastern Curlew	-	CE, M	Ρ	PMST	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	Nil	No suitable habitat onsite. No known records of this species within locality.
19.	Pandion haliaetus = Pandion cristatus Eastern Osprey	V	М	3	BioNet Atlas, PMST	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Breed 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.	Nil	No suitable habitat present onsite.
20.	<i>Rhipidura rufifrons</i> Rufous Fantail	-	Μ	1	PMST	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Nil	No suitable habitat present onsite.

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	Species	Sta	atus*	Decerde**	0	Habitat	LoO	Summary
		вс	EPBC	Records**	Source***			
21.	<i>Tringa glareola</i> Wood Sandpiper	-	М	3	BioNet Atlas	Occupies well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. Typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially <i>Melaleuca</i> and <i>Eucalyptus</i> <i>camaldulensis</i> (River Red Gums) and often with fallen timber. Also frequents inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains.	Low	Suitable habitat potentially present onsite. However, species not sighted within locality since 1986.
22.	<i>Tringa nebularia</i> Common Greenshank	-	Μ	4	BioNet Atlas, PMST	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. Uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores.	Nil	No suitable habitat present onsite. Species not sighted within locality since 1990.

	Species	Sta	atus*	D ++	0	Habitat	LoO	Summary
		BC	EPBC	Records**	Source***			
23.	<i>Tringa stagnatilis</i> Marsh Sandpiper	-	М	2	BioNet Atlas	Lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	Nil	No suitable habitat present onsite. However, species not sighted within locality since 1990.
Threa	tened Ecological Commu	nities						
1.	Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregion (BC Act)/Central Hunter Valley eucalypt forest and woodland (EPBC Act)	E	CE	-	PMST	Occurs in areas of relatively low rainfall and high temperatures. It is associated mostly with Permian lithology, and is situated on gently undulating hills, slopes and valleys, or occasionally on rocky knolls.	Nil	No suitable habitat present onsite. Community does not occur within Subject Site.
2.	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	-	E	-	PMST	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub- saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally, occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees.	Nil	No suitable habitat present onsite. Community does not occur within Subject Site.



APPENDIX B - FLORA SPECIES LIST





Table C1 - Flora Species List

		Plot ID		Q01		Q02		Q03		Q04		Q05		Q06		Q07		Q08		Q09
Family	Scientific Name	BAM Growt h Form / High Threat Weeds	C (foliag e cover) (%)	Ab (abundan ce rating)																
Acanthaceae	Brunoniella australis	Forb (FG)	0.1	50			0.1	20	0.1	100			0.1	5			0.1	50		
Adiantaceae	Cheilanthes sieberi	Fern (EG)	0.1	20	0.1	20	0.1	10	0.1	20			0.1	10	0.1	10				
Alliaceae	Nothoscordum borbonicum	Exotic											0.1	5						
Anthericaceae	Arthropodium milleflorum	Forb (FG)	0.1	2			0.1	20	0.1	20			0.1	20			0.1	5		
Apiaceae	Cyclospermum																			
leptophyllum	Exotic			0.1	20															
Apocynaceae	Araujia sericifera	Exotic			0.1	1														
Apocynaceae	Marsdenia suaveolens	Other (OG)					0.1	1												
Asteraceae	Bidens pilosa	High Threat	0.1	20	45	2000	0.1	3	0.1	2	0.1	20	1	100						
Asteraceae	Chrysocephalu m apiculatum	Forb (FG)							0.1	10	0.1	5								
Asteraceae	Cirsium vulgare	Exotic											0.1	5						
Asteraceae	Conyza bonariensis	Exotic	0.1	1									0.1	2						
Asteraceae	Glossocardia bidens	Forb (FG)	0.1	20																
Asteraceae	Hypochaeris radicata	Exotic									15	1000	5	500						
Asteraceae	Ozothamnus diosmifolius	Shrub (SG)	0.1	1	0.2	5	0.1	2	0.5	20	0.5	10	0.1	5	50	2	0.2	10		

Asteraceae	Senecio madagascarien sis	High Threat			1	100	0.1	1			0.5	20	0.5	50					
Asteraceae	Sonchus oleraceus	Exotic											0.5	100					
Asteraceae	Vernonia cinerea var. cinerea	Forb (FG)	0.1	20			0.1	10	0.1	20			0.1	5					
Anthericaceae	Tricoryne elatior	Forb (FG)							0.1	5	0.1	5	0.1	5					
Campanulace ae	Wahlenbergia gracilis	Forb (FG)	1	20															
Chenopodiace ae	Einadia nutans	Forb (FG)	0.5	10			0.1	5	0.1	1						0.1	10		
Clusiaceae	Hypericum gramineum	Forb (FG)											0.1	50					
Commelinace ae	Commelina cyanea	Forb (FG)			0.1	20			0.1	5			0.1	10					
Convolvulacea e	Dichondra repens	Forb (FG)	0.1	50					0.1	10						0.1	20		
Cyperaceae	Cyperus gracilis	Grass & grasslik e (GG)			0.1	10													
Cyperaceae	lsolepis prolifera	Exotic			0.2	50													
Cyperaceae	Schoenoplectie Ila mucronata	Grass & grasslik e (GG)																0.1	10
Cyperaceae	Lepidosperma laterale	Grass & grasslik e (GG)														0.1	1		
Ericaceae	Leucopogon juniperinus	Shrub (SG)														0.5	5		
Fabaceae (Faboideae)	Bossiaea																		

rhombifolia	Shrub (SG)	0.1	1			0.1	3	0.5	10	0.1	2			0.2	10					
Fabaceae (Faboideae)	Daviesia ulicifolia	Shrub (SG)									0.1	5			0.5	20				
Fabaceae (Faboideae)	Desmodium gunnii	Forb (FG)															0.1	10		
Fabaceae (Faboideae)	Desmodium rhytidophyllum	Forb (FG)					0.1	20												
Fabaceae (Faboideae)	Desmodium varians	Other (OG)	0.5	50			0.5	50	0.1	50	0.1	10								
Fabaceae (Faboideae)	Glycine clandestina	Other (OG)	0.1	20			0.1	20									0.1	20		
Fabaceae (Faboideae)	Glycine tabacina	Other (OG)	0.1	20																
Fabaceae (Faboideae)	Hardenbergia violacea	Other (OG)					0.1	20			0.1	10			0.1	10	0.1	5		
Fabaceae (Mimosoideae)	Acacia falcata	Shrub (SG)	0.1	5																
Fabaceae (Mimosoideae)	Acacia parvipinnula	Shrub (SG)							0.1	1	1	20	0.1	2	5	50	0.2	5		
Fabaceae (Mimosoideae)	Acacia elongata	Shrub (SG)			0.1	1														
Goodeniaceae	Goodenia paniculata	Forb (FG)											0.1	20	0.5	100				
Goodeniaceae	Goodenia heterophylla subsp. heterophylla	Forb (FG)									1	100	0.1	5	0.2	50				
Juncaceae	Juncus usitatus	Grass & grasslik e (GG)			0.1	10					0.1	1	0.1	10					5	500
Lamiaceae	Plectranthus parviflorus	Forb (FG)			1	50											0.2	5		
Lobeliaceae	Lobelia purpurascens	Forb (FG)	1	500	0.2	100	0.5	50	0.1	50	2	100	2	100	0.1	20	0.5	50		

Lomandracea e	Lomandra filiformis	Grass & grasslik e (GG)	1	500			0.5	1000	2	500							0.1	50	
Lomandracea e	Lomandra Iongifolia	Grass & grasslik e (GG)					5	50	2	20	0.5	2	0.1	2	4	50	2	20	
Lomandracea e	Lomandra multiflora subsp. multiflora	Grass & grasslik e (GG)	1	20			0.1	10	0.5	10			0.1	5					
Loranthaceae	Dendrophthoe sp.	Other (OG)													0.2	2			
Malvaceae	Sida rhombifolia	Exotic	0.1	20	2	100							0.1	10			0.1	5	
Myoporaceae	Eremophila debilis	Shrub (SG)	0.1	10															
Myrtaceae	Corymbia maculata	Tree (TG)	10	2	2	1	40	11	10	5	0.1	2					40	20	
Myrtaceae	Eucalyptus acmenoides	Tree (TG)	10	1													5	5	
Myrtaceae	Eucalyptus fibrosa	Tree (TG)					20	2	10	1							10	5	
Myrtaceae	Eucalyptus moluccana	Tree (TG)	25	5			2	1	15	5			0.1	1			15	2	
Myrtaceae	Eucalyptus tereticornis subsp. tereticornis	Tree (TG)													10	50	2	1	
Orchidaceae	Caleana major	Forb (FG)									0.1	5	0.1	1					
Oleaceae	Notelaea Iongifolia	Tree (TG)															0.5	10	
Oleaceae	Olea europaea subsp. africana	Exotic															0.1	1	
Oxalidaceae	Oxalis perennans	Forb (FG)	0.1	20	0.1	1	0.1	5	0.1	5	0.1	20	0.1	10					

Phormiaceae	Dianella caerulea	Forb (FG)											0.1	1			0.1	5		
Phormiaceae	Dianella revoluta var. revoluta	Forb (FG)	0.1	3			0.1	10	0.1	20			0.1	5	1	50	0.1	2		
Phyllanthacea e	Breynia oblongifolia	Shrub (SG)													0.1	5	0.1	10		
Phyllanthacea e	Phyllanthus gunnii	Shrub (SG)											0.1	1						
Pittosporacea e	Bursaria spinosa	Shrub (SG)	10	50	0.2	3	5	100	1	20			1	20	0.1	10	20	100		
Plantaginacea e	Plantago lanceolata	Exotic	0.5	50	0.1	20							0.5	50						
Plantaginacea e	Veronica plebeia	Forb (FG)					0.1	5												
Poaceae	Aristida vagans	Grass & grasslik e (GG)	5	100			0.1	10	5	100										
Poaceae	Cymbopogon refractus	Grass & grasslik e (GG)	0.5	20					3	100										
Poaceae	Cynodon dactylon	Grass & grasslik e (GG)			2	100					1	50	65	1000	20	500			0.2	50
Poaceae	Chloris ventricosa	Grass & grasslik e (GG)			1	100														
Poaceae	Echinopogon caespitosus var. caespitosus	Grass & grasslik e (GG)			0.1	20			0.1	10										
Poaceae	Ehrharta erecta	High Threat	1	50	1	100											5	100		

Poaceae	Entolasia stricta	Grass & grasslik e (GG)	1	50	0.1	10	1	50	5	100	45	2000	5	100	10	500	0.2	20		
Poaceae	Eragrostis brownii	Grass & grasslik e (GG)							0.1	5			0.1	50	0.5	100				
Poaceae	Imperata cylindrica	Grass & grasslik e (GG)	0.5	100													0.1	50		
Poaceae	Microlaena stipoides var. stipoides	Grass & grasslik e (GG)	20	2000	25	1000	0.5	500	5	100	15	2000	0.5	50	0.2	500	0.1	50		
Poaceae	Oplismenus aemulus	Grass & grasslik e (GG)															0.1	20		
Poaceae	Paspalidium distans	Grass & grasslik e (GG)			0.1	20			0.1	10	0.1	5			0.1	20				
Poaceae	Paspalum dilatatum	High Threat	0.1	10	5	100			0.1	1	2	50	2	100	0.2	20				
Poaceae	Pennisetum clandestinum	High Threat			5	100							1	10						
Poaceae	Poa labillardierei var. labillardierei	Grass & grasslik e (GG)	1	20					0.1	5							0.1	10		
Poaceae	Stenotaphrum secundatum	High Threat											0.1	2						
Poaceae	Themeda triandra	Grass & grasslik e (GG)	20	500			1	50	5	100							0.1	10		
Polygonaceae	Persicaria hydropiper	Forb (FG)																	0.5	50

Polygonaceae	Rumex conglomeratus	Exotic												0.1	10				
Primulaceae	Lysimachia arvensis	Exotic			0.1	5													
Ranunculacea e	Clematis glycinoides	Other (OG)														0.2	5		
Rubiaceae	Opercularia diphylla	Forb (FG)	0.1	20			0.1	20	0.1	50		0.1	10						
Santalaceae	Exocarpos cupressiformis	Shrub (SG)	0.1	1															
Solanaceae	Solanum lycopersicum	Exotic												0.1	1				
Solanaceae	Solanum nigrum	Exotic	0.1	1										0.1	1				
Solanaceae	Solanum prinophyllum	Forb (FG)	1	20															
Typhaceae	Typha orientalis	Grass & grasslik e (GG)																80	500
Verbenaceae	Lantana camara	High Threat					0.1	2	0.5	1				0.5	5	40	50		
Verbenaceae	Verbena bonariensis	Exotic			0.1	20						2	50						
Apiaceae	Centella asiatica	Forb (FG)	0.1	20	0.1	10			0.1	5		0.2	50						

APPENDIX C - FAUNA SPECIES LIST





Table C ²	•			
No.	Scientific Name	Common Name	Sta	itus
			BC	EPBC
Amphi	bians			
1.	Crinia signifera	Common Eastern Froglet		
2.	Limnodynastes tasmaniensis	Spotted Grass Frog		
3.	Limnodynastes peronii	Striped Marsh Frog		
4.	Litoria fallax	Eastern Dwarf Tree Frog		
5.	Litoria caerulea	Green Tree Frog		
6.	Litoria quiritatus	Screaming Tree Frog		
7.	Litoria peronii	Peron's Tree Frog		
8.	Litoria latopalmata	Broad-palmed Rocket Frog		
9.	Litoria tyleri	Tyler's Tree Frog		
Birds				
1.	Minox strenua	New Holland Honeyeater		
2.	Alisterus scapularis	Australian King-Parrot		
3.	Aquila audax	Wedge-tailed Eagle		
4.	Chalcites lucidus	Mistletoebird		
5.	Chenonetta jubata	Australian Wood Duck		
6.	Columba livia	Domestic Pigeon	Exotic	Exotic
7.	Coracina tenuirostris	Sulphur-crested Cockatoo		
8.	Corvus coronoides	Australian Raven		
9.	Cracticus nigrogularis	Pied Butcherbird		
10.	Cracticus tibicen	Australian Magpie		
11.	Cracticus torquatus	Grey Butcherbird		
12.	Dacelo novaeguineae	Laughing Kookaburra		
13.	Eurystomus orientalis	Dollarbird		
14.	Falco cenchroides	Eastern Yellow Robin		
15.	Geopelia humeralis	Black-faced Cuckoo-shrike		
16.	Grallina cyanoleuca	Magpie-lark		
17.		Galah		
	Himantopus himantopus			
18.	Lichenostomus chrysops	Yellow-faced Honeyeater		
19.	Malurus cyaneus	Superb Fairy-wren		

No.	Scientific Name	Common Name	Sta	atus
			BC	EPBC
20.	Manorina melanocephala	Noisy Miner		
21.	Melithreptus lunatus	Scarlet Honeyeater		
22.	Myiagra rubecula	White-browed Scrubwren		
23.	Ninox novaeseelandiae	Southern Boobook		
24.	Ocyphaps lophotes	Crested Pigeon		
25.	Pachycephala pectoralis	Golden Whistler		
26.	Pardalotus punctatus	Spotted Pardalote		
27.	Phylidonyris niger	Silvereye		
28.	Platycercus elegans	Crimson Rosella		
29.	Platycercus eximius	Eastern Rosella		
30.	Podargus strigoides	Tawny Frogmouth		
31.	Podiceps cristatus	Bell Miner		
32.	Ptilinopus magnificus	Wompoo Fruit Dove	V	
33.	Strepera versicolor	Variegated Fairy-wren		
34.	Sturnus vulgaris	Yellow Thornbill		
35.	Todiramphus macleayii	Pacific Black Duck		
36.	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet		
37.	Trichoglossus moluccanus	Rainbow Lorikeet		
38.	Tringa glareola	Grey Fantail		
39.	Turnix varius	Grey-crowned Babbler	V	
40.	Tyto novaehollandiae	Masked Owl (unconfirmed sighting)	V	
41.	Vanellus miles	Masked Lapwing		
Mamm	als			
1.	Austronomus australis	White-striped Free-tailed Bat		
2.	Chalinolobus gouldii	Gould's Wattled Bat		
3.	Dama dama	Fallow Deer	Exotic	Exotic
4.	Lepus europaeus	European Hare	Exotic	Exotic
5.	Macropus giganteus	Eastern Grey Kangaroo		
6.	Miniopterus australis	Little Bent-winged Bat	V	

No.	Scientific Name	Common Name	Status	
			BC	EPBC
7.	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	
8.	Mormopterus planiceps	Southern Free-tailed Bat		
9.	Mormopterus ridei	Eastern Free-tail Bat		
10.	Myotis macropus	Southern Myotis	V	
11.	Oryctolagus cuniculus	European Rabbit	Exotic	Exotic
12.	Petaurus breviceps	Sugar Glider		
13.	Pteropus poliocephalus	Grey-headed Flying-fox	V	V
14.	Scoteanax rueppellii	Greater Broad-nosed Bat	V	
15.	Trichosurus vulpecula	Common Brushtail Possum		
16.	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
17.	Vulpes vulpes	Red Fox	Exotic	Exotic
18.	Wallabia bicolor	Swamp Wallaby		
Reptiles				
1.	Eulamprus quoyii	Eastern Water Skink		
2.	Eulamprus tenuis	Bar-sided Skink		
3.	Pogona barbata	Eastern Bearded Dragon		

APPENDIX D - PREDICTED AND CANDIDATE SPECIES REPORTS

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BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00019114/BAAS18041/20/00019115	Stage 71 and 72 Waterford Living Chisholm	24/11/2021
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	14/12/2021	50
Assessor Number	Assessment Type	BAM Case Status
Assessor Number 18041	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised

* 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)
Australasian Bittern	Botaurus poiciloptilus	1737-Typha rushland
Australian Painted Snipe	Rostratula australis	1737-Typha rushland
Barking Owl	Ninox connivens	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Black Bittern	Ixobrychus flavicollis	1737-Typha rushland
Black Falcon	Falco subniger	1737-Typha rushland
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Black-necked Stork	Ephippiorhynchus asiaticus	1737-Typha rushland
Blue-billed Duck	Oxyura australis	1737-Typha rushland
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Comb-crested Jacana	Irediparra gallinacea	1737-Typha rushland

Assessment Id

00019114/BAAS18041/20/00019115

Proposal Name

Stage 71 and 72 Waterford Living



BAM Predicted Species Report

Diamond Firetail	Stagonopleura guttata	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Eastern Grass Owl	Tyto longimembris	1737-Typha rushland
Eastern Osprey	Pandion cristatus	1737-Typha rushland
Freckled Duck	Stictonetta naevosa	1737-Typha rushland
Gang-gang Cockatoo	Callocephalon fimbriatum	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Glossy Black- Cockatoo	Calyptorhynchus lathami	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Greater Broad-nosed Bat	Scoteanax rueppellii	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Grey-headed Flying- fox	Pteropus poliocephalus	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Koala	Phascolarctos cinereus	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Large Bent-winged Bat	Miniopterus orianae oceanensis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Little Bent-winged Bat	Miniopterus australis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Little Eagle	Hieraaetus	1737-Typha rushland
	morphnoides	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Little Lorikeet	Glossopsitta pusilla	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Magpie Goose	Anseranas semipalmata	1737-Typha rushland
Masked Owl	Tyto novaehollandiae	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Painted Honeyeater	Grantiella picta	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter

Assessment Id

00019114/BAAS18041/20/00019115

Proposal Name

Stage 71 and 72 Waterford Living



BAM Predicted Species Report

Powerful Owl	Ninox strenua	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Regent Honeyeater	Anthochaera phrygia	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Scarlet Robin	Petroica boodang	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Speckled Warbler	Chthonicola sagittata	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Spotted Harrier	Circus assimilis	1737-Typha rushland
Spotted-tailed Quoll	Dasyurus maculatus	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Square-tailed Kite	Lophoictinia isura	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Swift Parrot	Lathamus discolor	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Turquoise Parrot	Neophema pulchella	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Varied Sittella	Daphoenositta chrysoptera	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
White-bellied Sea-	Haliaeetus	1737-Typha rushland
		1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
White-fronted Chat	Epthianura albifrons	1737-Typha rushland
White-throated	Hirundapus	1737-Typha rushland
Needletail	caudacutus	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Yellow-bellied Glider	Petaurus australis	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter

Threatened species Manually Added

None added

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

Common Name	Scientific Name	Plant Community Type(s)
Black-tailed Godwit	Limosa limosa	1737-Typha rushland

Assessment Id



BAM Predicted Species Report

Broad-billed Sandpiper	Limicola falcinellus	1737-Typha rushland
Curlew Sandpiper	Calidris ferruginea	1737-Typha rushland
Great Knot	Calidris tenuirostris	1737-Typha rushland
Terek Sandpiper	Xenus cinereus	1737-Typha rushland

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
Black-tailed Godwit	Limosa limosa	Refer to BAR
Broad-billed Sandpiper	Limicola falcinellus	Refer to BAR
Curlew Sandpiper	Calidris ferruginea	Refer to BAR
Great Knot	Calidris tenuirostris	Refer to BAR
Terek Sandpiper	Xenus cinereus	Refer to BAR

Proposal Name

Stage 71 and 72 Waterford Living



Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00019114/BAAS18041/20/00019115	Stage 71 and 72 Waterford Living Chisholm	24/11/2021
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	14/12/2021	50
Assessor Number	Assessment Type	BAM Case Status
18041	Part 4 Developments (General)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
1	14/12/2021	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
Acacia bynoeana Bynoe's Wattle	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct □ Nov □ Dec □ Survey month outside the specified months?
Asperula asthenes Trailing Woodruff	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☑ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct □ Nov □ Dec □ Survey month outside the specified months?

Proposal Name

Stage 71 and 72 Waterford Living Chisholm



<i>Callistemon linearifolius</i> Netted Bottle Brush	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo	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?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct □ Nov □ Dec □ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	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?
Crinia tinnula Wallum Froglet	No (surveyed)	☑ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Cryptostylis hunteriana Leafless Tongue Orchid	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct ☑ Nov □ Dec □ Survey month outside the specified months?



Cynanchum elegans White-flowered Wax Plant	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
<i>Eucalyptus castrensis</i> Singleton Mallee	No (surveyed)	 Jan Ø Feb ☐ Mar ☐ Apr May ☐ Jun ☐ Jul ☐ Aug Sep Ø Oct ☐ Nov ☐ Dec Survey month outside the specified months?
Eucalyptus glaucina Slaty Red Gum	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct □ Nov □ Dec □ Survey month outside the specified months?
<i>Eucalyptus parramattensis subsp.</i> <i>decadens</i> Eucalyptus parramattensis subsp. decadens	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct □ Nov □ Dec □ Survey month outside the specified months?
Eucalyptus pumila Pokolbin Mallee	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct □ Nov □ Dec □ Survey month outside the specified months?
Grevillea parviflora subsp. parviflora Small-flower Grevillea	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?



Haliaeetus leucogaster	No (surveyed)	
White-bellied Sea-Eagle	- ()	□ Jan □ Feb □ Mar □ Apr
		🗆 May 🗆 Jun 🗖 Jul 🗹 Aug
		□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?
<i>Hieraaetus morphnoides</i> Little Eagle	No (surveyed) *Survey months are	🗆 Jan 🗆 Feb 🗆 Mar 🗆 Apr
5	outside of the months	🗆 May 🗆 Jun 🗖 Jul 🗹 Aug
	specified in Bionet.	□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?
<i>Litoria aurea</i> Green and Golden Bell Frog	No (surveyed)	🗹 Jan 🗆 Feb 🗆 Mar 🗖 Apr
diceir and dolder beir riog		🗆 May 🗆 Jun 🗖 Jul 🗖 Aug
		□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?
Litoria brevipalmata	No (surveyed)	🗹 Jan 🗆 Feb 🗆 Mar 🗆 Apr
Green-thighed Frog		🗆 May 🗆 Jun 🗖 Jul 🗖 Aug
		□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?
Lophoictinia isura	No (surveyed)	🗆 Jan 🗆 Feb 🗆 Mar 🗆 Apr
Square-tailed Kite	*Survey months are outside of the months specified in Bionet.	□ May □ Jun □ Jul ☑ Aug
		□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?
Maundia triglochinoides	No (surveyed)	🗆 Jan 🗹 Feb 🗆 Mar 🗖 Apr
Maundia triglochinoides		□ May □ Jun □ Jul □ Aug
		□ Sep □ Oct □ Nov □ Dec
		Survey month outside the specified months?



<i>Melaleuca biconvexa</i> Biconvex Paperbark	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct □ Nov □ Dec □ Survey month outside the specified months?
<i>Monotaxis macrophylla</i> Large-leafed Monotaxis	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 (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct □ Nov □ Dec □ Survey month outside the specified months?
<i>Ninox strenua</i> Powerful Owl	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct □ Nov □ Dec □ Survey month outside the specified months?
Pandion cristatus Eastern Osprey	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct ☑ Nov □ Dec □ Survey month outside the specified months?



Persicaria elatior	No (surveyed)	
Tall Knotweed		□ Jan ☑ Feb □ Mar □ Apr
		□ May □ Jun □ Jul □ Aug
		Sep Oct Nov Dec
		Survey month outside the specified months?
Petauroides volans Greater Glider	No (surveyed)	🗹 Jan 🗆 Feb 🗆 Mar 🗆 Apr
		🗆 May 🗆 Jun 🗖 Jul 🗹 Aug
		□ Sep □ Oct ☑ Nov ☑ Dec
		Survey month outside the specified months?
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	No (surveyed) *Survey months are	🗹 Jan 🗆 Feb 🗆 Mar 🗖 Apr
brush tulicu i huseoguie	outside of the months	🗆 May 🗖 Jun 🗖 Jul 🗹 Aug
	specified in Bionet.	Sep Oct V Nov Dec
		Survey month outside the specified months?
Phascolarctos cinereus	No (surveyed)	🗹 Jan 🗆 Feb 🗆 Mar 🗖 Apr
Koala		🗆 May 🗖 Jun 🗖 Jul 🗹 Aug
		□ Sep □ Oct ☑ Nov ☑ Dec
		Survey month outside the specified months?
Pomaderris queenslandica Scant Pomaderris	No (surveyed)	🗆 Jan 🗖 Feb 🗖 Mar 🗖 Apr
Scant Pomaderns		□ May □ Jun □ Jul ☑ Aug
		□ Sep ☑ Oct □ Nov □ Dec
		Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed) *Survey months are	□ Jan □ Feb □ Mar □ Apr
	outside of the months	🗆 May 🗆 Jun 🗹 Jul 🗖 Aug
	specified in Bionet.	□ Sep □ Oct ☑ Nov □ Dec
		Survey month outside the specified months?

Proposal Name

Stage 71 and 72 Waterford Living Chisholm



Pterostylis chaetophora Pterostylis chaetophora	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Rutidosis heterogama Heath Wrinklewort	No (surveyed)	 Jan Feb Mar Apr May Jun Jul ✓ Aug Sep Oct Nov Dec
Thesium australe Austral Toadflax	No (surveyed)	□ Jan ☑ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct ☑ Nov □ Dec □ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul ☑ Aug □ Sep □ Oct □ Nov □ Dec □ Survey month outside the specified months?
Uperoleia mahonyi Mahony's Toadlet	No (surveyed)	✓ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct ✓ Nov □ Dec □ Survey month outside the specified months?
Zannichellia palustris Zannichellia palustris	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep ☑ Oct ☑ Nov □ Dec □ Survey month outside the specified months?



Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	lustification in the BANA C
Common name	Scientific name	Justification in the BAM-C
Black-tailed Godwit	Limosa limosa	Refer to BAR
Broad-billed Sandpiper	Limicola falcinellus	Refer to BAR
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Common Planigale	Planigale maculata	Species is vagrant
Curlew Sandpiper	Calidris ferruginea	Refer to BAR
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints
Great Knot	Calidris tenuirostris	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
North Rothbury Persoonia	Persoonia pauciflora	Refer to BAR
Ozothamnus tesselatus	Ozothamnus tesselatus	Species is vagrant
Pale-headed Snake	Hoplocephalus bitorquatus	Species is vagrant
Pine Donkey Orchid	Diuris tricolor	Species is vagrant
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat degraded Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Rough Doubletail	Diuris praecox	Refer to BAR
Singleton Mint Bush	Prostanthera cineolifera	Species is vagrant
Striped Legless Lizard	Delma impar	Habitat degraded Species is vagrant
Swift Parrot	Lathamus discolor	Habitat constraints
Terek Sandpiper	Xenus cinereus	Refer to BAR

Proposal Name Stage 71 and 72 Waterford Living Chisholm

APPENDIX E - BIODIVERSITY CREDIT REPORTS

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Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00019114/BAAS18041/20/00019115	Stage 71 and 72 Waterford Living Chisholm	24/11/2021
Assessor Name	Assessor Number	BAM Data version *
Gilbert Whyte	18041	50
Proponent Names	Report Created	BAM Case Status
CSR Building Products Limited, Graeme Jeffries, Mark Kelly	14/12/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
1	Part 4 Developments (General)	14/12/2021
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either comple	
BOS Threshold: Area clearing threshold	BAM calculator database. BAM calculator database may not be	completely aligned with Bionet.

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

Assessment Id

Proposal Name

00019114/BAAS18041/20/00019115



PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes
Predicted Threatened Species Not On Site
Name
Calidris tenuirostris / Great Knot
Limicola falcinellus / Broad-billed Sandpiper
Limosa limosa / Black-tailed Godwit
Xenus cinereus / Terek Sandpiper
Calidris ferruginea / Curlew Sandpiper

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

00019114/BAAS18041/20/00019115



Name of Plant Community Type,	/ID	Name of threatened ecological community		Area of impact	HBT Cr	No HBT Cr	Total credits to be retired	
1737-Typha rushland		Not a TEC		0.5	0	14	14	
1600-Spotted Gum - Red Ironba Ironbark - Grey Box shrub-grass Hunter		Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions		12.6	209	43	252	
1600-Spotted Gum - Red	Like-for-like credit retin	ement options						
Ironbark - Narrow-leaved Ironbark - Grey Box shrub-	Name of offset trading group	Trading group	Zone	НВТ	Credits	IBRA reg	lion	
grass open forest of the lower Hunter	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast	-	1600_Moderat e	No	15	Kerrabee	e, Liverpool	aruah Manning, Range, Peel, nter, Wyong and

NSW North Coast Bioregions		Yengo.
This includes PCT's: 1590, 1592, 1593, 1600, 1602		or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	- 1600_Low_mod	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Assessment Id



	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Mod- good	Yes	209	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Grasslan d_regen	No	0	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1737-Typha rushland	Like-for-like credit reti	rement options Trading group	Zone	НВТ	Credits	IBRA region

Assessment Id



Coastal Freshwater Lagoons This includes PCT's: 781, 783, 1071, 1735, 1736, 1737, 1740, 1741 1742	Coastal Freshwater Lagoons >=70% and <90%	1737_Mod- good	No	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. 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	1737_Mod-good, 1600_Mod- good, 1600_Moderate, 1600_Low_mod, 1600_Grassland_regen	5.8	110.00

Credit Retirement Options	Like-for-like credit retirement options		
Myotis macropus / Southern Myotis	Spp	IBRA subregion	
	Myotis macropus / Southern Myotis	Any in NSW	

Assessment	Id

Proposal Name

00019114/BAAS18041/20/00019115



Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00019114/BAAS18041/20/00019115	Stage 71 and 72 Waterford Living Chisholm	24/11/2021
Assessor Name	Assessor Number	BAM Data version *
Gilbert Whyte	18041	50
Proponent Name(s)	Report Created	BAM Case Status
CSR Building Products Limited, Graeme Jeffries, Mark Kelly	14/12/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
1	Part 4 Developments (General)	14/12/2021
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete o	
BOS Threshold: Area clearing threshold	calculator database. BAM calculator database may not be completel	y aligned with Bionet.

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

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks



PCT
No Changes
Predicted Threatened Species Not On Site
Name
Calidris tenuirostris / Great Knot
Limicola falcinellus / Broad-billed Sandpiper
Limosa limosa / Black-tailed Godwit
Xenus cinereus / Terek Sandpiper
Calidris ferruginea / Curlew Sandpiper

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

Name of Plant Community Type,	f Plant Community Type/ID		Name of threatened ecological community			HBT Cr	No HBT Cr	Total credits to be retired
1737-Typha rushland		Not a TEC			0.5	0	14	14.00
1600-Spotted Gum - Red Ironba Ironbark - Grey Box shrub-grass Hunter		Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions			12.6	209	43	252.00
1600-Spotted Gum - Red	Like-for-like credit retir	ement options						
Ironbark - Narrow-leaved Ironbark - Grey Box shrub-	Class	Trading group	Zone H	НВТ	Credits I	BRA region	I	
grass open forest of the lower Hunter								



Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Mod erate	No	15	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Low_ mod	No	28	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Mod- good	Yes	209	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1600_Grass land_regen	No	0	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla Upper Hunter, Wyong and Yengo. 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
Dry Sclerophyll Forests (Shrub/grass sub- formation)	Tier 3 or higher threat status	1600_Mod erate	No	15	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrub/grass sub- formation)	Tier 3 or higher threat status	1600_Low_ mod	No	28	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrub/grass sub- formation)	Tier 3 or higher threat status	1600_Mod- good	Yes (includi ng artificia l)		IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



	Dry Sclerophyll Forests (Shrub/grass sub- formation)	Tier 3 or higher threat status	1600_Grass land_regen		0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1737-Typha rushland	Like-for-like credit retire	ement options				
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Freshwater Lagoons This includes PCT's: 781, 783, 1071, 1735, 1736, 1737, 1740, 1741, 1742	goons Lagoons >=70% and <90% his includes PCT's: 1, 783, 1071, 1735, 36, 1737, 1740, 1741,		No	14	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. 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
	Freshwater Wetlands	Tier 2 or higher threat status	1737_Mod- good	or Any IBRA subregi		Any IBRA subregion that is within 100 kilometers of the outer edge of the

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	1737_Mod-good, 1600_Mod- good, 1600_Moderate, 1600_Low_mod, 1600_Grassland_regen	5.8	110.00



Credit Retirement Options	Like-for-like options						
Myotis macropus/	Spp		IBRA region				
Southern Myotis	Myotis macropus/Southern Myotis		Any in NSW	Any in NSW			
	Variation options						
	Kingdom Any species with sam higher category of list under Part 4 of the Bo shown below		y of listing	IBRA region			
	Fauna	Vulnerable		Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. Or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.			

APPENDIX F - BAM PLOT DATASHEETS







for Plot Q1 on 16 May 2019 by Y Buissiere

Magnetic Bearing:	344.34		
Start Location:	Latitude: -32.76305	Longitude:151.637658	Accuracy:5.000 m
End Location:	Latitude: -32.76278	Longitude:151.637563	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Siz	e Class*	Eucalypt Species	Non-Eucalypt species	Notes
Count of Large Trees	80+ cm			Record DBH of each tree at 1.3 m from ground
	50+ cm	3		
All other Trees:	30 - 49 cm	Y	Ν	Only record presence or absence of trees in
	20 - 29 cm	Y	Ν	these stem size classes
	10 - 19 cm	Y	Ν	
	5 - 9 cm	Ν	Ν	
	<5 cm	Y	Ν	

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class								cm	20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class							ć	3	0	
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)				Tally	2		Total (m)	2		
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	40	60	30	80	50	52.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)					
Morphological Type	Landform Element				
Lithology	Landform Pattern				
Slope and Aspect	Soil Colour				
Site Drainage	Microrelief				
Distance to nearest water and type					

General Notes



for Plot Q1 on 16 May 2019 by Y Buissiere

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q02 on 16 May 2019 by E Connolly

Magnetic Bearing:	3.21		
Start Location:	Latitude: -32.76358	Longitude:151.636661	Accuracy:5.000 m
End Location:	Latitude: -32.76313	Longitude:151.636692	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Siz	e Class*	Eucalypt Species	Non-Eucalypt species	Notes
Count of Large Trees	80+ cm		0	Record DBH of each tree at 1.3 m from ground
	50+ cm	3		
All other Trees:	30 - 49 cm	Y	Ν	Only record presence or absence of trees in
	20 - 29 cm	Y	Ν	these stem size classes
	10 - 19 cm	Y	Ν	
	5 - 9 cm	Y	Ν	
	<5 cm	Y	Ν	

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class								cm	20 cm+
Count of hollow-l	Count of hollow-bearing trees; includes living and dead; record by stem size class									
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	5		Total (m)	5	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	90	20	85	100	95	78.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in de	Physiography + Site Features (may help in determining PCT and Mangement Zones)							
Morphological Type	Landform Element							
Lithology	Landform Pattern							
Slope and Aspect	Soil Colour							
Site Drainage	Microrelief							
Distance to nearest water and type								



for Plot Q02 on 16 May 2019 by E Connolly

Photo Log

Fig. 1: Photo of Starting Area

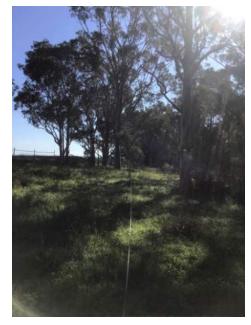


Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q03 on 16 May 2019 by Y Buissiere

Magnetic Bearing:	5.34		
Start Location:	Latitude: -32.76117	Longitude:151.638258	Accuracy:5.000 m
End Location:	Latitude: -32.76081	Longitude:151.638297	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes		
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground		
	50+ cm					
All other Trees:	30 - 49 cm	Y	Ν	Only record presence or absence of trees in		
	20 - 29 cm	Y	Ν	these stem size classes		
	10 - 19 cm	Y	Ν			
	5 - 9 cm	Y	Ν			
	<5 cm	Ν	Ν			

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class									20 cm+
Count of hollow-	Count of hollow-bearing trees; includes living and dead; record by stem size class									
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	1, 2, 3		Total (m)	6	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	60	80	80	90	90	80.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in	Physiography + Site Features (may help in determining PCT and Mangement Zones)						
Morphological Type	Landform Element						
Lithology	Landform Pattern						
Slope and Aspect	Soil Colour						
Site Drainage	Microrelief						
Distance to nearest water and type							
General Notes							



for Plot Q03 on 16 May 2019 by Y Buissiere

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q03 on 16 May 2019 by Y Buissiere

Photo Log

Fig. 5: Recent underscrubbing



Remarks: Plot recently underscrubbed



for Plot Q04 on 16 May 2019 by E Connolly

Magnetic Bearing:	183.01		
Start Location:	Latitude: -32.75984	Longitude:151.637563	Accuracy:5.000 m
End Location:	Latitude: -32.76016	Longitude:151.637543	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes		
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground		
	50+ cm	1				
All other Trees:	30 - 49 cm	Y	N	Only record presence or absence of trees in		
	20 - 29 cm	Y	Ν	these stem size classes		
	10 - 19 cm	Y	Ν			
	5 - 9 cm	Y	Ν			
	<5 cm	Y	Ν			

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class									20 cm+
Count of hollow-l	Count of hollow-bearing trees; includes living and dead; record by stem size class									
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	10		Total (m)	10	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	10	100	95	100	100	81.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in det	Physiography + Site Features (may help in determining PCT and Mangement Zones)						
Morphological Type	Landform Element						
Lithology	Landform Pattern						
Slope and Aspect	Soil Colour						
Site Drainage	Microrelief						
Distance to nearest water and type							
O en enel Nietee							

General Notes



for Plot Q04 on 16 May 2019 by E Connolly

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q05 on 16 May 2019 by Y Buissiere

Magnetic Bearing:	53.38		
Start Location:	Latitude: -32.75961	Longitude:151.639334	Accuracy:5.000 m
End Location:	Latitude: -32.75931	Longitude:151.639814	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes		
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground		
	50+ cm					
All other Trees:	30 - 49 cm	N	Ν	Only record presence or absence of trees in		
	20 - 29 cm	Ν	Ν	these stem size classes		
	10 - 19 cm	Ν	Ν			
	5 - 9 cm	Ν	Ν			
	<5 cm	Ν	Ν			

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class									20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class										
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	0		Total (m)	0	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	5	10	2	5	10	6.4				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)							
Morphological Type	Landform Element						
Lithology	Landform Pattern						
Slope and Aspect	Soil Colour						
Site Drainage	Microrelief						
Distance to nearest water and type							

General Notes



for Plot Q05 on 16 May 2019 by Y Buissiere

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q06 on 17 May 2019 by E Connolly

Magnetic Bearing:	288.60		
Start Location:	Latitude: -32.75927	Longitude:151.638914	Accuracy:5.000 m
End Location:	Latitude: -32.75912	Longitude:151.638381	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes		
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground		
	50+ cm					
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in		
	20 - 29 cm	Ν	Ν	these stem size classes		
	10 - 19 cm	Ν	Ν			
	5 - 9 cm	Ν	Ν			
	<5 cm	Ν	Ν			

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class									20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class										
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	0		Total (m)	0	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	90	95	40	75	15	63.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)						
Morphological Type	Landform Element					
Lithology	Landform Pattern					
Slope and Aspect	Soil Colour					
Site Drainage	Microrelief					
Distance to nearest water and type						

General Notes



for Plot Q06 on 17 May 2019 by E Connolly

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q07 on 17 May 2019 by Y Buissiere

Magnetic Bearing:	294.58		
Start Location:	Latitude: -32.75681	Longitude:151.639403	Accuracy:5.000 m
End Location:	Latitude: -32.75661	Longitude:151.638888	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes	
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground	
	50+ cm				
All other Trees:	30 - 49 cm	N	N	Only record presence or absence of trees in	
	20 - 29 cm	Y	Ν	these stem size classes	
	10 - 19 cm	Y	Ν		
	5 - 9 cm	Ν	Ν		
	<5 cm	Y	Ν		

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

	Hollow Bearing Trees (HBT) by Stem Size Class									20 cm+
Count of hollow-bearing trees; includes living and dead; record by stem size class										
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)					Tally	1		Total (m)	2	
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	10	60	40	2	40	30.4				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)						
Morphological Type	Landform Element					
Lithology	Landform Pattern					
Slope and Aspect	Soil Colour					
Site Drainage	Microrelief					
Distance to nearest water and type						
O constant Nuclear						

General Notes



for Plot Q07 on 17 May 2019 by Y Buissiere

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





for Plot Q07 on 17 May 2019 by Y Buissiere

Photo Log

Fig. 5: Disturbance, slashing



Remarks:



for Plot Q08 on 17 May 2019 by Y Buissiere

Magnetic Bearing:	293.38		
Start Location:	Latitude: -32.75627	Longitude:151.639324	Accuracy:5.000 m
End Location:	Latitude: -32.75611	Longitude:151.638886	Accuracy:5.000 m

1000 m2 PLOT

Tree Stem Size Class*		Eucalypt Species	Non-Eucalypt species	Notes	
Count of Large Trees 80+ cm				Record DBH of each tree at 1.3 m from ground	
	50+ cm				
All other Trees:	30 - 49 cm	Y	N	Only record presence or absence of trees in	
	20 - 29 cm	Y	Ν	these stem size classes	
	10 - 19 cm	Y	Ν		
	5 - 9 cm	Y	Ν		
	<5 cm	Y	Ν		

*Living trees only; for multi-stemmed trees, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as regeneration.

Includes species of Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia

Hollow Bearing Trees (HBT) by Stem Size Class							<20	cm	20 cm+	
Count of hollow-bearing trees; includes living and dead; record by stem size class										
Length of logs (m) (>= 10 cm diameter, > 50 cm in length)			Tally	1, 2, 4		Total (m)	7			
1 m2 subPLOT										
Subplot	А	В	С	D	Е	Avg				
Litter Cover(%)	80	100	70	90	80	84.0				

Litter includes leaves, seeds, twigs, branchlets and branches less than 10 cm diameter; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. Rock includes units >20 mm.

Physiography + Site Features (may help in determining PCT and Mangement Zones)						
Morphological Type	Landform Element					
Lithology	Landform Pattern					
Slope and Aspect	Soil Colour					
Site Drainage	Microrelief					
Distance to nearest water and type						
Conoral Natao						



for Plot Q08 on 17 May 2019 by Y Buissiere

Photo Log

Fig. 1: Photo of Starting Area



Fig. 3: Photo of Ending Area



Remarks:

Fig. 2: Photo of Starting Area



Fig. 4: Photo of Ending Area





BAM Strata Datasheet

for Plot Q09 on 17 May 2019 by Y Buissiere

CSR O'Brians Site, Thornton 20193587.001A xxxx Blundell, Adam

Photo Log

Fig. 1: Orientation west at 10m



Fig. 2: Orientation west at 10 m



APPENDIX G - STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Table H1 Staff Contributions								
Name	Qualification	Title/Experience	Contribution					
Ashley Owen	DipSc BEnvSc	Ecologist	Flora surveys					
David Russell	BSc	Senior Ecologist	Flora surveys					
Dr Daniel O'Brien	BEnvSc & Mgt (Hons) PhD	Senior Ecologist	Report review, BAM calculations					
Dr Gilbert Whyte	BSc (PhD) Accredited BAM Assessor	Senior Ecologist	Report Review					
Elise Connolly	Dip Cons Lnd Mgmt, Adv Dip Env Mgmt (BAM Accredited Assessor)	Ecologist (Botanist)	Flora surveys, fauna surveys,					
Emily Fittell	BSc (Hons)	Ecologist	Flora surveys, fauna surveys and report writing					
Gayle Joyce	BSc Forestry (Hons)	GIS Specialist	GIS data management and figure preparation					
Joshua Smart	BEnvSc&Mgt (Hons)	Ecologist	Fauna surveys					
Kane Blundell	BTBa MEnvSc	Ecologist (Fauna)	Fauna surveys					
Mark Dean	BEnvSc&Mgt	Ecologist (Fauna)	Fauna surveys and report writing					
Nigel Fisher	BSc (Hons) PhD	Senior Soil Microecologist / Ecologist	Fauna surveys					
Yann Buissiere	BEnvSc & Mgt	Ecologist	Flora surveys					

Table H1 Staff Contributions



APPENDIX H - LICENSES

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: 31 March 2022) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.



