BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

251 ADELAIDE STREET RAYMOND TERRACE NSW

CLIENT: Raymond Terrace Parklands

DATE: 19 April 2022

PREPARED BY: Alan Midgley and Robert Scanlon

de Witt Ecology
▪ SURVEYING ▪ PLANNING
▪ GIS ▪ SEWER & WATER
▪ PROJECT MANAGEMENT

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CERTIFICATION AND DECLARATION

I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method and s6.15 of the BC Act.

In preparing this assessment I have acted in accordance with the Accredited BAM ASSESSOR Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest OR I wish to openly declare the following actual, perceived or potential conflict of interest and the management strategies employed;

Alan Midgley

Signature: 

Date: 19/04/2022

BAM Assessor Accreditation no: BAAS17094

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DOCUMENT INFORMATION

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Prepared by:	Alan Midgley & Robert Scanlon
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ACKNOWLEDGEMENTS

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- Department of Agriculture, Water and the Environment (DAWE) for access to the Protected Matters Search Tool of the Australian Government
- NSW Department of Planning, Industry and Environment, for access to the BioNet Atlas of NSW Wildlife.

de Witt Ecology staff involved in this project were:

- Alejandro Barreto (Report Review)
- Alan Midgley (Field work and Reporting)
- Robert Scanlon (GIS, Field work and Reporting)

GLOSSARY

BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BCT	Biodiversity Conservation Trust
Biosecurity Act	NSW *Biosecurity Act 2015*
DAWE	Department of Agriculture, Water and the Environment
DEE	Commonwealth Department of the Environment and Energy
BOS	Biodiversity Offsets Scheme
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
DTDB	Digital topographic databases
Ecosystem credit species	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development.
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
HBT	Hollow-bearing Tree
IBRA	Interim Biogeographical Regionalisation for Australia
LEP	Local Environment Plan
LGA	Local Government Area
Locality	Area located within 5 kilometres radius from the study area
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PSCKPoM	Port Stephens Comprehensive Koala Plan of Management 2002
SAII	Serious and irreversible impact
Site Boundary	The entirety of Lot 9 DP 4831 within which the study area is located
Study Area	Situated within the site boundary where biodiversity field surveys were undertaken to inform the biodiversity assessment
Subject Land	The outer extent of predicted direct impacts associated with the proposed works
VIS	NSW Vegetation Information System

STAGE 1: BIODIVERSITY ASSESSMENT

1.0 INTRODUCTION

de Witt Ecology has been engaged by Raymond Terrace Parklands to undertake a Biodiversity Development Assessment Report (BDAR) for earthworks/fill proposal at 251 Adelaide Street, Raymond Terrace NSW (Lot 232 DP593512) (study area) within the Port Stephens Local Government Area (LGA). The project will ensure that an area of the site that is currently constrained by flood impacts can be made suitable for future residential development. A separate parcel of land within the same property is also subject to a concurrent development, which is not part of this assessment (Figure 1).

In accordance with the NSW *Biodiversity Conservation Act 2016* (BC Act), assessment of the proposed development was performed in line with the NSW Biodiversity Assessment Method (BAM [DPIE 2020a]). The BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), specifically, consideration of potential impacts to Matters of National Environmental Significance (MNES).

As part of the Development Application (DA) for the proposed development, submission of the BDAR to Port Stephens Council will be required.

1.1 PROJECT BACKGROUND

Assessment of the proposed development will occur under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Study Area falls under the coverage of the Biodiversity Values map (BV Map) (Department of Planning, Industry and Environment [DPIE] 2021).

As a requirement of the BC Act, a local development must be assessed under the Biodiversity Offsets Scheme (BOS) if vegetation clearing is proposed or other prescribed impacts are to occur within an area mapped on the BV map. As a consequence, the project triggers the BOS and a BDAR is required. The extent of direct impacts of the development is contained within the 'subject land' (Figure 1).

This proposal will involve the use of earthworks and fill to enable flood immunity of a future residential development. Recent flood mapping of the study area has shown that a flood planning level of 5.7 m AHD would be appropriate (BMT 2018). Currently across the site, the land height is generally below 2.5 AHD (BMT WBM 2017). This would require fill and the placement of a retaining wall to ensure stability (Australian Consulting Engineers 2020a,b).

1.2 PURPOSE OF CURRENT ASSESSMENT

This BDAR includes, but is not limited to:

- Review and consideration of previous ecological investigations undertaken in proximity to the Project;
- Address the BAM and the BOS;
- Mapping of Plant Community Types (PCTs) impacted by the Project;
- Identify how the proponent proposes to avoid and minimise impacts to biodiversity;
- Identification of biodiversity impact avoidance, minimisation, mitigation and management measures as required;
- Identify any potential impact that could be classified as prescribed or serious and irreversible (SAII) consistent with the BAM;
- Outline offset obligations necessary to compensate for any biodiversity impacts that cannot be avoided resulting from the proposed development;
- Describe and assess the significance of potential impacts to MNES in accordance with the EPBC Act; and
- Address relevant Planning Secretary's Environmental Assessment Requirements.

Completion of biodiversity assessments are in accordance with the BAM. This BDAR has been prepared by Accredited Assessor Alan Midgley (BAAS BAAS17094) and reviewed by Accredited Assessor Alejandro Barreto (BAAS BAAS18057). Support has been provided by Robert Scanlon (PhD, BSc (Hons)).

1.3 STUDY AREA

The study area is located in Raymond Terrace, approximately 17 kilometres north of Newcastle (Figure 2). The Study Area covers a total area of approximately 44.4 hectares and the Subject Land covers a 6.4 hectares section in the north west of the Study Area. A mapped hydroline identified as Grahamstown Drain passes through the northern and western parts of the study area, including a small part of the south east corner of the Subject Land. An additional mapped hydroline (Windeyers Creek) is located just outside the southern boundary of the study area.

The subject land is located within the study area and is defined as the total area of disturbance; including both the construction and operational footprints. The subject land is comprised of native vegetation remnants, exotic grassland and powerlines (Figure 4).

1.4 SOURCES OF INFORMATION

Sources of information used in the assessment include relevant databases, spatial data, literature and previous site reports. In order to provide a context for the subject land, records of flora and fauna from within 10 kilometres (the 'locality') were collated from the following databases and were reviewed:

- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool, for matters protected by the EPBC Act.
- NSW BioNet - the database for the BioNet Atlas and BioNet Vegetation Classification (NSW Department of Planning, Industry and Environment (DPIE)).
- NSW Department of Primary Industries (DPI) Spatial Data Portal for NSW *Fisheries Management Act* 1994 listed threatened species, populations and communities.
- PlantNET (Royal Botanic Gardens and Domain Trust 2013).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2013.

Other sources of biodiversity information included:

- Relevant vegetation mapping, including the Lower Hunter Vegetation Mapping (Cockerill *et al.* 2013).
- Port Stephens Council Comprehensive Koala Plan of Management (PSC 2002).
- Phase 1 Environmental Site Assessment and Development Constraints Assessment Summary Report (ERM 2011).
- Flora and fauna and offsets assessment: Proposed rezoning at Adelaide Street, Raymond Terrace. (Biosis 2016).
- Re: Biodiversity submissions response – Planning proposal 251 Adelaide St Raymond Terrace (Biosis 2018).
- Environmental Impact Statement, Environmental Protection Works – Rehabilitate Disused Quarry (de Witt Consulting 2021).
- Detailed Contaminated Land Assessment (CES 2020).
- Acid Sulfate Soils Investigation Report (CES 2021a).
- Site Water Balance Report (CES 2021b).
- Backfill Management Plan (CES 2021c).
- Conceptual Earthworks Report (Australian Consulting Engineers, 2020a)
- Earthworks and Retaining Walls Civil Works Plans (Australian Consulting Engineers, 2020b)
- Cut and Fill Operations: Air Quality Impact Assessment (ViridIFC 2021)
- Preliminary Geotechnical Investigation Report (Aargus 2020)
- Preliminary Site Investigation (EI Australia 2018)
- RE: Flood Assessment 251 Adelaide St, Raymond Terrace (BMT WBM 2017)
- Flood Assessment 251 Adelaide St, Raymond Terrace (BMT WBM 2018)

Mapping was assisted by hand-held (uncorrected) GPS units (GDA94), mobile tablet computers running Qfield and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 5 metres) and dependent on the limitations of aerial photo rectification and registration.

Basemap data was obtained from NSW Department of Customer Services (DCS) Spatial Services containing a selection of LANDSAT® satellite imagery as well as from MetroMap by Aerometrex. Cadastral data was obtained from LPI digital cadastral database.

The following spatial datasets were utilised during the development of this report:

- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DIWA). 2.6
- NSW Soil and Land Information System (SALIS), accessed via eSPADE.

Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:

- Digital mapping with digital aerial photography at 1:1000 scale or finer.
- Site map as described in subsection 4.1.2 of the BAM.
- Location Map as described in subsection 4.1.2 of the BAM.
- Landscape map with features including 1500 metre buffer, as described in section 4.2.4 of the BAM.

LEGEND

- Study Area
- Subject Land
- Rehabilitation of Quarry (Separate Proposal)
- IBRA7 Regions
- Cadastral

Waterways Strahler Order and Buffers

- Strahler-1
- Strahler-2
- Strahler-4 and Higher
- Waterway Buffers

Acid Sulfate Soils

- Class 2
- Class 4

IBRA Region: Sydney Basin (Hunter)
IBRA Region: NSW North Coast (Karuah Manning)

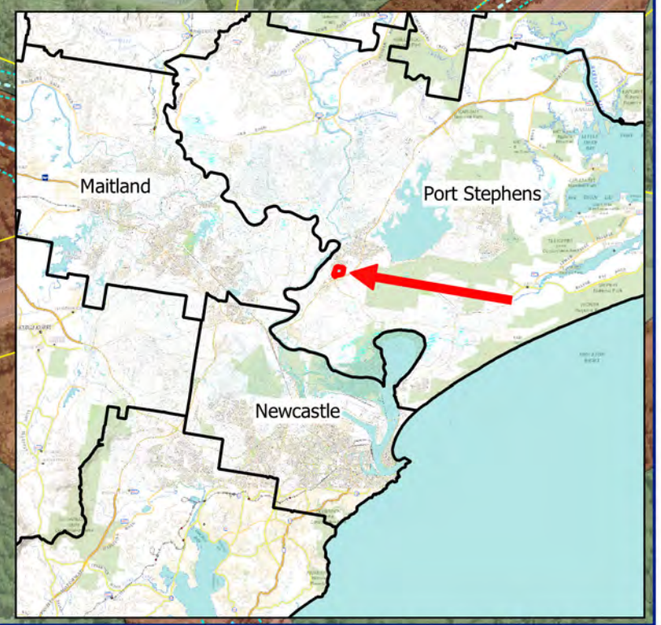

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FIGURE 1

Site Map

0 100 200 300 400 500 m

JOB ADDRESS:	251 Adelaide Street Raymond Terrace NEW SOUTH WALES | AUSTRALIA				
CLIENT:	Raymond Terrace Parkland				
A3 SCALE:	1:5,000	DRAWN:	RS	JOB REF:	EC103
PLAN DATE:	17/03/2022	CHECKED:	AB	ISSUE:	Final - 01

N

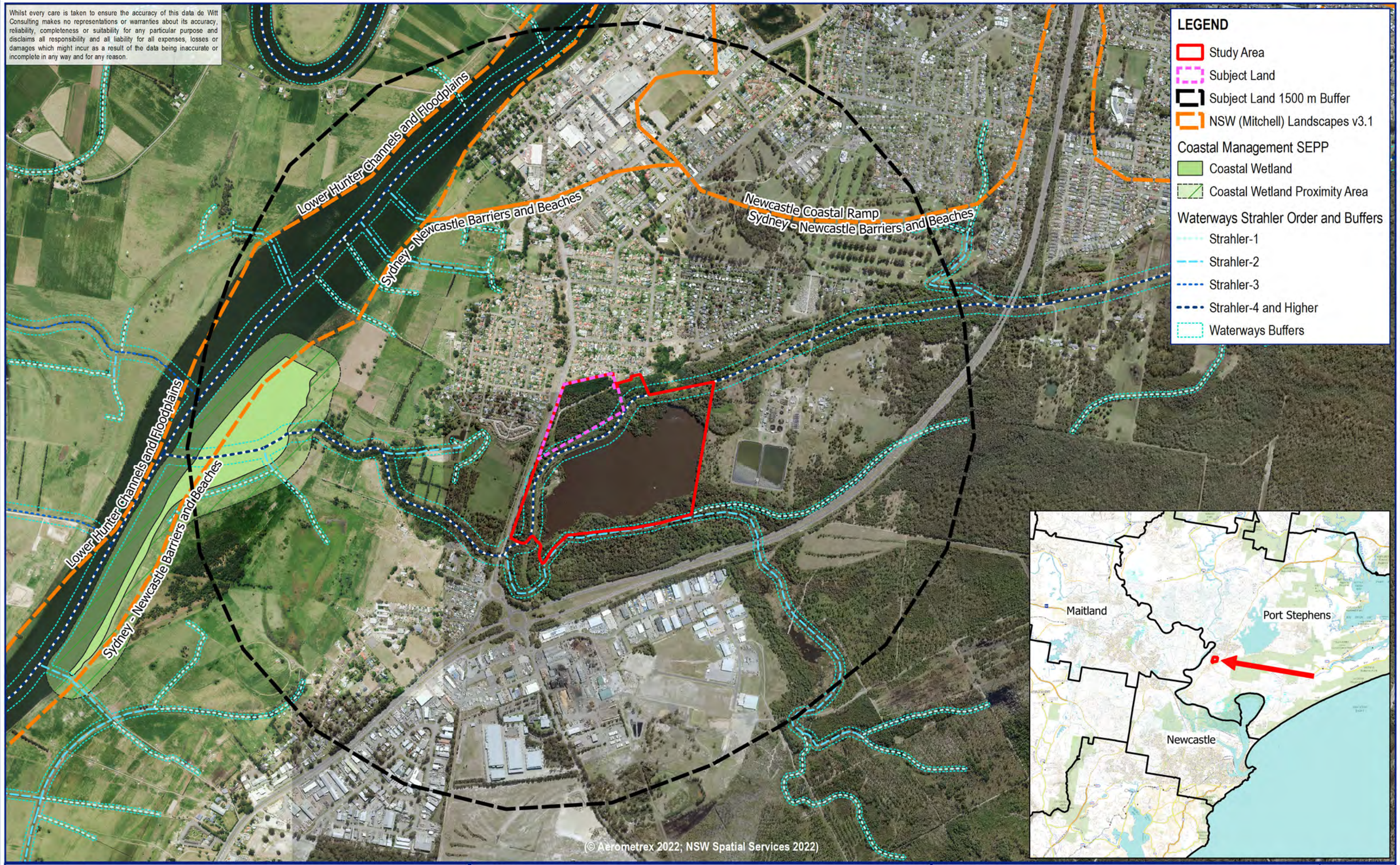

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FIGURE 2

Location Map

0 250 500 750 1,000 1,250 1,500 m

JOB ADDRESS:	251 Adelaide Street Raymond Terrace NEW SOUTH WALES | AUSTRALIA				
CLIENT:	Raymond Terrace Parklands				
A3 SCALE:	1:15,000	DRAWN:	RS	JOB REF:	EC103
PLAN DATE:	17/03/2022	CHECKED:	AB	ISSUE:	Final - 01

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1.5 LEGISLATIVE AND POLICY REQUIREMENTS

The project has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999.*
- *Environmental Planning and Assessment Act 1979.*
- *Biodiversity Conservation Act 2016.*
- *Fisheries Management Act 1994.*
- *Water Management Act 2000.*
- *Biosecurity Act 2015.*
- State Environmental Planning Policy (SEPP) Coastal Management 2018.
- SEPP (Koala Habitat Protection) 2021.
- Port Stephens Comprehensive Koala Plan of Management 2002 (PSCKPoM).
- Port Stephens Development Control Plan 2014 (PSC 2014).
- Port Stephens Local Environmental Plan 2013 (PSC 2013).

2.0 LANDSCAPE CONTEXT

2.1 BIOREGIONS

The study area sits on the border of two bioregions with the boundary passing through the southern sections of the lot. The Sydney Basin IBRA region (Hunter IBRA subregion) occurs to the north of the site and the Subject Land sits entirely within this region. The NSW North Coast IBRA region (Karuah Manning IBRA subregion) occurs to the south (Figure 1).

The North Coast Bioregion runs along the east coast of NSW from just north of Newcastle to just inside the Queensland border. The total area of the bioregion is 5,924,130 hectares and the NSW portion accounts for 96.1 per cent of the bioregion. The Sydney Basin Bioregion bounds the southern edge of the North Coast Bioregion and covers 4.53% of NSW, an area of approximately 3,624,008 hectares.

2.2 NSW (MITCHELL) LANDSCAPE

The study area occurs within the Sydney Basin Coastal Barriers *Sydney-Newcastle Barriers and Beaches* NSW Landscape (Figure 2). The Sydney-Newcastle Barriers and Beaches Landscape occurs as quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands, backed by sand dunes and intermittently closed and open lagoons. It has a general elevation of between 0 to 30 metres with local relief of 10 metres. Cliff top dunes may be found as high as 90 metres above sea level.

This landscape has distinct zonation of vegetation and increasing soil development from the beach to the inland dunes. At the beach, Spinifex (*Spinifex hirsutus*), Spiky Mat-rush (*Lomandra longifolia*), Coast Wattle (*Acacia longifolia* subsp. *sophorae*) and Coast Tea-tree (*Leptospermum laevigatum*) colonise the frontal dune. Coast Banksia (*Banksia integrifolia*) and Old Man Banksia (*Banksia serrata*) are found on the second dunes and these merge with more complex forest containing Blackbutt (*Eucalyptus pilularis*), Red Bloodwood (*Corymbia gummifera*), Grass trees (*Xanthorrhoea* spp.) and numerous understorey shrubs on deep sands that have an organic rich A horizon, a bleached A2 horizon and the initial development of weak iron or organic pans in the sandy subsoil.

Within the landscape, freshwater sedge swamps are found in larger areas of sand. In the lagoons, salinity varies depending on tidal flushing and they are often surrounded by Broad-leaved Tea-tree (*Melaleuca quinquenervia*) and Swamp Oak (*Casuarina glauca*). Water margins are occupied by *Juncus* spp. And Common Reed (*Phragmites australis*) in fresh water areas. Grey Mangrove (*Avicennia marina*) may occur in some tidal inlets (Mitchell 2002).

2.3 AIR QUALITY

Rainfall data was sourced from Raymond Terrace (Kinross) (approximately 2.4 km away, station number: 61031), which has been monitoring since 1894. The average annual rainfall was 1043.4 mm and is dominated by a peak in rainfall between February and April, and lower rainfall between August and October. Temperature data was sourced from Williamtown RAAF (approximately 10.2 km away, station number: 61078). Average monthly maximum temperature is highest in January at 28.3˚C and lowest in July at 17.2˚C. Monthly minimum temperatures are highest in January at 18.2˚C and lowest in July at 6.4˚C.

Urban activities in the local area affect air quality, generally through use of vehicles and power tools all year and wood fires utilised during winter months. The site is surrounded by local roads where public transport and traffic on these roads affect air quality through vehicle emissions.

2.4 SOILS AND TOPOGRAPHY

The study area borders two regions of surface geology. The majority of the site is Quaternary coastal dune deposits, which are sand dune systems found along the north coast. The sand is deposited by both wind (aeolian) and ocean currents. Older (Pleistocene) dunes are vegetated and stable. Younger (Holocene) dunes are not-vegetated and may be highly mobile depending on wind and wave action. The western part of the site includes Quaternary alluvial deposits which feature current and recent mud, silt, sand and gravel deposited by river (alluvial) systems.

There are several soil landscapes within the surrounding area, including:

- Bobs Farm Variant A is likely to occur throughout the south of the site. This variant is produced from low remnant lake shore beach deposits on dark brown loose loamy sand which may overlay greyish yellow brown loose coarse beach sand. This landscape is typically flat with <1% slope gradient and elevations 1-3 m above sea level.
- Millers Forest soil landscape occurs in the north west of the site and is an extensive alluvial plain on recent sediments. The soils include well-structured brownish black silty clay loam A horizon over a well-structured brown silty clay B horizon. This landscape is generally flat with <1% slope and relief <1 m, elevation ranges from 6 m to less than 3 m above sea level.
- Occurring on the eastern parts of the site, Tea Gardens variant A is reworked aeolian Pleistocene sand-sheets with wet heath forest. Soils include sandy peat and Brownish black to brownish grey loose loamy sand A_1 horizons over bleached loose sand A_2 horizons. Tea Gardens landscape generally has <1 m local relief with slopes less than 5% and elevation between 5 and 8 m above sea level.
- Other areas are identified as disturbed terrain, dominated by human activity. Disturbed terrain has a wide range of potential conditions that could occur.

The site has a gradual slope from Adelaide Street to the quarry void with levels of approximately 2.3 m AHD at the access road into the site and 1.4 m AHD at the top of the bank of the quarry void. The study area has a gentle rise to the north to 3.5 m AHD before a steep increase to 8 m AHD near the suburban area.

2.5 SOIL HAZARD FEATURES

The Study Area contains land mapped as Class 2 and Class 4 acid sulfate soils (Figure 1) According to the Port Stephens Local Environmental Plan 2013 (PSC 2013), development consent is required for:

Class 2:

- Works below the natural ground surface.
- Works by which the water table is likely to be lowered.

Class 4:

- Works more than 2 metres below the natural ground surface.
- Works by which the water table is likely to be lowered more than 2 metres below the natural ground surface.

However, an Acid Sulfate Soil Investigation Report (CES 2021a) found that while there were acidic soils on site, it is unlikely that the acidic soils present on the site are acid sulfate soils. There was some acidified groundwater identified but the pH returned to neutral conditions in all surface water locations down-gradient of the sample, indicating acidic conditions are being naturally ameliorated.

2.6 CONTAMINATION

A Detailed Contaminated Land Assessment Report (CES 2020) was performed for the study area and concluded that the past land uses had not contributed to any contamination. Sediment samples from the quarry void detected nickel concentrations in sediment that slightly exceeded the adopted low-level sediment criteria but did not exceed levels that may impact on the nature and diversity of the ecosystem.

Surface water testing of the quarry void, up-gradient of Grahamstown Drain and down-gradient of Windeyers Creek detected copper, nickel and zinc in excess of the adopted screening criteria indicating a potential risk to the ecology of the ecosystems. Additionally, a number of metals were detected in groundwater samples that were higher than the adopted groundwater criteria. The assessment suggested that the contamination was likely indicative of background levels or influences from outside the study area such as Grahamstown Dam.

2.7 HYDROGEOLOGY

A Site Water Balance Report showed that the site is underlain by a regionally important aquifer system known as the Tomago Sandbeds. Groundwater levels were estimated to be at an average of 1.1 m AHD in the east and 0.89 m AHD in the west but values were highly variable (CES 2021b). This could indicate that the soils are regularly saturated or contain groundwater less than 1 m below surface level.

2.7.1 Rivers and Streams

The dominant feature of the study area is a post quarry void that has filled with water. Subsurface and surface water within the study area is expected to discharge into either the manmade Grahamstown Drain in the north or the Windeyers Creek in the south.

Travelling from the north east to the south west of the Study Area, the Grahamstown Drain is mapped as transporting water from Grahamstown Dam to the Hunter River. This waterway is clearly distinguished on aerial imagery of the Study Area and had water flowing through it during site visits on the 11th and 12th of January 2022 (Figure 2). Grahamstown Drain is a greater than fourth-order stream.

Just south of the study area, Windeyers Creek flows from the east as a second-order stream. It meets Grahamstown Drain southwest of the study area, becoming a greater than fourth-order stream where it continues to the Hunter River (Figure 2).

Land within 40 metres of the watercourse (Grahamstown Drain) within the study area is classified as waterfront land under the *Water Management Act 2000* (WM Act). Therefore, any works undertaken within 40 metres of the top of bank of Grahamstown Drain may be considered 'controlled activities' under the WM Act and require assessment and approval by the NSW Office of Water.

As a greater than fourth–order watercourse, the maintenance of a 40-metre vegetated riparian zone (VRZ) is required each side of the watercourse in accordance with the DPI Office of Water Guidelines for Riparian Corridors on Waterfront Land (NSW DPI 2018).

2.7.2 Wetlands

There are three Nationally Important Wetlands within the 10 km buffer including Hunter Wetlands Centre, Hexham Swamp and Kooragang Nature Reserve Research (also referred to as the Hunter Wetlands National Park). Both Kooragang Nature and Hunter Wetlands Centre are part of the Hunter Estuary Wetlands, these wetlands were the first to be listed under the Ramsar Convention in 1984.

Each of these wetlands are located downstream of the study area and are fed from a large catchment (22,000 km^2) with stream inflows of approximately 1,800 GL/year and no strong pattern of seasonal freshwater flows. The majority of the inflow and outflows in the estuary are tidal fluxes (Brereton & Taylor-Wood 2010).

2.8 GROUND WATER DEPENDANT ECOSYSTEMS

The study area contains communities that have been mapped on the terrestrial groundwater dependant ecosystems atlas map. Existing mapping suggests the site contains PCT 1646 Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast with a range of low to high potential of reliance on groundwater and inflow dependence rated between 3 and 10 (on a scale from 1 (low) to 10 (high)).

Field verification of PCTs occurring within the study area resulted in:

- PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast
- PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion

Both of these ecosystems are considered groundwater dependent ecosystems. Refer to Section 3.2.6 for more details.

2.9 NATIVE VEGETATION EXTENT

Native vegetation extent within the study area and within the 1500 metre buffer area of the Subject Land was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping (Figure 3). Of the land that is suitable for vegetation within the 1500 metre buffer area, approximately 23% is occupied by native vegetation.

Lower Hunter Vegetation Mapping (Cockerill *et al.* 2013) indicated that there were a number of vegetation communities within the study area and its immediate boundaries (Table 1).

Table 1 Plant Community Types within the 1500 metre buffer

PCT – (mapped Cockerill et al. 2013)	Location		
	Subject Land	Study Area (including adjoining proposed development)	1500 m Buffer
PCT 1591 Grey Gum – Rough-barked Apple shrubby open forest of the lower Hunter	Yes	Yes (including adjoining proposed development; de Witt Ecology ref EC102)	Yes
PCT 1601 Spotted Gum – Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter	No	No	Yes
PCT 1619 Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands	No	No	Yes
PCT 1646 Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Yes	Yes (including adjoining proposed development; de Witt Ecology ref EC102)	Yes
PCT 1647 Red Bloodwood – Smooth-barked Apple heathy woodland on coastal sands of the Central and lower North Coast	No	No	Yes
PCT 1718 Swamp Mahogany – Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Yes	Yes (including adjoining proposed development; de Witt Ecology ref EC102)	Yes
PCT 1727 Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Yes	Yes (including adjoining proposed development; de Witt Ecology ref EC102)	Yes

2.10 CLEARED AREAS

Land has been cleared to allow vehicle access to the quarry void. Power lines travelling through the north and western parts of the study area and subject land have cleared land around them. Cleared areas within the study area and buffer area include waterbodies, roads, car parks, built up areas and other infrastructure.

2.11 CONNECTIVITY FEATURES

Habitats within the study area are associated with coastal swamp forests and wetlands. There are very few man-made infrastructures within the study area, allowing the vegetation to connect well to vegetation to the south and east. Native vegetation continues east and south across the A1 Pacific Highway, into a very large area of native vegetation through to Williamtown and even further east. The Pacific Highway would provide a barrier to movement for less mobile and ground-dwelling species.

To the north and west is the town of Raymond Terrace with poor connections to other native vegetation through suburbia and roads. Though it is separated by Adelaide Street, there is a bridge that fauna could pass under along Windeyers Creek, allowing a corridor of access through to the Hunter River for all forms of fauna.

Vegetation connectivity within the subject land specifically is bounded to the north and west by Raymond Terrace and Adelaide Street. There is a narrow corridor along the eastern side of Adelaide that allows

movement of species from the subject land to the south. Vegetation is continuous to the east of the subject land, allowing movement around the eastern side of the quarry void (Figure 3).

2.12 BUSHFIRE RISK

The study area is partially affected by Bushfire Prone Land with Vegetation Category 1, 2, 3 and Buffer all occurring on the study area. The centre of the quarry void is not identified as bushfire prone land. The proposed filling works are located partially within the bushfire prone land. The proposed activity is not a special fire protection purpose pursuant to the *Rural Fires Act 1997* or Rural Fires Regulation 2013 and does not require a bushfire safety authority.

2.13 EXISTING WEED MANAGEMENT PLANS AND STRATEGIES

Biosecurity protects the economy, environment and community from the negative impacts of pests, diseases and weeds. The Hunter Regional Strategic Weed Management Plan 2017-2022 focuses on managing weeds to improve the region's biosecurity. This document works together with the NSW Biosecurity Strategy 2013-2021 and NSW *Biosecurity Act 2015* (which repeals the *Noxious Weeds Act 1993*) to improve weed management.

2.14 AREAS OF OUTSTANDING BIODIVERSITY VALUE

There are no areas within the study area that have been identified under the BC Act as areas of outstanding biodiversity value.

There are several state reserves within the 10 km buffer including the Hunter Wetlands National Park, Medowie State Conservation Area, Tilligerry State Conservation Area and Hexham Swamp (Gazettal in Progress).

2.15 AREAS OF GEOLOGICAL SIGNIFICANCE

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land or within its locality.

2.16 PATCH SIZE

Patch size was assessed as per the BAM (DPIE 2020a) using a select process in QGIS. All native vegetation that has a gap of less than 100 metres (or ≤30 m for non-woody ecosystems) from the next area of native vegetation is considered to be of the same patch.

Vegetation within the subject land meeting this criteria was mapped sequentially and was found to form part of a relatively large patch of connecting vegetation with a patch size larger than 100 hectares.

LEGEND

- Study Area
- Subject Land
- Subject Land 1500 Buffer
- Habitat Connectivity
- Native Vegetation

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FIGURE 3

Native Vegetation Cover and Connectivity

0 250 500 750 1,000 1,250 1,500 m

JOB ADDRESS:	251 Adelaide Street Raymond Terrace NEW SOUTH WALES | AUSTRALIA				
CLIENT:	Raymond Terrace Parklands				
A3 SCALE:	1:15,000	DRAWN:	RS	JOB REF:	EC103
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N

3.0 NATIVE VEGETATION

The extent of native vegetation, threatened ecological communities and vegetation integrity within the study area was determined using the results of site investigations and Section 4.1, Appendix A and Appendix H of the BAM (DPIE 2020a).

3.1 METHODOLOGY

3.1.1 Background Review

Regional vegetation mapping and database searches (See Section 1.4) were reviewed to inform the site investigations. Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the study area and subject land.

3.1.2 Site Investigation

3.1.2.1 Flora Assessment

A detailed ecological assessment was undertaken by qualified and experienced ecologists Alan Midgley and Robert Scanlon on 11th and 12th of January 2022. The study area was surveyed in accordance with the BAM (DPIE 2020a) and random meander methods (Cropper 1993), which involved:

- Ground truthing of existing vegetation mapping.
- Determining the type and condition of vegetation present within the study area.
- The identification and mapping of PCTs according to the structural definitions of Lower Hunter Vegetation Mapping (Cockerill *et al.* 2013) and NSW BioNet Vegetation Classification database.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002), with reference to recent taxonomic changes.
- Incidental flora observations using the "random meander" method (Cropper 1993).
- An assessment of the natural resilience of the vegetation of the site.
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the study area.

Details on targeted surveys are provided in Section 3.6.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW.
- EPBC Act for significance within Australia.

Detailed mapping of PCTs was conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab A7) using the Qfield application and aerial photo interpretation (© Metromap: Aerometrex; LPI NSW Imagery: NSW Spatial Services 2021).

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined. Identification of PCTs within the study area was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the Cockerill *et al.* (2013) mapping project and NSW BioNet Vegetation Classification database.

Detailed mapping included the completion of the requisite number of vegetation integrity survey plots within each broad condition state of each mapped PCT, in accordance with the BAM. The locations of surveyed plots are shown in Figure 4. Targeted surveys for candidate species credit flora and fauna species were also undertaken (Figure 6) and are described in detail in Section 3.6.

3.1.2.2 Fauna Assessment

The study area was investigated on 11th and 12th of January 2022 to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitats present. All species of fauna observed during the assessment were recorded and active searching for fauna was also undertaken. This included direct observation, examination of tracks and scats, identifying calls and recording other signs of animal activity (e.g. nests, burrows, hollow utilisation, scratches and diggings). Particular attention was given to searching for threatened biota and their habitats. Fauna species were recorded with a view to

characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

Fauna records will be submitted to DPIE for incorporation into the NSW BioNet Wildlife Atlas.

3.1.3 Team Qualifications

The qualifications of the personnel involved in this biodiversity assessment are presented in Table 2 below.

Table 2 de Witt Ecology staff and qualifications

NAME	POSITION / PROJECT ROLE	QUALIFICATIONS	RELEVANT EXPERIENCE
Alejandro Barreto	Senior Ecologist, Project Director and technical review	BSc Biotechnology Accredited BAM Assessor	11+ years
Alan Midgley	Ecologist Field surveys and reporting	Doctor of Philosophy (PhD) B.Sc (Hons) Accredited BAM Assessor	10+ years
Robert Scanlon	Ecologist Field surveys and reporting	Doctor of Philosophy (PhD) B.Sc (Hons)	6+ years

3.1.4 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall ecological values of a site.

The current biodiversity assessment was conducted in mid-Summer, which is a suitable time for survey. Overall, the survey effort was sufficient to assess the general ecological values of the study area.

Database searches, and associated conclusions on the likelihood of threatened species to occur within the study area, are reliant upon external data sources and information managed by third parties.

3.2 RESULTS

3.2.1 Vegetation Description

The vegetation and fauna habitat throughout the study area has been modified by past disturbances associated with land clearing (including associated with sand quarrying and for power lines), ongoing management and edge effects from roadways and residential dwellings. The subject land supports 5.48 hectares of native vegetation and 1 ha of slashed / exotic vegetation. Native vegetation within the overall study area varied in composition and condition as a result of previous land uses, with native vegetation covering 18.83 ha of the 44.06 ha total area. Exotic vegetation was restricted to the access routes throughout the site, particularly the access road to the quarry void, underneath power lines and along the edge of Grahamstown Drain.

Excluding the quarry void, the study area is predominately covered with native vegetation (Figure 4).

3.2.2 Native Vegetation Extent

The native vegetation extent recorded within the subject land, as assessed during field investigations undertaken in January 2022, included all areas of native vegetation (native ground cover and areas with canopy) and low condition areas that used to be part of the adjacent native vegetation. Areas not shown as native vegetation cover within Figure 3 are not included for further assessment in accordance with Section 4.1.2 of the BAM (DPIE 2020).

The ground-truthing of vegetation on site and the utilisation of aerial imagery resulted in native vegetation extent refinement from that which was observed in the regionally relevant mapped vegetation (Lower Hunter Vegetation Mapping; Cockerill *et al.* 2013)). The flora and fauna and offsets assessment (Biosis 2016) previously completed for the site was generally consistent with our mapped native vegetation extent.

3.2.3 Plant Community Types

The following PCTs were assessed as present within the subject land:

- PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast.
- PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion
- Exotic / Slashed Vegetation.

Table 3, Table 4 and Table 5 provides a detailed description of the PCTs recorded within the subject land.

Table 3 Description of PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast

PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast		
PCT (DPIE, 2022)	Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Centra– Coast and Lower North Coast	
PCT ID	1717	
Vegetation Formation	KF_CH9 Forested Wetlands	
Vegetation Class	Coastal Swamp Forests	
Conservation Significance	BC Act: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered) EPBC Act: Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (Endangered). This PCT was considered for its association with this EEC. Based on floristic attributes and patch size (>5 hectares), this PCT meets the minimum condition thresholds for this EEC (Class C2).	
Typical Landscape Position	This community is common on coastal floodplains and poorly drained lowlands from the Broadwater to Failford. It mainly occurs on unconsolidated sediments at elevations below 50m. More isolated examples occur as far south as Macmasters Beach.	
Typical Structure	Myrtaceous Swamp Open Forests with a mid-stratum of small trees. The ground stratum is dense and dominated by wet-loving grasses and graminoid species	
Extent Within Subject Land	5.35 ha	
Survey Effort	Two BAM plots were completed in 4.03 ha of low-moderate condition PCT 1717. An additional BAM plot was completed in the 1.32 ha of moderate-good condition PCT 1717.	
Observed Condition	Three patches of this PCT in low-moderate condition and one patch of moderate-good condition vegetation occur within the subject land. Within the subject land, the low-moderate condition patches of this PCT are surrounded by exotic vegetation and/or disturbed land. In the south of the subject land, the PCT improves to a moderate-good condition. Many of the southern areas in the broader study area merge with a larger patch of moderate-good condition PCT 1717.	
Observed Over Storey	Where this PCT occurs, it consists of regrowth native vegetation dominated by an over-storey of *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp Oak).	
Observed Mid Storey	The mid-storey of this PCT contains *Casuarina glauca* (Swamp Oak), *Glochidion ferdinandii* (Cheese Tree), *Pittosporum undulatum* (Sweet Pittosporum), *Breynia oblongifolia* (Coffee Bush), *Banksia integrifolia* (Coast Banksia), *Melia azedarach* (White Cedar) and *Alphitonia excelsa* (Red Ash).	
Observed Groundcover	The groundcover of this PCT consists of a low cover of native species, including *Oplismenus aemulus* (Australian basket grass), *Entolasia marginata* (Bordered Panic), *Geitonoplesium cymosum* (Scrambling Lily), *Calochlaena dubia* (Rainbow Fern), *Parsonsia straminea* (Common Silkpod) and *Pratia purpurascens* (Whiteroot).	
Observed Exotic	The canopy has areas of *Pinus elliotii* (Slash Pine). The mid-storey of this PCT contains exotic species including *Lantana camara* (Lantana), *Jacaranda mimosifolia* (Jacaranda), *Ochna serrulata* (Mickey Mouse Plants), *Schefflera actinophylla* (Umbrella Tree) and *Ligustrum sinense* (Small-leaved Privet),. The groundcover of this PCT consists of a low-moderate cover of exotic species, including *Megathyrsus maximus* (Guinea Grass), *Asparagus plumosus* (Climbing	

PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast	
	Asparagus Fern), *Asparagus scandens* (Asparagus Fern), *Conyza bonariensis* (Flaxleaf Fleabane), *Ehrharta erecta* (Panic Veldt Grass) and *Melinis repens* (Red Natal Grass).
Estimate of Percent Cleared	68%

Table 4 Description of PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion

PCT1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion		
PCT (DPIE, 2022)	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	
PCT ID	1071	
Vegetation Formation	KF_CH8 Freshwater Wetlands	
Vegetation Class	Coastal Freshwater Lagoons	
Conservation Significance	BC Act: Associated with Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)	
Typical Landscape Position	Man-made water bodies, drainage lines and depressions across a wide variety of environments. Includes modified former wetlands such as Hexham Swamp. Occurs also in original form in wide variety of situations associated with coastal plains, valleys, lagoons and other sites of poor drainage.	
Typical Structure	Typha and Phragmites communities occupying modified drainage lines, wetlands and ephemeral and permanent water bodies. Can be derived from Coastal floodplain sedgelands, rushlands, and forblands of the North Coast; and Coastal freshwater lagoons of the Sydney Basin and South East Corner.	
Extent Within Subject Land	0.12 ha	
Survey Effort	One BAM plot was completed in the 0.12 ha of moderate condition PCT 1071. Due to the location of the community, the plot was not entirely within the Subject Land.	
Observed Condition	A single patch of this PCT is within the subject land; which extends over the southern border of the subject land. The vegetation is in moderate condition.	
Observed Over Storey	This PCT does not contain any tree species.	
Observed Mid Storey	This PCT does not contain any native tree or shrub species.	
Observed Groundcover	The groundcover of this PCT was dominated by *Phragmites australis* (Common Reed) and *Hypolepis muelleri* (Harsh Ground Fern). Other species that occurred included *Calystegia sepium*, *Lycopus australis* (Australian Gipsywort) and *Persicaria strigosa*.	

PCT1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	
Observed Exotic	The canopy has areas of *Lantana camara* (Lantana).
Estimate of Percent Cleared	75% cleared since European settlement

Table 5 Description of Exotic / Slashed Vegetation

Exotic / Slashed Vegetation		
PCT (DPIE, 2022)	Exotic / Slashed Vegetation	
PCT ID	N/A	
Vegetation Formation	N/A	
Vegetation Class	N/A	
Conservation Significance	BC Act: Not listed EPBC Act: Not listed	
Typical Landscape Position	N/A	
Typical Structure	N/A	
Extent Within Subject Land	One hectare	
Survey Effort	One BAM plot was completed in the one hectare of mapped exotic / slashed vegetation within the subject land. The BAM plot data confirmed the validity of mapping these areas as exotic / slashed vegetation with floristic data. Calculations resulted in a vegetation integrity score of 15.6, which is below thresholds for credit offset requirement.	
Conservation Significance	BC Act: Not listed EPBC Act: Not listed	
Typical Landscape Position	N/A	
Typical Structure	N/A	
Observed Condition	Low	
Observed Over Storey	Area has been cleared of trees.	
Observed Mid Storey	The area has been cleared of mid-storey.	
Observed Groundcover	Native groundcover consists of *Juncus usitatus, Lycopus australis* (Australian Gipsywort), *Oxalis spp., Commelina cyanea* (Scurvy Weed), *Juncus flockei*, *Entolasia marginata* (Bordered Panic),	

Exotic / Slashed Vegetation	
	Ischaemum australe, *Phragmites australis* (Common Reed), *Persicaria decipiens* (Slender Knotweed), *Persicaria strigosa* and *Ranunculus plebeius* (Forest Buttercup).
Observed Exotic	A moderate diversity of chiefly exotic species was observed, including *Lantana camara* (Lantana), *Phalaris aquatica* (Phalaris), *Conyza bonariensis* (Flaxleaf Fleabane), *Paspalum dilatatum* (Paspalum), *Senecio madagascariensis* (Fireweed), *Tagetes minuta* (Stinking Roger) , *Cyclospermum leptophyllum* (Slender Celery), *Araujia sericifera* (Moth Vine), *Bidens pilosa* (Cobbler's Pegs), *Cirsium vulgare* (Spear Thistle), *Erechtites valerianifolia* (Brazilian Fireweed), *Gamochaeta calviceps* (Cudweed), *Cyperus eragrostis* (Umbrella Sedge), *Medicago polymorpha* (Burr Medic) and *Romulea rosea* (Onion Grass)
Estimate of Percent Cleared	N/A

3.2.4 Threatened Ecological Communities

PCT 1717 is consistent with the following Threatened Ecological Communities (TEC):

- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – listed as Endangered under the BC Act.
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland – listed as Endangered under the EPBC Act. This PCT was considered for its association with this EEC. Based on floristic attributes and patch size (>5 hectares), this PCT meets the minimum condition thresholds for this EEC (Class C2).

Both of these TECs occur in both low-moderate and moderate-good condition, of which there is 5.35 ha within the subject land (Figure 5).

PCT 1071 is consistent with the following TEC:

- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – listed as Endangered under the BC Act.

This TEC is restricted to PCT 1071 in moderate condition of which there is 0.12 ha within the subject land (Figure 5).

3.2.5 Terrestrial Fauna Habitat

Habitat provided by PCT 1717 within the study area consisted of a high number of Broad-leaved Paperbark (*Melaleuca quinquenervia*), Slash Pine (*Pinus elliotii*), Swamp Oak (*Casuarina glauca*) and small numbers of mid storey species such as Cheese Tree (*Glochidion ferdinandii*), Sweet Pittosporum (*Pittosporum undulatum*), Coffee Bush (*Breynia oblongifolia*), Coast Banksia (*Banksia integrifolia*), White Cedar (*Melia azedarach*) and Red Ash (*Alphitonia excelsa*). PCT 1717 also provides a low to moderate ground cover that can support species such as Swamp Wallaby (*Wallabia bicolor*) observed within the subject land. This community is developing a dense leaf litter layer which can provide shelter and foraging habitat for frogs and small mammals. A juvenile Marsh Snake (*Hemiaspis signata*) was observed moving through the leaf litter in the southern parts of the study area and an Australian Water Dragon (*Intellagama lesueurii*) was observed to the south of the subject land near Grahamstown Drain.

Habitat is also provided by PCT 1071 (Figure 5) mapped within the subject land. This wetland habitat, where *Phragmites australis* (Common Reed) dominates and trees are typically absent, provides shelter and foraging habitat for herpetofauna, birds and other fauna.

Swamp Mahogany *(Eucalyptus robusta)* and Forest Red Gum *(Eucalyptus tereticornis)* trees are listed under the Port Stephens Comprehensive Koala Plan of Management (CKPOM) (PSC 2002) and the National Recovery Plan for the Koala as a primary feed tree for Koala in the Port Stephens LGA. These trees also provide foraging for nectar-feeding species such as the Grey-headed Flying-fox. Semi-mature to mature *E. robusta* and *E. tereticornis* trees occur within the south-western extent of the study area, however these have been avoided and are located outside the area of the subject land.

A number of common bird species were either observed or their calls heard including Purple Swamphen (*Porphyrio porphyrio*), Australian Raven (*Corvus coronoides*), Superb Fairy-wren (*Malurus cyaneus*),

Yellow-tailed Black-cockatoo (*Zanda funereus*), Eastern Whipbird (*Psophodes olivaceus*), Grey Fantail (*Rhipidura albiscapa*) and Magpie-lark (*Grallina cyanoleuca*).

Considerable areas in the south of the study area were observed to be flooded, which can facilitate dispersal of frog species. Flooded areas can provide additional habitat for wetland birds but can also impact the abundance of insects for as a food resource. Flooding can also impact mammals, particularly those that rely on burrows.

There were no hollows observed within the subject land, including in PCT 1717.

Gambusia holbrooki (Mosquitofish) were observed in the Grahamstown Drain and quarry void.

3.2.6 Groundwater Dependent Ecosystems

PCT 1717 has been identified as being a groundwater dependent ecosystem in other areas of the Groundwater Dependent Ecosystems Atlas (BoM 2022b).

Though PCT 1071 is not present in the Groundwater Dependent Ecosystems Atlas (BoM 2022b), the vegetation class of Coastal Freshwater Lagoon is included as a groundwater dependant ecosystem and it is highly likely that a wetland is considered groundwater dependant.

3.3 VEGETATION INTEGRITY ASSESSMENT

3.3.1 Vegetation Zones

Vegetation zones were determined based on the PCTs within the subject land and are stratified based on broad condition state. This resulted in four vegetation zones being identified within the subject land (Table 6). As the BAM Calculator requires the assignment of a PCT type to a vegetation zone, regardless of condition class, exotic / slashed vegetation is entered under PCT 1717 for the purposes of calculator entry to obtain a Vegetation Integrity Score.

Table 6 Vegetation zones mapped within the subject land

Vegetation Zone	Plant Community Type	Condition Class	Area (ha)	Patch Size Class
VZ1	PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast	Low-moderate	4.03	>100ha
VZ2	PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast (Exotic / Slashed Vegetation)	Moderate-good	1.32	>100ha
VZ3	PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	0.12	>100ha
VZ4	PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast (Exotic / Slashed Vegetation)	Exotic / Slashed Vegetation	1	>100ha

3.3.2 Vegetation Integrity

Vegetation integrity was assessed using data obtained from BAM plots completed within each PCT, in accordance with the methodology outlined in Subsection 4.3.3 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes and function.

- A 20 metre x 20 metre quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined through application of Table 3 of the BAM (DPIE 2020a). A total of five BAM plots was therefore completed within the subject land. For exotic / slashed vegetation, calculations resulted in a vegetation integrity score (15.6) below thresholds for credit offset requirement. An assessment of vegetation integrity was undertaken using benchmark data collected as outlined in Subsection 4.3.3 of the BAM. No additional local data was used for this assessment.

A list of flora species recorded within the subject land was compiled, and records of all flora species will be submitted to DPIE for incorporation into the NSW BioNet.

3.3.3 Vegetation Integrity Score

Plot data were entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix Table A. 1. Vegetation integrity scores are calculated for each vegetation zone and are provided in Table 7.

Table 7 Vegetation zone integrity score

PCT	No. of Plots	Vegetation Zone	Comp Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score
PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast	2	VZ1	16.9	15	52.9	23.8
PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast	1	VZ2	28.8	42.1	78.2	45.6
PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	1	VZ3	34.2	65.5	NA	47.4
PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast (Exotic / Slashed Vegetation)	1	VZ4	45.8	7.5	11.2	15.6

As outlined in Section 9.2 of the BAM, an offset is required for impacts to native vegetation where the vegetation integrity score is:

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

As shown in Table 7, the integrity scores for VZ1, VZ2 and VZ3 are above 15 and these communities are all considered to be associated with TECs. Therefore, offsets will be required for impacts to mapped VZ1, VZ2, and VZ3 native vegetation within the subject land. VZ4 is not associated with a TEC and its score is below 20 so offsets are not required for impacts to VZ4.

BAM5
BAM4
BAM3
BAM1
BAM2

LEGEND

- Study Area
- Subject Land
- BAM Plots

Potential Habitat

- Abandoned Building
- Bridge

Preferred Koala Food Trees (CKPoM)

- Eucalyptus robusta
- Eucalyptus tereticornis

Plant Community Type

- PCT 1071 Moderate
- PCT 1717 Low-moderate
- PCT 1717 Moderate-good
- Exotic / Slashed Vegetation

Threatened Communities

- Associated with Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered; BC Act)
- Associated with TEC Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered; BC Act); Associated with TEC Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (Endangered; EPBC Act)

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FIGURE 4

Native Vegetation Within Study Area

0 100 200 300 400 m

N

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CLIENT:	Raymond Terrace Parklands				
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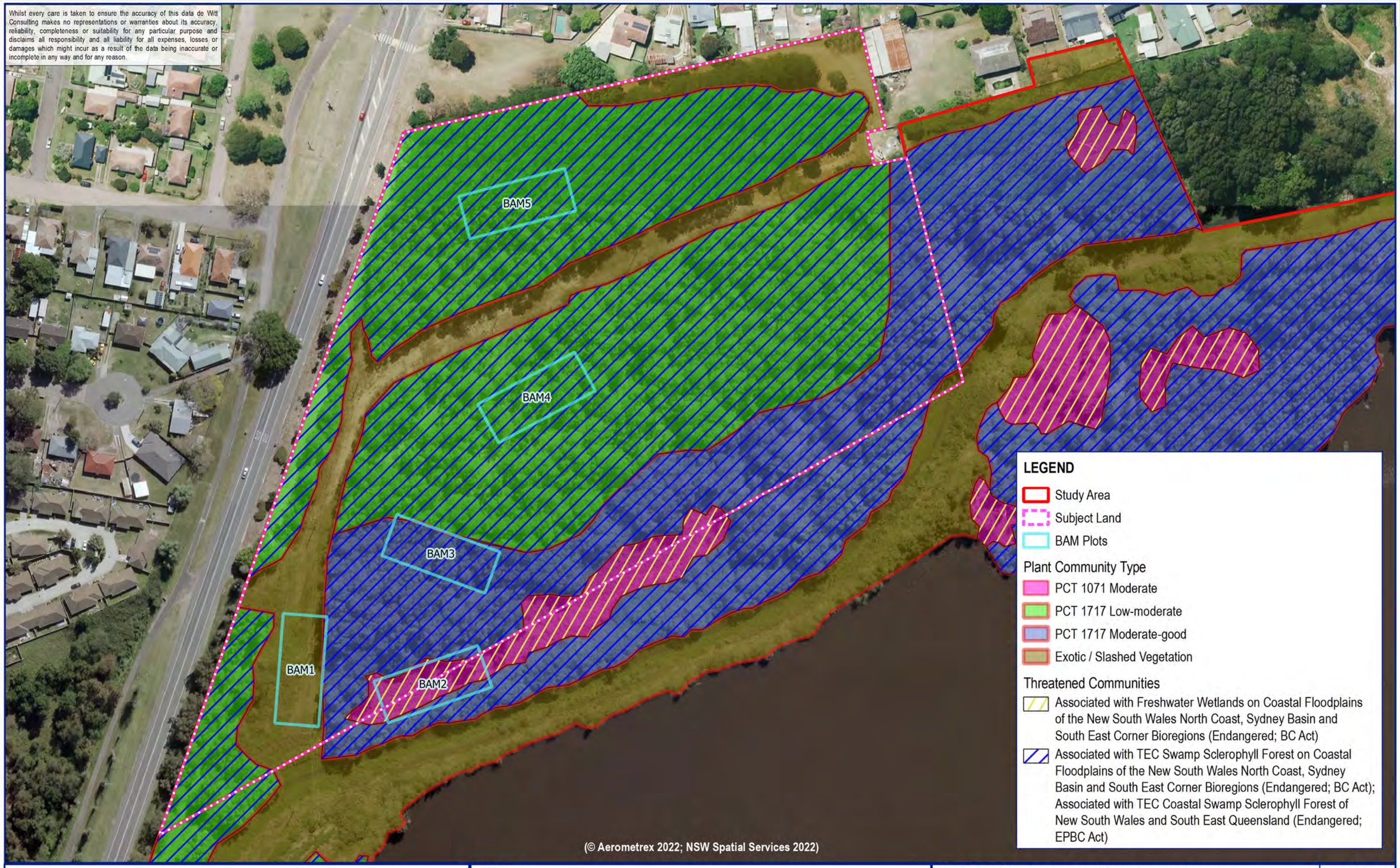

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FIGURE 5

Native Vegetation Within Subject Land

0 50 100 150 m

N

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FIGURE 6

Vegetation Zones & Survey Effort within the Subject Land

0 50 100 150 m

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3.4 ECOSYSTEM CREDIT SPECIES

Species reliably predicted to occur based on PCTs present within the subject land (i.e. ecosystem credit species) and information obtained from the Threatened Biodiversity Data Collection, were returned from the BAM Offsets Calculator and refined as per Section 5 of the BAM (DPIE 2020a). Impacts to these species require consideration but targeted survey is not required.

Table 8 Assessment of ecosystem credit species with the subject land

Common Name	Scientific Name	Sensitivity to gain class	NSW Listing Status	Commonwealth Listing Status	Vegetation Zone
Australasian Bittern	*Botaurus poiciloptilus*	Moderate Sensitivity to Potential Gain	Endangered	Endangered	VZ3
Australian Painted Snipe	*Rostratula australis*	Moderate Sensitivity to Potential Gain	Endangered	Endangered	VZ3
Barking Owl	*Ninox connivens*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4
Black Bittern	*Ixobrychus flavicollis*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
Black-necked Stork	*Ephippiorhynchus asiaticus*	Moderate Sensitivity to Potential Gain	Endangered	-	VZ1, VZ2, VZ3, VZ4
Black-tailed Godwit	*Limosa limosa*	High Sensitivity to Potential Gain	Vulnerable	-	VZ3
Blue-billed Duck	*Oxyura australis*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Broad-billed Sandpiper	*Limicola falcinellus*	High Sensitivity to Potential Gain	Vulnerable	-	VZ3
Comb-crested Jacana	*Irediparra gallinacea*	High Sensitivity to Potential Gain	Vulnerable	-	VZ3
Curlew Sandpiper	*Calidris ferruginea*	High Sensitivity to Potential Gain	Endangered	Critically Endangered	VZ3
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Moderate Sensitivity to	Vulnerable	-	VZ3

Common Name	Scientific Name	Sensitivity to gain class	NSW Listing Status	Commonwealth Listing Status	Vegetation Zone
		Potential Gain			
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
Eastern Grass Owl	*Tyto longimembris*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Eastern Osprey	*Pandion cristatus*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
Freckled Duck	*Stictonetta naevosa*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4
Great Knot	*Calidris tenuirostris*	High Sensitivity to Potential Gain	Vulnerable	Critically Endangered	VZ3
Grey-headed Flying-fox	*Pteropus poliocephalus*	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	VZ1, VZ2, VZ4
Koala	*Phascolarctos cinereus*	High Sensitivity to Potential Gain	Vulnerable	Endangered	VZ1, VZ2, VZ4
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
Little Bent-winged Bat	*Miniopterus australis*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
Little Eagle	*Hieraaetus morphnoides*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4

Common Name	Scientific Name	Sensitivity to gain class	NSW Listing Status	Commonwealth Listing Status	Vegetation Zone
Little Lorikeet	*Glossopsitta pusilla*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4
Magpie Goose	*Anseranas semipalmata*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Regent Honeyeater	*Anthochaera phrygia*	High Sensitivity to Potential Gain	Critically Endangered	Critically Endangered	VZ1, VZ2, VZ4
Spotted Harrier	*Circus assimilis*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Spotted-tailed Quoll	*Dasyurus maculatus*	High Sensitivity to Potential Gain	Vulnerable	Endangered	VZ1, VZ2, VZ3, VZ4
Square-tailed Kite	*Lophoictinia isura*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
Swift Parrot	*Lathamus discolor*	Moderate Sensitivity to Potential Gain	Endangered	Critically Endangered	VZ1, VZ2, VZ4
Varied Sittella	*Daphoenositta chrysoptera*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ3, VZ4
White-fronted Chat	*Epthianura albifrons*	Moderate Sensitivity to Potential Gain	Vulnerable	-	VZ3
White-throated Needletail	*Hirundapus caudacutus*	High Sensitivity to Potential Gain	-	Vulnerable	VZ1, VZ2, VZ3, VZ4
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	High Sensitivity to Potential Gain	Vulnerable	-	VZ1, VZ2, VZ4

The presence of species outlined in Table 8 could not be discounted using the methodology outlined in Step 1 and Step 2 of Section 5.2 of the BAM. It was therefore assumed that these species may occur within the subject land.

3.5 SPECIES CREDIT SPECIES

A list of species credit species potentially occurring within the subject land was generated in accordance with Section 5.2 of the BAM, including information obtained from the Threatened Biodiversity Data Collection. An assessment of whether suitable habitat occurs within the subject land, and therefore whether a species is to be considered a candidate species credit species is also provided (Table 9 and Table 10). The identification of candidate species credit species was assessed in accordance with Sections 5.2 and 5.3 of the BAM.

Table 9 Candidate species credit species within the subject land

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
Asperula asthenes (Trailing Woodruff)	-	-	-	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).	High (2)	Vulnerable	Vulnerable	Potential habitat is present for this species.
Grevillea parviflora subsp. *Parviflora* (Small-flower Grevillea)	-	-	-	Sporadically distributed throughout the Sydney Basin with sizeable populations around Picton, Appin and Bargo (and possibly further south to the Moss Vale area) and in the Hunter at in the Cessnock – Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast.	High (2)	Vulnerable	Vulnerable	Potential habitat is present for species. Species records occurs within 5 km.
Tetratheca juncea (Black-eyed Susan)	-	-	-	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. Suitable habitat restricted to low nutrient, well drained soils on substrates that are generally sandy skeletal soil on sandstone or sandy-loam, or pH neutral clayey soil	High (2)	Vulnerable	Vulnerable	Potential habitat occurs for this species.

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
				from conglomerates. The annual rainfall is between 1000 – 1200 mm.				
Pterostylis chaetophora (Pterostylis chaetophora)	-	-	-	Recorded in Queensland and NSW. 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. There are also isolated records from the Sydney region. The species occurs in two conservation reserves, Columbey National Park and Wingen Maid Nature Reserve.	High (2)	Vulnerable	-	Potential habitat occurs for this species.
Burhinus grallarius (Bush Stone- curlew)	-	Fallen/standing dead timber including logs.	-	Species is mainly found in western slopes and plains and the Riverina, smaller numbers on Central and North Coast with increasing numbers in Tweed Valley.	High (2)	Endangered	-	Potential habitat occurs for this species.
Cercartetus nanus (Eastern Pygmy- possum)	-	-	-	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW, it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.	High (2)	Vulnerable	-	Potential habitat occurs for this species.
Hoplocephalus bitorquatus	-	-	-	A patchy distribution from north-east Queensland to the north-eastern quarter of NSW. In NSW it has historically been	High (2)	Vulnerable	-	Potential habitat occurs for this species.

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
(Pale- headed Snake)				recorded from as far west as Mungindi and Quambone on the Darling Riverine Plains, across the north west slopes, and from the north coast from Queensland to Sydney. A small number of historical records are known for the New England Tablelands from Glenn Innes and Tenterfield; however, the majority of records appear to be from sites of relatively lower elevation. Although the Pale-headed snake distribution is very cryptic, it now appears to have contracted to a patchy and fragmented distribution.				
Lathamus discolor (Swift Parrot)	Breeding	As per mapped areas.	-	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes.	Very High (3)	Endangered	Critically Endangered	Mapped Important Areas occur within the study area. Previous records occur within 1.1 km.
Litoria aurea (Green and Golden Bell Frog)	-	Within 1 km of wet areas. (semi-permanent / ephemeral wet areas). Within 1 km of swamp (swamps). Within 1 km of waterbody.	-	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations	High (2)	Endangered	Vulnerable	Potential habitat is present for this species. Species records occur within 1.5 km.

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
		While chytrid is a potential threat to some populations of the species, other populations are subject to manageable threats.		occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands.				
Litoria brevipalmata (Green- thighed Frog)	-	Semi-permanent / ephemeral wet areas. Swamps. Waterbodies.	-	Isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland.	Moderate (1.5)	Vulnerable	-	Potential habitat occurs for this species.
Myotis macropus (Southern Myotis)	-	Hollow bearing trees within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone. Waterbodies including rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site.	-	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	High (2)	Vulnerable	-	Abandoned building and existing bridge provides potential habitat within the subject land. Records occur within 600 m.

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
Pandion cristatus (Eastern Osprey)	Breeding	Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting.	-	The Osprey has a global distribution with four subspecies previously recognised throughout its range. However, recent studies have identified that there are two species of Osprey – the Western Osprey (*P. halietus*) with three occurring in Europe, Asia and the Americas and the Eastern Osprey (*P. cristatus*) occurring between Sulawesi (in Indonesia), Australia and New Caledonia. Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas.	Moderate (1.5)	Vulnerable	-	Potential habitat is present on site. Previous records occur within 2 km.
Petaurus norfolcensis (Squirrel Glider)	-	-	-	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	High (2)			Potential habitat is present on site. Records occur within 600 m.
Phascogale tapoatafa	-	-	-	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia.	High (2)	Vulnerable	-	Potential habitat is present on

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
(Brush-tailed Phascogale)				In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide.				site. A record occurs within 200 m.
Phascolarctos cinereus (Koala)	Breeding	Areas identified via survey as important habitat (as defined by the density of koalas and quality of habitat determined by on-site survey. Important habitat is not a mapped habitat area)	-	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.	High (2)	Vulnerable	Endangered	Potential habitat occurs on site. A number of records occur within the study area.

Species	Habitat Type	Habitat Constraints	Geographic Limitations	Threatened Biodiversity Data Collection habitats	Biodiversity Risk Weighting	NSW Listing Status	Commonwealth Listing Status	Justification
Planigale maculata (Common Planigale)	-	-	-	Coastal north-eastern NSW, coastal east Queensland and Arnhem Land. 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. The ecotonal zone is the boundary between a 'wet' PCT and a 'dry' PCT. Under drier conditions, the species moves into the lower elevation 'wet' PCT, and under wetter conditions it moves upslope to the higher elevation 'dry' PCT. Habitat includes hollow logs, under bark, rocks, cracks in soil, grass tussocks or building debris.	High (2)	Vulnerable	-	Potential habitat occurs on site.
Uperoleia mahonyi (Mahony's Toadlet)	-	-	-	Mahony's Toadlet is endemic to the mid-north coast of New South Wales (NSW) and to date has been found between Kangy Angy and Seal Rocks.	High (2)	Endangered	-	A number of records occurs within the locality. Nearest record is 1.4 km from the study area.

There were thirteen candidate species that were deemed to not require survey or associated offset credit requirements. These were excluded from further consideration; justification is provided in Table 10.

Table 10 Candidate species credit species that have been excluded.

Species	Habitat Type	Justification for Exclusion
Barking Owl (*Ninox connivens*)	Breeding	No tree hollows were identified within the study area. No records have been found within 10 km.
Black-tailed Godwit (*Limosa limosa*)	Breeding	Important habitat, as per the Migratory Shorebird Important Areas map, are not present within the study area or subject land
Broad-billed Sandpiper (*Limicola falcinellusi)*	Breeding	Important habitat, as per the Migratory Shorebird Important Areas map, are not present within the study area or subject land
Charmhaven Apple (*Angophora inopina*)	-	Typical vegetation communities that the species is associated with are not present on site, including • *Eucalyptus haemastoma – Corymbia gummifera – Angophora inopina* woodland/forest; • *Hakea teretifolia – Banksia oblongifolia* wet heath; • *Eucalyptus resinifera – Melaleuca sieberi – Angophora inopina* sedge woodland; • *Eucalyptus capitellata – Corymbia gummifera – Angophora inopina* woodland/forest This species has a geographic limitation to the Singleton or Cessnock LGAs as specified within the BAM Calculator. However, the study area is within the extent of the species known range. Nevertheless, records of this species do not occur within a 10km buffer of the study area and this species was not identified during field surveys.
Curlew Sandpiper (*Calidris ferruginea*)	Breeding	Important habitat, as per the Migratory Shorebird Important Areas map, are not present within the study area or subject land
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	Breeding	Species favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts. No hollows were identified within the subject land. Records of this species do not occur within a 10km buffer of the study area and this species was not identified during field surveys.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Breeding	This species is dependent on large hollow-bearing eucalypts for nest sites. Hollow bearing trees can be living or dead with hollows greater than 15 cm diameter and greater than 8 m above the ground. No hollows were identified in the study area. Glossy Black-Cockatoo feed almost exclusively on the seeds of several species of she-oak, particularly *Allocasuarina* species. Although the study area is dominated by *Casuarina glauca*, this is not one of the preferred she-oak species. Two records of this species are located within a 10 km buffer of the study area. One record is 370 m from the study area and the other is 1.2 km from the study area.
Great Knot (*Calidris tenuirostris*)	Breeding	Important habitat, as per the Migratory Shorebird Important Areas map, are not present within the study area or subject land
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Breeding	Roosting camps were not identified in the study area. The closest campsite identified is in Tomago. Sixty-six records occur within the 10 km buffer, with a number of these records occurring within 500 m of the study area.

Species	Habitat Type	Justification for Exclusion
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	Breeding	There are no caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding within the study area.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	-	This species roosts in caves, crevices in cliffs, old mine workings and in the disused mud nests of the Fairy Martin (*Petrochelidon ariel*). No caves, cliffs or old mine workings are present in the study area.
Little Bent-winged Bat (*Miniopterus australis*)	Breeding	There are no caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding within the study area.
Little Eagle (*Hieraaetus morphnoides*)	Breeding	Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. Paddock trees can provide important breeding habitat (there are examples of nest trees in ACT). Large, old trees were not identified within the site. Little Eagle was not observed within the study area. No stick nests were observed within the site.
Regent Honeyeater (*Anthochaera phrygia*)	Breeding	There are three known key breeding areas, two of them in NSW – Capertee Valley and Bundarra-Barraba regions. The study area isn't within either region. The study area is not mapped as an important area for the species. The species breeds within Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. These communities are not present on site.
Rough Doubletail (*Diuris praecox*)	-	Species grows on the hills and slopes while the study area is generally flat. The species is found near-coastal districts and existing records show that the species only occurs in close proximity to the coast. This species has a geographical limitation of the Newcastle LGA as specified within the BAM Calculator. The study area is not within the Newcastle LGA.
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Breeding	Breeding habitat for this species is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. Live, large, old trees were not identified within the study area. Stick nests were not identified within the study area. No White-bellied Sea-Eagles were observed within the study area. A record of this species from 1992 occurs on site, the meander survey included a traverse within 10 m of this point, where suitable breeding habitat for this was not observed.
Wallum Froglet (*Crinia tinnula)*	-	Although this species has previously been identified within Grahamstown Drain and Windeyers Creek, a waterbody with pH of <5.5 is required to provide suitable breeding and non-breeding habitat for this species (DPIE 2020d). The lowest pH measurement in the mining void was previously reported as 7.54. Where Grahamstown Drain bisects the subject land a pH of 7 has previously been reported (CES 2021a). As these recent waterbody identified pH measurements within the Grahamstown Drain are too basic, suitable breeding and non-breeding habitat is not considered present within the study area.

3.6 THREATENED SPECIES SURVEYS

Targeted flora and fauna surveys of the study area were undertaken on the 11th, 12th and 25th January 2022. Weather observations for each survey date are shown in Table 11.

Table 11 Weather observations during flora and fauna surveys (Raymond Terrace, NSW)

Survey Undertaken	Survey Date	Temperature (°C)		Humidity %	Cloud (eighths)	Wind	Rain (mm)
		Min.	Max.				
Targeted flora and fauna surveys	11/02/2022	21.5	30.1	71	8	Light	0
Targeted flora and fauna surveys	12/02/2022	19.3	27.3	81	8	Moderate	0
Targeted flora and fauna surveys	25/02/2022	18.3	26.3	65	2	Moderate	0

3.6.1 Threatened Flora Habitat and Survey

Despite past disturbance within the study area, the subject land is considered to be habitat for threatened flora. Historical and ongoing disturbance in the form of vegetation removal, grazing and invasion of exotic canopy as well as dense and smothering exotic plant species has degraded the habitats present. However, potential habitat can be found in the forested and less disturbed areas within the subject land.

Threatened flora surveys of the study area were undertaken in accordance with the *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b). This included a comprehensive survey of all vegetation zones within the subject land.

Targeted surveys extended along the subject land to adjoining vegetation (Figure 6). This additional survey was undertaken to determine whether threatened flora populations may occur outside the subject land and have potential to be indirectly impacted (e.g. as a result of edge effects) by the proposed development.

Candidate flora species credit species identified in Table 9 were not the subject of targeted surveys (assumed present). However, targeted surveys were performed for *Eucalyptus parramattensis* subsp. *decadens Maundia triglochinoides, Melaleuca biconvexa* (Biconvex Paperbark), *Persicaria elatior* (Tall Knotweed) and *Zannichellia palustris.* Since targeted surveys were undertaken within the appropriate survey period for these species, they are not considered to be present within the subject land. Targeted surveys did not record any threatened flora species within the subject land or in adjoining native vegetation.

3.6.2 Fauna Habitat Assessment and Field Survey

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed development contained microhabitats suitable to support the threatened fauna species outlined in Table 8 and Table 9 above.

Fauna habitat within the subject land occurs as a total of

- 4.03 hectares of PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast in low-moderate condition
- 1.32 hectares of PCT 1717 Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast in moderate-good condition
- 0.12 hectares of PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion in moderate condition, and
- 1. hectare of Exotic / Slashed Vegetation.

Habitat assessments for threatened species focussed on the presence/absence of the following features within the study area:

- Habitat trees including large and small hollow-bearing trees, availability of flowering shrubs and feed tree species.
- Condition of native vegetation and the presence of exotic species.
- Condition of waterways and associated habitat for aquatic threatened species.
- Quantity of ground litter and logs.
- Searches for indirect evidence of threatened species (e.g. scats, tracks, etc.).
- General degradation of the site as a result of past land management practices and lack of maintenance.

Candidate flora species credit species identified in Table 9 were not the subject of targeted surveys (assumed present). However, targeted surveys were performed for White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Little Eagle (*Hieraaetus morphnoides*) and Square-tailed Kite (*Lophoictinia isura*). The survey was within an appropriate time of year for Square-tailed Kite but not for White-bellied Sea-Eagle or Little Eagle. As surveys were performed for potential breeding habitat for each of these species, the timing is considered to be of little constraint. No suitable trees or nests were found to provide potential breeding habitat for White-bellied Sea-Eagle, Little Eagle or Square-tailed Kite. The Koala is considered likely to occur within the study area on occasion given the presence of feed tree species (outside the subject land) and recent records within five kilometres.

3.6.3 Threatened Species Polygons

Threatened species polygons have been prepared for the following species credit species for the subject land:

- Trailing Woodruff *(Asperula asthenes)*, Black-eyed Susan (*Tetratheca juncea*) and *Pterostylis chaetophora* within
    - PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest (low-moderate and moderate-good condition)
    - PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (moderate condition) and
    - Exotic dominated areas (Figure 10).
- Small-flower Grevillea (*Grevillea parviflora subsp. parviflora*), within
    - PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest (low-moderate and moderate-good condition)
    - PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion in moderate condition (Figure 10).
- Bush Stone-curlew (*Burhinus grallarius*), Eastern Pygmy-possum (*Cercartetus nanus*), Pale-headed Snake (*Hoplocephalus bitorquatus*),) and Mahony's Toadlet (*Uperoleia mahonyi*) within
    - PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest (low-moderate and moderate-good condition)
    - PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion in moderate condition and
    - Exotic dominated areas (Figure 11)
- Eastern Osprey (*Pandion cristatus*), Squirrel Glider (*Petaurus norfolcensis*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Koala (*Phascolarctos cinereus*), and Common Planigale (*Planigale maculata)* within
    - PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest (low-moderate and moderate-good condition)
    - PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion in moderate condition (Figure 11).
- Green and Golden Bell Frog (*Litoria aurea*) and Southern Myotis (*Myotis macropus*) within
    - 200 metres of Grahamstown Drain (Figure 12)
- Green- thighed Frog (*Litoria brevipalmata*) within
    - 100 meters of Grahamstown Drain (Figure 12)
- The Swift Parrot is presumed to be present based on the Draft Swift Parrot Important Areas map. The Draft Swift Parrot Important Areas map includes

- mapped PCT 1717 Broad-leaved Paperbark – Swamp mahogany – Swamp Oak – Saw Sedge swamp forest in low-moderate condition areas (Figure 13).

The method for calculating species polygons is outlined in Table 17.

STAGE 2: IMPACT ASSESSMENT (BIODIVERSITY VALUES AND PRESCRIBED IMPACTS)

4.0 AVOID AND MINIMISE IMPACTS

This section identifies the potential impacts of proposed development on the biodiversity values of the subject land and broader study area and describes measures to avoid and minimise impacts on those biodiversity values.

4.1 ACTIONS TO AVOID/MINIMISE IMPACTS

The main way to reduce impacts on biodiversity values within the study area is to avoid and minimise removal of native vegetation and associated habitat for threatened species. Additional measures to minimise and mitigate indirect and off-site or downstream impacts during construction and operation of the proposed development have also been identified.

4.1.1 Site Selection and Planning

The footprint of the subject land has been selected, in part, to minimise impacts to native vegetation and flora and fauna habitats present within the broader study area. Biodiversity values identified during the ecological assessment included:

- Native vegetation consistent with the Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC (Endangered; BC Act) and Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland EEC (Endangered; EPBC Act) within the study area (Figure 4).
- Native wetland vegetation consistent with the Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC (Endangered; BC Act) within the study area (Figure 4).
- A post quarry void, now filled with water, is the dominant feature of the study area.
- One greater than fourth-order waterway (Grahamstown Drain) flowing from the north-east to the south-west of the study area.
- Semi-mature to mature Koala feed trees (*E. robusta* and *E. tereticornis*) occur within the south-western extent of the study area.
- Potential foraging habitat for a number of BC Act and EPBC Act listed threatened fauna.

Key design elements were altered in the early design phase to reduce direct impacts to better condition threatened ecological communities and native vegetation where practicable, focusing on impacts within the part of the study area containing lower condition threatened ecological communities and native vegetation, non-native vegetation and previously disturbed areas adjoining existing residential areas and roadways.

The subject land is located such that direct impacts to better condition Swamp Sclerophyll Forest EEC and the moderate condition Freshwater Wetlands EEC is minimised and most of the existing native vegetation is maintained. Moreover, indirect impacts to any better condition remnant vegetation adjoining the subject land are able to be minimised through fenced 'no-go zones' and careful management of tree management zones (TMZs), limiting impacts to the better condition EEC vegetation to only that which can't be avoided as a result of proposed works.

Where practicable, the proposed development within the subject land has been positioned to ensure maintenance of habitat connectivity for native species and minimisation of direct impacts to remnant vegetation within the study area.

The proposed development has been able to restrict direct impacts to:

- Removal of one hectare of exotic / slashed vegetation which is heavily disturbed, not consistent with any threatened ecological communities and provides limited foraging resources for threatened fauna species.
- Removal of PCT 1717 Broad-leaved Paperbark - Swamp mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast, consistent with Swamp Sclerophyll Forest EEC, in line with the following:
    - Low-moderate condition – 4.03 hectares to be removed
    - Moderate-good condition – 1.32 hectares to be removed.

- Removal of 0.12 hectares of moderate condition PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion, consistent with Freshwater Wetlands EEC.

4.1.2 Construction

Direct and indirect impacts to biodiversity values retained within the subject land and adjoining the subject land may occur if adequate mitigation and management measures are not in place during construction of the proposed development.

The mitigation and management measures listed in Table 12, are to be implemented in order to mitigate and manage potential direct and indirect impacts during construction.

Table 12 Mitigation measures to be implemented to avoid and minimise impacts of the proposal

Impact	Mitigation	Timing	Responsibility
General	All workers are to be provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity and penalties for breaches.	Prior to clearing/construction works.	Construction contractor
	Prepare a flora and fauna management sub-plan as part of a Construction Environmental Management Plan (CEMP), incorporating recommendations below, and expanding on specific details where necessary.	Prior to clearing/construction works.	Construction contractor
	A Vegetation Management Plan (VMP) will be required in order to guide the restoration or rehabilitation of the riparian corridor established by way of the retained VRZ extending 40 metres from the top of bank from Grahamstown Drain. Alternatively, vegetation to be retained within the study area (i.e. Lot 232 DP593512), that is not subject to any future proposed developments, may potentially be established as a future Biodiversity Stewardship Site for the purposes of offsetting the loss of native vegetation from the project. Establishment as a Biodiversity Stewardship Site effectively conserves this retained native vegetation in perpetuity, with future potential to improve vegetation integrity.	Prior to clearing/construction works.	Qualified ecologist
Vegetation clearing	Limit disturbance of vegetation to the minimum necessary to undertake the proposal.	Prior to works commencing.	Construction contractor
	Prior to the commencement of any work in or adjoining areas of native vegetation, a survey would be carried out to mark the construction impact boundary. The perimeter of this area will be fenced using high-visibility fencing and clearly marked as the limits of clearing. All vegetation outside this fence line will be clearly delineated as an exclusion zone to avoid unnecessary vegetation and habitat removal. Fencing and signage must be maintained for the duration of the construction period. Fencing should be designed to allow fauna to exit the site during clearing activities. Native trees and vegetation to be retained on site is to be protected in accordance with *Development Control Plan 2014 Guidelines – Tree Preservation and Native Vegetation Management Guidelines (Section 6)* and the *Australian Standard AS4970-2009 – Protection of Trees on Development Sites*.	Prior to clearing / Daily inspections of exclusion zones during works in area.	Construction contractor and qualified ecologist
	Stockpiles of soil or vegetation should be placed within existing cleared areas (and not within areas of adjoining native vegetation).	Prior to clearing/ construction works.	Construction contractor
	Sedimentation and erosion control measures including silt fencing, sediment traps, etc. to prevent sediment-laden stormwater exiting the construction areas and to prevent scouring and erosion of land beyond the development footprint. All erosion and sediment control measures are to be constructed and installed in accordance with relevant guidelines, are to be regularly maintained for the duration of the construction period and are to be carefully removed at completion of works. Sediment and erosion control measures should follow recommendations of The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004). Dust suppression measures to ensure dust deposition beyond the construction area is minimised.	Prior to clearing/ construction works.	Construction contractor
Introduction of Weeds	Develop a weed and pest species management sub-plan as part of project CEMP to manage weeds and pathogens during the construction and operational phase of the proposal.	Prior to clearing/ construction works.	Construction contractor

Impact	Mitigation	Timing	Responsibility
and Pathogens	The location and extent of any priority and/or high threat environmental weeds within the site will be identified by a suitably qualified ecologist during pre-clearance surveys. The introduction and spread of weed species will be minimised by restricting access to areas of native vegetation and communicating the responsibilities of all Project personnel at site inductions and during regular toolbox meetings. All priority weeds identified on the site will be controlled and removed in accordance with the requirements of the *Biosecurity Act 2016* and Council's relevant Weed Control Manuals. Appropriate pesticides will be applied if required and a record of such application made in the pesticide application register. All priority and environmental weeds will be cleared and stockpiled separately to all other vegetation, removed from site and disposed of at an appropriately licenced disposal facility. When transporting weed waste from the site to the waste facility, trucks must be covered to avoid the spread of weed-contaminated material. Disposal must be documented, and evidence of appropriate disposal must be kept.	Prior to clearing/ construction works.	Construction contractor and qualified ecologist
	All machinery entering the site must be appropriately washed down and disinfected prior to work on site to prevent the potential spread of weeds, Cinnamon Fungus (*Phytophthora cinnamomi*) and Myrtle Rust (*Pucciniales fungi*) in accordance with the national best practice guidelines for Phytophthora (O'Gara et al. 2005) and the Myrtle Rust factsheet (DPI 2015) for hygiene control.	Prior to any plant or machinery being brought onto the site.	Construction contractor
	Incorporate control measures in the design of the proposal to limit the spread of weed propagules downstream of subject land. Sediment control devices, such as silt fences, would assist in reducing the potential for spreading weeds.	Prior to clearing/ throughout construction works.	Construction contractor
Removal of fauna habitat	Protocols to prevent introduction or spread of chytrid fungus should be implemented following Office of Environment and Heritage Hygiene protocol for the control of disease in frogs (DPIE, 2020c).	Prior to clearing throughout construction works.	Construction contractor
	A suitably qualified ecologist should be present during the clearing of native vegetation or removal of potential fauna habitat to avoid impacts on resident fauna and to salvage habitat resources for relocating in the adjoining habitat as far as is practicable. Clearing surveys should include the following:	Prior to and during clearing works.	Qualified ecologist
	Staged vegetation clearing, commencing with the exotic dominated vegetation to increase the opportunity for fauna to vacate the site and disperse into areas of adjoining habitat to evade injury. Where appropriate native vegetation cleared from the study area should be mulched for re-use on the site, to stabilise bare ground. Soil stockpiles are to be placed away from, and ideally downslope of, receiving water bodies and drainage lines. Security lighting within the construction site is to be minimised and where required, is to be oriented such that light spill beyond the subject land and into patches of retained vegetation is minimised.	During clearing phase.	Construction contractor
	Pre-clearance fauna surveys, undertaken in accordance with the following procedure: Prior to the commencement of any clearing activities, an initial pre-clearance survey of the site will be undertaken by a suitably qualified ecologist inclusive of a search for any Koalas or Swift Parrots. Relevant protocols for the pre-clearance fauna surveys will need to be developed as part of a Flora and Fauna sub-plan for the CEMP.	Prior to and during clearing works.	Qualified ecologist

Impact	Mitigation	Timing	Responsibility
	The location of significant environmental or priority weed infestations would also be identified and communicated to the contractor.		
	A suitably qualified and appropriately licenced ecologist is to be present during clearing of all native vegetation to ensure felling of trees is carried out in an appropriate manner, and that any fauna present can be rescued and relocated. Appropriate fauna 'capture and release' techniques will be implemented. During the removal of any identified sensitive habitat, a suitably qualified and experienced ecologist will be present, with appropriate animal-handling equipment and holding containers.	During clearing phase.	Qualified ecologist
	A suitably qualified and appropriately licenced ecologist will be present during the clearance of all native vegetation and/or fauna habitats. Animals that require handling must not be approached or handled until the ecologist is present, unless in an emergency (e.g. when there are both no authorised persons present and where the failure to immediately intervene would place the animal at significant risk). In such an emergency, the site manager may obtain over the phone instructions from the project ecologist to ameliorate the situation. A wildlife rescue organisation (e.g. WIRES or Sydney Wildlife) should be made aware of operations in case any injured fauna are found.	During clearing phase.	Qualified ecologist
	All animals encountered will be treated humanely, ethically, and in accordance with relevant codes under the *NSW Prevention of Cruelty to Animals Act 1979*, including: • Australian code of practice for the care of animals for scientific purposes (NHMRC, 2013). • Code of practice for the welfare of wildlife during rehabilitation (Victoria, 2001). • Animal ethics considerations and protocols outlined in this document. • If the project ecologist considers an animal is at risk of injury or undue stress, it is to be gently directed into secure adjoining habitat. Where deemed necessary by the project ecologist, the animal may be required to be captured and released. Capture and release operations will proceed via the following protocols: • All construction activities that are considered by the project ecologist be likely to increase the risk of injury, mortality or stress to the animal will be halted until the animal has been removed, which will be enforced with the co-operation of the Contractor. Construction activities that do not contribute to the risk of injury, mortality or stress to the animal can continue (as determined by the project ecologist). • Only qualified ecologists or wildlife carers are authorised to handle animals. • Animals will be captured (if required) by the project ecologist using a safe and ethical technique, as is appropriate for the particular species (see below). Native animals that are unable to depart of their own accord will be captured and held in a receptacle appropriate for that species until release. All captive-held animals will be provided with food, water and warmth as is appropriate for the species. Each receptacle will only hold one animal at a time and will be cleaned and disinfected between use to avoid the spread of disease. • Any fauna relocated from trees, shrubs or other areas would be recorded.	During clearing phase.	Qualified ecologist
	The construction contractor is to contact the Project ecologist for advice if any unexpected fauna is found during the construction period (i.e. following clearing of native vegetation when the Project ecologist is no longer on site).	During clearing phase.	Construction contractor

Impact	Mitigation	Timing	Responsibility
	A post-clearing report will be prepared documenting all animals that are handled, or otherwise managed, within the site. Data to be recorded includes: • Date and time of the sighting and details of the observer • Species • Number of individuals recorded • Adult/juvenile • Condition of the animal (living/dead/injured/sick) • Management action undertaken (e.g. captured, handled, taken to vet) • Results of any management actions (e.g. released, placed in a nest box, euthanised, placed with carer)	Post-clearing phase.	Construction contractor/ Qualified ecologist
Water Quality and aquatic habitats	Erosion and sediment control plans should be prepared in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004). The erosion and sediment control plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase.	Prior to construction commencing.	Construction contractor
	Erosion and sediment control controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality.	Weekly during construction phase or after any significant rainfall event.	Construction contractor
	Stabilised surfaces should be reinstated as quickly as practicable after construction.	Immediately following clearing.	Construction contractor
	Appropriate speeds are to be enforced to limit dust generation and minimise chances of fauna mortality through vehicle strike.	During construction.	Construction contractor
	All stockpiled material should be stored in bunded areas and, where practicable, kept away from waterways to avoid sediment or contaminants entering the waterway.	During construction.	Construction contractor
	Spill kits would be made available to construction vehicles. A management protocol for accidental spills would be put in place.	During construction.	Construction contractor

4.2 ASSESSMENT OF UNAVOIDABLE IMPACTS

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a). The following direct and indirect impacts are unable to be avoided in progressing the proposed development.

4.2.1 Direct Impacts

Direct impacts arising from the project include:

- Removal of 1.00 hectare of exotic / slashed vegetation which is heavily disturbed, not consistent with any threatened ecological communities and provides limited foraging resources for threatened fauna species.
- Removal of PCT 1717 Broad-leaved Paperbark - Swamp mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast, consistent with Swamp Sclerophyll Forest EEC listed under the BC Act and Coastal Swamp Sclerophyll Forest listed under the EPBC Act (Figure 4), in line with the following:
    - Low-moderate condition – 4.03 hectares to be removed
    - Moderate-good condition – 1.32 hectares to be removed.
- Removal of 0.12 hectares of moderate condition PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion, consistent with Freshwater Wetlands EEC.
- Removal of 6.47 hectares of assumed habitat for:
    - *Asperula asthenes* (Trailing Woodruff)
    - *Tetratheca juncea* (Black-eyed Susan)
    - *Pterostylis chaetophora*
    - Bush Stone-curlew (*Burhinus grallarius*)
    - Eastern Pygmy-possum (*Cercartetus nanus*)
    - Pale-headed Snake (*Hoplocephalus bitorquatus*)
    - Mahony's Toadlet (*Uperoleia mahonyi*)
    - Common Planigale (*Planigale maculata*)
- Removal of 5.47 hectares of assumed habitat for:
    - *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea)
    - Squirrel Glider (*Petaurus norfolcensis*)
    - Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Removal of 4.84 hectares of assumed habitat for:
    - Southern Myotis (*Myotis macropus*)
- Removal of 5.83 hectares of assumed habitat for:
    - Green and Golden Bell Frog (*Litoria aurea*)
- Removal of 2.81 hectares of assumed habitat for:
    - Green-thighed Frog (*Litoria brevipalmata*)
- Removal of 5.47 hectares of assumed breeding habitat for:
    - Koala (*Phascolarctos cinereus*)
- Removal of 4.84 hectares of assumed breeding habitat for:
    - Eastern Osprey (*Pandion cristatus*)
- Removal of 0.12 hectares of mapped important habitat for:
    - Swift Parrot (*Lathamus discolor*).

These impacts will be permanent, will occur from the outset of the development and represent the result of efforts to avoid and minimise impacts at the project design phase. Mitigation measures outlined in Section 4.1 above will help to minimise the potential impacts to biodiversity values that remain present within the study area.

The effect of the above-described direct impacts on vegetation integrity of native vegetation within the subject land is summarised in Table 16.

4.2.2 Indirect Impacts

Potential indirect impacts arising from the project are outlined and addressed in Table 13 below. Consideration of indirect impacts was undertaken across an area encompassed by a 1500 metre buffer around the study area and included consideration of the proposed development within the subject land.

Table 13 Assessment of indirect impacts

Indirect impact	Assessment / likelihood of occurrence
Inadvertent impacts on adjacent habitat or vegetation.	The proposed development is unlikely to result in inadvertent impacts on adjacent retained habitat or vegetation. Mitigation measures implemented during the construction of the project will ensure no encroachment to adjacent vegetation and habitat by construction workers.
Reduced viability of adjacent habitat due to edge effects.	The proposed development will not result in a significant increase in edge effects impacting upon the retained vegetation. The subject land has been historically impacted and as such edge effects have been an ongoing impact to the vegetation that is to be retained within the study area. The proposed development will increase edge effects to the remaining vegetation within the study area. The vegetation to be impacted is located such that direct impacts to better condition Swamp Sclerophyll Forest EEC and the moderate condition Freshwater Wetlands EEC is minimised and most of the existing native vegetation is maintained. As such any increased edge effects are expected to result in negligible impacts.
Reduced viability of adjacent habitat due to noise, dust or light spill.	Mitigation measures outlined above and standard construction environmental controls will ensure potential impacts are minimised. Light spill from the adjacent residential area, nearby road and water treatment plant currently occurs around the study area.
Transport of weeds and pathogens from the subject land to adjacent vegetation.	The potential introduction and spread of weeds and pathogens will be managed through implementation of weed hygiene controls as part of a CEMP during construction.
Increased risk of starvation, exposure and loss of shade or shelter.	Where practicable, the proposed development has been carefully positioned away from adjacent habitats and is therefore unlikely to increase the risk of starvation, exposure and loss of shade or shelter.
Loss of breeding habitats.	The proposed development avoids impacts on hollow-bearing trees. The proposal will however require removal of 5.47 hectares of assumed breeding habitat for Koala (*Phascolarctos cinereus*) and removal of 4.84 hectares of assumed breeding habitat for Eastern Osprey (*Pandion cristatus*). The proposal will also require removal 0.12 hectares of mapped important habitat for Swift Parrot (*Lathamus discolor*). However, due to the area of the subject land, the equivalent or better habitat available in the adjoining locality and the scale of the project, impacts are considered negligible.
Trampling of threatened flora species.	No threatened flora species were recorded within the subject land or study area. However, the proposal will require removal of 6.47 hectares of assumed habitat for *Asperula asthenes* (Trailing Woodruff), *Tetratheca juncea* (Black-eyed Susan) and *Pterostylis chaetophora*. The proposal will also require removal of 5.47 hectares of assumed habitat for *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea).

Indirect impact	Assessment / likelihood of occurrence
Inhibition of nitrogen fixation and increased soil salinity.	The proposed development will not result in the removal of a substantial area of native vegetation. There are large patches of native vegetation, both within and adjacent to the study area, that will not be impacted. As such it is not considered likely that nitrogen fixation or soil salinity will be impacted such that adjacent habitat will be negatively affected.
Fertiliser drift	The proposed development will not result in fertiliser application. As such it is not considered likely that fertiliser drift would be an issue.
Rubbish dumping.	The CEMP will clearly set out waste management areas and procedures during the proposed works.
Wood collection.	It is considered unlikely those persons who will work at the study area will collect wood from the retained vegetation.
Removal and disturbance of rocks, including bush rock	The study area does not contain any bush rocks.
Increase in predatory species populations.	Waste management measures implemented as part of the CEMP will mitigate the potential increase in predator species populations.
Increase in pest animal populations.	It is unknown whether pest animals are currently being controlled within the area however the proposed development is unlikely to result in an increase in pest animals.
Change in fire regimes	The construction and operation of the proposed development is unlikely to lead to a substantial change in the fire regime of adjacent vegetation and habitats.
Disturbance to specialist breeding and foraging habitat.	The proposal will implement appropriate measures to ensure the impacts that occur within the subject land do not impact other parts of the study area or adjoining lands. Assuming that the appropriate mitigation measures are implemented, indirect impacts on specialist breeding and foraging habitat are not anticipated to occur as a result of the proposal.
Fragmentation of movement corridors and riparian zone.	Vegetation to be removed within the subject land consists of an already fragmented movement corridor linking habitats surrounding the study area to native vegetation to the south and east. Removal of 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, is not considered likely to result in substantial or significant adverse impedance to fauna species that may use the corridor for dispersal. Nevertheless, due to its position in the landscape, the vegetation to be removed will result in the loss of a portion of a linking vegetated corridor, decreasing overall corridor functionality. However, corridor and connective habitat which permits fauna movement between large areas of habitat will be maintained to the immediate south of the study area in an east-west direction.
Contamination to adjacent waterways	Accidental runoff contamination originating from the subject land can be avoided, minimised and mitigated by implementing sedimentation and erosion control measures (refer to Section 4.1) (Landcom 2004).

4.2.3 Prescribed Impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 14 below and identified on Figure 7.

Table 14 Assessment of prescribed impacts

Prescribed impact	Assessment / likelihood of occurrence
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No karst, caves, crevices, cliffs and other features of geological significance will be impacted by the proposed works and no threatened species associated with these features were recorded during the assessment. No bush rock will be impacted by the proposed works and no threatened species associated with this habitat feature were recorded during the assessment.
Human-made structures or non-native vegetation	No human made structures will be impacted by the proposed works and no threatened species associated with this habitat feature were recorded during the assessment. The non-native and degraded vegetation within the subject land and broader study area is unlikely to provide preferred threatened species habitat known or likely to occur in the locality. It is possible some highly-mobile threatened species including threatened frogs, raptors and large forest owls may forage in areas of non-native and degraded vegetation from time to time. These species include, Eastern Grass Owl (*Tyto longimembris*), Eastern Osprey (*Pandion cristatus*), Green and Golden Bell Frog (*Litoria aurea*), Green- thighed Frog (*Litoria brevipalmata*), Spotted Harrier (*Circus assimilis*), Square-tailed Kite (*Lophoictinia isura*) and White-bellied Sea-Eagle (*Haliaeetus leucogaster*). However, similar habitat is extensive in the locality and subregion. The loss of this non-native and degraded vegetation is expected to result in negligible impact to threatened species.
Habitat connectivity	Vegetation to be removed within the subject land consists of an already fragmented movement corridor linking habitats surrounding the study area to native vegetation to the south and east. Removal of 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, is not considered likely to result in substantial or significant adverse impedance to fauna species that may use the corridor for dispersal. Nevertheless, due to its position in the landscape, the vegetation to be removed will result in the loss of a portion of a linking vegetated corridor, decreasing overall corridor functionality. However, corridor and connective habitat which permits fauna movement between large areas of habitat will be maintained to the immediate south of the study area in an east-west direction.
Water bodies, water quality and hydrological processes	Consistent with Figure 7, the south-eastern corner of the subject land is mapped to extend marginally over Grahamstown Drain, which is verified from the aerial imagery. Threatened species that could utilise the Grahamstown Drain include, Freckled Duck (*Stictonetta naevosa*), Green and Golden Bell Frog (*Litoria aurea*), Green- thighed Frog (*Litoria brevipalmata*), Magpie Goose (*Anseranas semipalmata*). There is an anomaly in that the available mapped route of this waterway is slightly east of this location. It is likely that in the design stage the subject land was drawn so as to not extend over Grahamstown Drain, but was not verified either in the field or with detailed aerial imagery. It is not anticipated that this waterway will form part of the subject land. In any case, provided appropriate mitigation measures listed in Section 4.1 are adopted, construction of the proposed development is not expected to substantially alter the groundwater or surface hydrology that sustains threatened species and threatened ecological communities including Swamp Sclerophyll Forest and Freshwater Wetland EECs.
Wind turbine strikes	The proposed development does not include operation of wind turbines.

Prescribed impact	Assessment / likelihood of occurrence
Vehicle strikes	The proposed development will result in increased vehicle movements within the study area, during construction works. As such, the construction works may increase the existing risk of vehicle strike to threatened fauna present under existing vehicle usage regime. Measures proposed to increase awareness and reduce vehicle speeds in the vicinity of the study area are expected to result in an overall negligible increase in risk to threatened fauna from vehicle strike.

4.3 ADAPTIVE MANAGEMENT STRATEGY

In order to appropriately address the potential impacts of the proposal on biodiversity as discussed in Section 4.1, the mitigation and management measures outlined in Table 15 would be implemented as part of the CEMP for the site. Table 15 has been prepared with reference to section 9.3 of the BAM and includes an assessment of the risk of these mitigation measures not succeeding and adaptive management responses to address any consequences.

Further detail regarding environmental management and mitigation measures would be provided in the CEMP for the proposal, which would be further developed and updated once the proposed development layout has been confirmed. The CEMP would include details of a monitoring program to help identify any shortfalls in the implementation of the proposed mitigation measures and appropriate management responses.

Table 15 Adaptive Management Strategy measures

Impact	Mitigation	Timing	Responsibility	Risk	Adaptive Management Response
Subject land management	Enforcement of legal obligations to control priority weeds within the subject land to prevent the spread of propagules into adjacent areas of native vegetation.	In perpetuity	Land owner/s	Increased extent or cover of priority weeds.	Periodic monitoring and adaption and/or intensification of weed control activities.
	Street lighting and security lighting to be designed to direct light away from adjoining bushland areas and to limit the impacts of light spill on native fauna habitats. Lighting design must identify and adopt technologies that are least likely to adversely affect fauna use of habitat through impacts such as disruption of microbat foraging. This should consider light colour and intensity, provision of light shields and other measures as appropriate to the position of lighting relative to offsite habitats.	In perpetuity	Land owner/s	Disruption of fauna use of habitat.	Modification of lighting design.
Management of Vegetation	A Vegetation Management Plan (VMP) will be required in order to guide the restoration or rehabilitation of the riparian corridor established by way of the retained VRZ extending 40 metres from top of bank of Grahamstown Drain. Alternatively, vegetation to be retained within the study area (i.e. Lot 232 DP593512), that is not subject to any future proposed developments, may potentially be established as a future Biodiversity Stewardship Site for the purposes of offsetting the loss of native vegetation from the project. Establishment as a Biodiversity Stewardship Site effectively conserves this retained native vegetation in perpetuity, with future potential to improve vegetation integrity.	Annual monitoring reports consistent with Port Stephen Council requirements	Land owner	Further degradation of vegetated riparian zone.	Annual monitoring of condition and further rehabilitation of riparian corridors.

5.0 IMPACT SUMMARY

5.1 THRESHOLDS FOR ASSESSMENT AND OFFSETTING

This section outlines the thresholds for assessment and offsetting in accordance with Section 9 of the BAM.

5.1.1 Serious and Irreversible Impacts on Biodiversity Values

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles set out in Section 6.7 of the BC Regulation.

The principles are aimed at capturing impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales. These include impacts that will:

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

A set of criteria have been developed and are included in the DPIE Guidelines to assist a decision-maker to determine a serious and irreversible impact (SAII) (DPIE, 2019a). Threatened biota that meet the criteria under one or more of the above principles have been identified as SAII entities and are listed in the fore mentioned document. Each potential SAII entity has an impact threshold identified which can be used to help determine if a development will result in SAII.

The criteria for identifying potential SAII entities based on consideration of these principles are listed in Appendix 1 of the Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE, 2019a). The threatened entities which were recorded on site were considered against the principles and criteria.

The Swift Parrot meets principle 1 (evidence of rapid decline) listed on the Serious and Irreversible Impacts webpage (DPIE, 2019b). The area of habitat for Swift Parrot has been identified based on the Swift Parrot Important Area map. Based on this mapping, the Swift Parrot is presumed to potentially utilise part of the subject land for foraging. The Important Areas map for Swift Parrot is still in draft form and subject to change.

An assessment of impacts on this SAII entity is included in Appendix 3 in accordance with the 'additional impact assessment provisions for ecological communities' listed in section 9.1 of the BAM. The proposal would result in a relatively small area of habitat which is included in the Important Areas mapping for this species. DPIE will make a determination of whether the proposal's impacts on Swift Parrot comprises a SAII in their consideration of this BDAR.

As it is not known if the species could occur within the subject land, mitigation measures will be implemented prior to construction within the area shown on the Swift Parrot Important Area map and in Figure 13. These measures include conducting surveys for Swift Parrot in conjunction with advice and records from DPIE and Birdlife Australia (who have prepared the mapping based on monitoring data since 2000).

5.1.2 Impacts Requiring Offsets

As outlined in Section 9.2.1 of the BAM, an offset is not required for impacts on native vegetation where the vegetation integrity score is:

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

The effect of the above describe direct impacts on vegetation integrity of native vegetation within the subject land is summarised in Table 16.

Table 16 Loss in vegetation zone integrity score

PCT	Vegetation Zone	Comp	Structure	Function	Vegetation integrity	Comp	Structure	Function	Integrity score	Change in Integrity score	Rationale for change
		Before development (Current)				After development (Future)					
1717	VZ1	16.9	15	52.9	**23.8**	0	0	0	0	**-23.8**	Vegetation is to be permanently removed.
1717	VZ2	28.8	42.1	78.2	**45.6**	0	0	0	0	**-45.6**	
1071	VZ3	34.2	65.5	N/A	**47.4**	0	0	0	0	**-47.4**	
1717 (Exotic)	VZ4	45.8	7.5	11.2	**15.6**	0	0	0	0	**-15.6**	

Impacts to native vegetation and threatened species

The proposed subject land will result in impacts:

Direct impacts:

- Removal of 1.00 hectare of exotic / slashed vegetation which is heavily disturbed, not consistent with any threatened ecological communities and provides limited foraging resources for threatened fauna species.
- Removal of PCT 1717 Broad-leaved Paperbark - Swamp mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast, consistent with Swamp Sclerophyll Forest EEC listed under the BC Act and Coastal Swamp Sclerophyll Forest listed under the EPBC Act (Figure 4), in line with the following:
    - Low-moderate condition – 4.03 hectares to be removed
    - Moderate-good condition – 1.32 hectares to be removed.
- Removal of 0.12 hectares of moderate condition PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion, consistent with Freshwater Wetlands EEC.
- Removal of 6.47 hectares of assumed habitat for:
    - *Asperula asthenes* (Trailing Woodruff)
    - *Tetratheca juncea* (Black-eyed Susan)
    - *Pterostylis chaetophora*
    - Bush Stone-curlew (*Burhinus grallarius*)
    - Eastern Pygmy-possum (*Cercartetus nanus*)
    - Pale-headed Snake (*Hoplocephalus bitorquatus*)
    - Mahony's Toadlet (*Uperoleia mahonyi*)
    - Common Planigale (*Planigale maculata*)
- Removal of 5.47 hectares of assumed habitat for:
    - *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea)
    - Squirrel Glider (*Petaurus norfolcensis*)
    - Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Removal of 4.84 hectares of assumed habitat for:
    - Southern Myotis (*Myotis macropus*)
- Removal of 5.83 hectares of assumed habitat for:
    - Green and Golden Bell Frog (*Litoria aurea*)
- Removal of 2.81 hectares of assumed habitat for:
    - Green-thighed Frog (*Litoria brevipalmata*)
- Removal of 5.47 hectares of assumed breeding habitat for:
    - Koala (*Phascolarctos cinereus*)
- Removal of 4.84 hectares of assumed breeding habitat for:

    - Eastern Osprey (*Pandion cristatus*)
- Removal of 0.12 hectares of mapped important habitat for:
    - Swift Parrot (*Lathamus discolor*).

The vegetation integrity score for VZ1, VZ2 and VZ3 within the subject land is greater than 15; therefore, impacts on these TEC-aligned PCTs will require offsetting. The vegetation integrity score for VZ4 is less than 15; therefore, impacts on this exotic / slashed vegetation which is not associated with any TEC does not require offsets.

Species polygons have been prepared for all flora and fauna species credit species that are assumed to be present, or are likely to use the suitable habitat at the subject land (DPIE 2020a). The species polygons identify the areas of suitable habitat for a species credit species on the subject land (Figure 10, Figure 11, Figure 12 and Figure 13).

The species polygons were mapped following the protocols for each species listed in the Threatened Biodiversity Data Collection in accordance with the BAM. The methods for calculating the species polygons for the species credit species recorded within the subject land are provided in Table 17 below.

Refer to Section 6.0 of this BDAR for biodiversity credit requirements.

Table 17 Method for calculating species polygons

Species Credit	Type	Method
Trailing Woodruff (*Asperula asthenes*)	Area	The habitat area of these species is used as the unit of measurement to calculate species credits in the BAM Calculator. Targeted surveys for these species were not undertaken in accordance with the survey guidelines for threatened flora (DPIE 2020). The species occurs in damp sites, often along river banks. Assumed present in VZ1, VZ2, VZ3 and VZ4.
Black-eyed Susan (*Tetratheca juncea*) *Pterostylis chaetophora*	Area	The habitat area of these species is used as the unit of measurement to calculate species credits in the BAM Calculator. Targeted surveys for these species were not undertaken in accordance with the survey guidelines for threatened flora (DPIE 2020). These species can occur in a variety of habitats including disturbed environments. Assumed present in VZ1, VZ2, VZ3 and VZ4.
Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*)	Area	Targeted surveys for this species were not performed however, as it is an erect shrub it is expected that surveys would have detected this species within exotic areas even outside the survey period. Assumed present in VZ1, VZ2 and VZ3.
Squirrel Glider (*Petaurus norfolcensis*) Brush-tailed Phascogale (*Phascogale tapoatafa*)	Area	Each of these species rely on trees and hollows for foraging and nesting habitat. This species was excluded from VZ4, as these areas were dominated by exotic vegetation with only few exotic trees lacking hollows. Presence was assumed within VZ1, VZ2 and VZ3; polygon was drawn to the outer edge of the PCT as per TBDC.
Koala (*Phascolarctos cinereus*)	Area	The Koala Habitat Planning Map for the Port Stephens LGA was not consistent with on ground conditions, possibly due to the coarse scale of mapping and the sites history as a mine. Koala habitat was mapped for the study area as per CKPoM. This involved identifying preferred Koala feed trees, developing preferred Koala habitat, Supplementary habitat as well as applying the required buffers and linkages as appropriate. Presence is assumed in supplementary vegetation in VZ1, VZ2 and VZ3.

Species Credit	Type	Method
Eastern Osprey (*Pandion cristatus*)	Area	The survey was performed outside the appropriate survey period for this species. Eastern Osprey require living or dead trees greater than 15m or artificial structures within 100m of a floodplain for nesting. This type of habitat was not present within VZ4. Assumed present in VZ1, VZ2 and VZ3.
Bush Stone- curlew (*Burhinus grallarius*) Eastern Pygmy- possum (*Cercartetus nanus*) Pale- headed Snake (Hoplocephalus *bitorquatus*) Common Planigale (*Planigale maculata*)	Area	These species were not surveyed for and their presence could not be excluded from VZ1, VZ2, VZ3 and VZ4 based on environmental conditions. Assumed present in VZ1, VZ2, VZ3 and VZ4.
Green and Golden Bell Frog (*Litoria aurea*)	Area	This species is associated with PCT 1717 and was not surveyed for. Its polygon aligns with aquatic habitats and within 200m of the top bank of VZ1, VZ2, VZ3 and VZ4 following the NSW Survey Guide for Threatened Frogs (DPIE 2020d). This polygon includes minimum 50 m wide corridors of native and non-native vegetated areas linking the available waterbodies.
Green- thighed Frog (*Litoria brevipalmata*)	Area	This species is associated with PCT 1717 and was not surveyed for. Its polygon aligns with aquatic habitats and within 100m of the top bank of VZ1, VZ2, VZ3 and VZ4 following the NSW Survey Guide for Threatened Frogs (DPIE 2020d).
Mahony's Toadlet (*Uperoleia mahonyi*)	Area	Targeted survey was not performed for this species. Potential habitat includes ephemeral and semi-permanent swamps and swales associated with nutrient impoverished sand (DPIE 2020d), which occurs on site. Species is assumed present in VZ1, VZ2, VZ3 and VZ4.
Southern Myotis (*Myotis macropus*)	Area	This species occurs within the PCT described on site and within 200 meters of any medium to large permanent creeks, rivers, lakes or other waterways (i.e. with pools/ stretches 3m or wider) (Anderson et al. 2006). Due to a lack of bridges, tunnels, culverts, or buildings that could be potential roost habitat, the species is not assumed present in VZ4. Species is assumed present within VZ1, VZ2 and VZ3.
Swift Parrot (*Lathamus discolor*)	Area	The BAM species polygon has been created based on the Swift Parrot Important Area mapped within the subject land (Figure 13).

5.1.3 Areas not requiring assessment

Areas of land not containing native vegetation or threatened species habitat and therefore not requiring assessment are shown in Figure 7.

GRAHAMSTOWN DRAIN

LEGEND

- Study Area
- Subject Land
- Strahler-4 and Higher

Offset Requirements

- Areas Not Requiring Assessment
- Impacts to Native Vegetation Requiring Offsets

Prescribed Impact

- Grahamstown Drain

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FIGURE 7

Offset Requirements and Prescribed Impacts Summary

0 50 100 150 m

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CLIENT:	Raymond Terrace Parklands				
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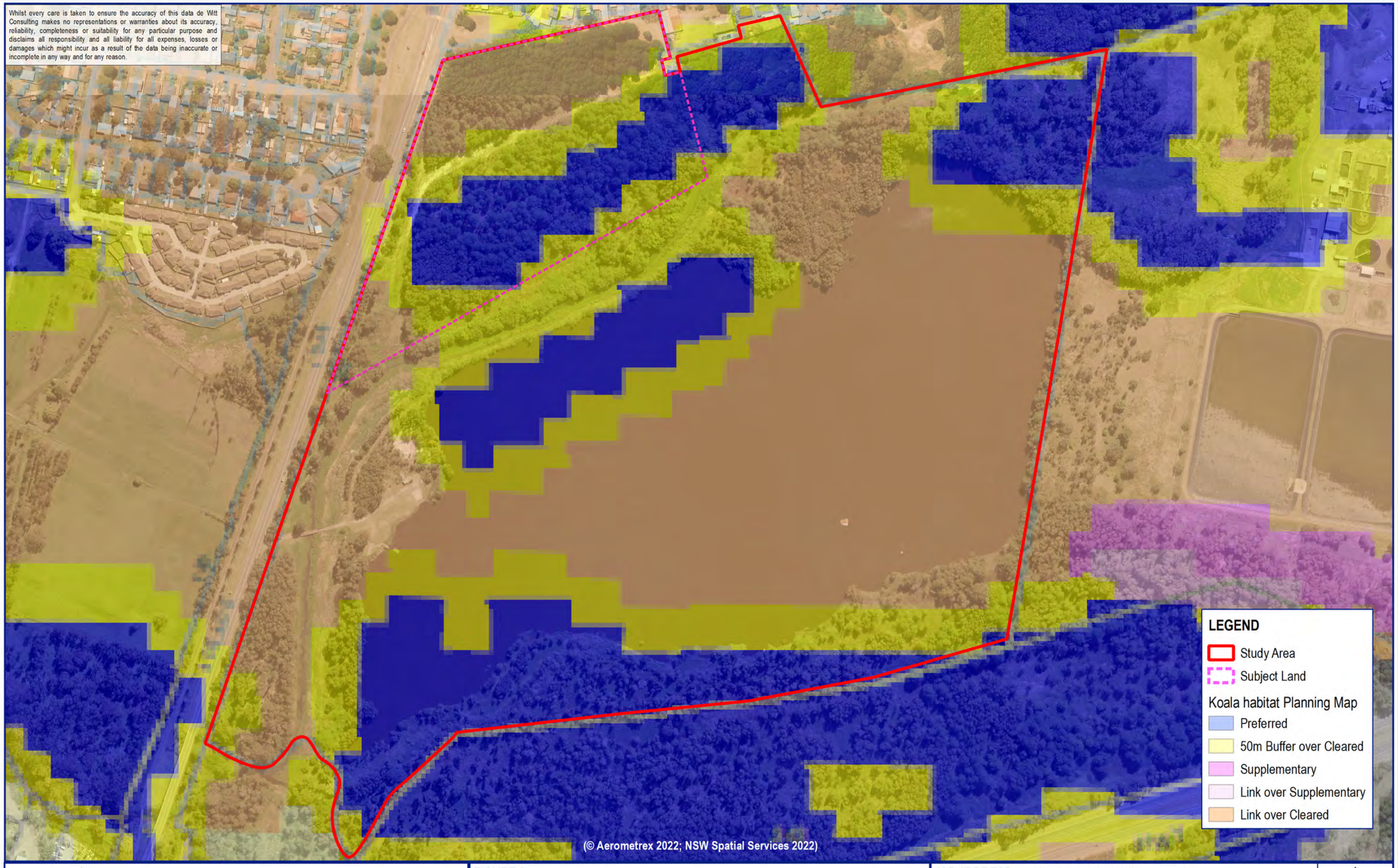

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FIGURE 8

Koala Habitat Planning Map (Port Stephens Council 2001)

0 100 200 300 400 m

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FIGURE 9

Koala Habitat Planning Map (de Witt Ecology2022)

0 100 200 300 400 m

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CLIENT:	Raymond Terrace Parklands				
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FIGURE 10

Threatened Flora Species Polygons within the Subject Land

0 50 100 150 m

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LEGEND

- Study Area
- Subject Site
- Strahler-4 and Higher

Threatened Fauna Polygons

- Bush Stone- curlew (Burhinus grallarius)
- Eastern Pygmy- possum (Cercartetus nanus)
- Pale- headed Snake (Hoplocephalus bitorquatus)
- Mahony's Toadlet (Uperoleia mahonyi)
- Eastern Osprey (Pandion cristatus)
- Squirrel Glider (Petaurus norfolcensis)
- Brush-tailed Phascogale (Phascogale tapoatafa)
- Koala (Phascolarctos cinereus)
- Common Planigale (Planigale maculata)

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FIGURE 11

Threatened Fauna Species Polygons within the Subject Land

0 50 100 150 m

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LEGEND

- Study Area
- Subject Land
- Strahler-4 and Higher

Threatened Species Polygons

- Green- thighed Frog (Litoria brevipalmata)
- Green and Golden Bell Frog (Litoria aurea)
- Southern Myotis (Myotis macropus)

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FIGURE 12

Threatened Fauna Species Polygons within the Subject Land

0 50 100 150 m

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GRAHAMSTOWN DRAIN

GRAHAMSTOWN DRAIN

WINDEYERS CREEK

WINDEYERS CREEK

WINDEYERS CREEK

LEGEND

- Study Area
- Subject Site
- Swift Parrot Important Areas
- Threatened Fauna Polygon (Swift Parrot (Lathamus discolor)

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FIGURE 13

Threatened Fauna species (Swift Parrot) Polygon within the Subject Land

0 100 200 300 400 m

N

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6.0 BIODIVERSITY CREDITS REQUIREMENTS

This section provides a summary of biodiversity credits required for impacts on the biodiversity values within the subject land, following consideration of measures to avoid, minimise and mitigate impacts.

Table 18 and Table 19 provide a summary of ecosystem and species credits resulting from the proposed development. The full credit profile is provided in Appendix 2.

Table 18 Summary of ecosystem credits for all vegetation zones

Vegetation zone	Plant community type	Condition	Area (ha)	Vegetation integrity Loss	Biodiversity Risk Weighting	Candidate SAII	Ecosystem credits required
VZ1	1717-Broad-leaved Paperbark – Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Low-moderate	4.03	-23.8	2	No	48
VZ2	1717-Broad-leaved Paperbark – Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Moderate-good	1.32	-45.6	2	No	30
VZ3	1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	0.12	-47.4	2	No	3
VZ4	1717-Broad-leaved Paperbark – Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Exotic	1.00	-15.6	1.75	No	0
						Total	81

Table 19 Summary of species credits for all vegetation zones

Scientific Name	Common Name	Vegetation Zone	Change in Habitat Condition	Area of Habitat (ha)	Potential SAII	Species credits
Burhinus grallarius	**Bush Stone-curlew**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Cercartetus nanus	**Eastern Pygmy-possum**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Hoplocephalus bitorquatus	**Pale-headed Snake**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Lathamus discolor	**Swift Parrot**	VZ1	-23.8	0.12	True	2
Litoria aurea	**Green and Golden Bell Frog**	VZ1	-23.8	3.4	False	40
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8

Scientific Name	Common Name	Vegetation Zone	Change in Habitat Condition	Area of Habitat (ha)	Potential SAII	Species credits
Litoria brevipalmata	**Green-thighed Frog**	VZ1	-23.8	1.1	False	10
		VZ2	-45.6	1.3	False	22
		VZ3	-47.4	0.12	False	2
		VZ4	-15.6	0.3	False	2
Myotis macropus	**Southern Myotis**	VZ1	-23.8	3.4	False	40
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
Pandion cristatus	**Eastern Osprey**	VZ1	-23.8	4	False	36
		VZ2	-45.6	1.3	False	23
		VZ3	-47.4	0.12	False	2
Petaurus norfolcensis	**Squirrel Glider**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
Phascogale tapoatafa	**Brush-tailed Phascogale**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
Phascolarctos cinereus	**Koala**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30

Scientific Name	Common Name	Vegetation Zone	Change in Habitat Condition	Area of Habitat (ha)	Potential SAII	Species credits
		VZ3	-47.4	0.12	False	3
Planigale maculata	**Common Planigale**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Asperula asthenes	**Trailing Woodruff**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Grevillea parviflora* subsp. *parviflora	**Small-flower Grevillea**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
Pterostylis chaetophora		VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Tetratheca juncea	**Black-eyed Susan**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30

Scientific Name	Common Name	Vegetation Zone	Change in Habitat Condition	Area of Habitat (ha)	Potential SAII	Species credits
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
Uperoleia mahonyi	**Mahony's Toadlet**	VZ1	-23.8	4	False	48
		VZ2	-45.6	1.3	False	30
		VZ3	-47.4	0.12	False	3
		VZ4	-15.6	1	False	8
					Total	1289

7.0 STRATEGY TO MEET BIODIVERSITY OFFSET REQUIREMENTS

The total number and classes of biodiversity credits required to be retired for the project are summarised in Table 20 and Table 21 with the like-for-like credit options as identified through application of the BAM Offsets Calculator.

Due to the timeframe constraints of the project, Raymond Terrace Parklands proposes to discharge the biodiversity offset obligations through payment into the Biodiversity Conservation Fund of an equivalent amount calculated using the BAM Offsets Payment Calculator.

Table 20 Summary of like-for-like ecosystem credits required to offset impacts of the project

PCT code	PCT Name	TEC	Ecosystem credits required	Vegetation Class	Offset trading group	Containing HBTs	IBRA subregions of Trading Group	PCTs in Trading Group
1717	PCT 1717 Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	78	Coastal Swamp Forests	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.	837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798
1071	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	3	Coastal Freshwater Lagoons	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.	780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911

Table 21 Summary of like-for-like species credits required to offset impacts of the project

Kingdom	Species Credit Species	Like-for-like Retirement Options IBRA Region	Species Credits Required
Animalia	*Burhinus grallarius* (Bush Stone-curlew)	Any in NSW	89
Animalia	*Cercartetus nanus* (Eastern Pygmy-possum)	Any in NSW	89
Animalia	*Hoplocephalus bitorquatus* (Pale-headed Snake)	Any in NSW	89
Animalia	*Lathamus discolor* (Swift Parrot)	Any in NSW	2
Animalia	*Litoria aurea* (Green and Golden Bell Frog)	Any in NSW	81
Animalia	*Litoria brevipalmata* (Green-thighed Frog)	Any in NSW	36
Animalia	*Myotis macropus* (Southern Myotis)	Any in NSW	73
Animalia	*Pandion cristatus* (Eastern Osprey)	Any in NSW	61
Animalia	*Petaurus norfolcensis* (Squirrel Glider)	Any in NSW	81
Animalia	*Phascogale tapoatafa* (Brush-tailed Phascogale)	Any in NSW	81
Animalia	*Phascolarctos cinereus* (Koala)	Any in NSW	81
Animalia	*Planigale maculata* (Common Planigale)	Any in NSW	89
Animalia	*Uperoleia mahonyi* (Mahony's Toadlet)	Any in NSW	89
Plantae	*Asperula asthenes* (Trailing Woodruff)	Any in NSW	89
Plantae	*Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea)	Any in NSW	81
Plantae	*Pterostylis chaetophora*	Any in NSW	89
Plantae	*Tetratheca juncea* (Black-eyed Susan)	Any in NSW	89
		Total	1289

8.0 ASSESSMENT AGAINST BIODIVERSITY LEGISLATION AND POLICIES

8.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the project to the commonwealth minister for the environment is required. Matters of NES relevant to the project are summarised in Table 22.

Table 22 Assessment of the project against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	Threatened species were not recorded within the subject land, however, the following threatened species were assumed to be present: • *Asperula asthenes* (Trailing Woodruff) • *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea) • *Tetratheca juncea* (Black-eyed Susan) • *Lathamus discolor* (Swift Parrot) • *Litoria aurea* (Green and Golden Bell Frog) • *Phascolarctos cinereus* (Koala). Twenty-six flora species and 52 fauna species listed under the EPBC Act have been recorded or are predicted to occur in the broader locality. SIC assessments have been prepared only for species assumed to be present within the subject land (Appendix 4). The study area was not assessed against the EPBC Act referral guidelines for the vulnerable koala (CoA 2014) to determine the significance of habitat to be removed to the Koala, as this species is now listed as endangered (a higher degree of endangerment), and this policy document is no longer current.	The following species were assumed present within the subject land and are at risk of impact: • *Asperula asthenes* (Trailing Woodruff) • *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea) • *Tetratheca juncea* (Black-eyed Susan) • *Lathamus discolor* (Swift Parrot) • *Litoria aurea* (Green and Golden Bell Frog) • *Phascolarctos cinereus* (Koala). Assessments against the Significant Impact Criteria (Commonwealth of Australia 2013) have been prepared for these species and concluded that a significant impact was not likely to result from the project (Appendix 4). Based on the level of disturbance and the nature of the project, the habitat present within the subject land does not constitute limiting habitat for the above threatened species. Therefore, a referral is not required.
Threatened ecological communities	Based on meeting the minimum condition thresholds (Class C2), one endangered ecological community, Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland, was recorded within the study area and subject land.	An assessment against the Significant Impact Criteria (Commonwealth of Australia 2013) has been prepared for this TEC (Appendix 4). Based on the extent of proposal impacts within a landscape already impacted by established roadways, clearing, weed incursion, edge effects and the impact area being micro-sited to areas of low-moderate condition native vegetation, exotic / slashed vegetation where practicable coupled with the proposed mitigation measures to be adopted, it is not anticipated that the proposed action will significantly impact Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland and a referral is therefore not required.
Migratory species	Fifty-four migratory bird species have been recorded or are predicted to occur in the locality.	While some of these species would be expected to use the study area on occasions, the subject land does not provide important habitat for any of these species. Therefore, SIC assessments were not undertaken for migratory species.

Matter of NES	Project specifics	Potential for significant impact
Wetlands of international importance (Ramsar sites)	There are 12 Ramsar sites in NSW, the closest one being Hunter Estuary Wetlands, approximately 8 km to the south.	Water that travels through the study area may ultimately contribute to Hunter River water flow which may reach the Hunter Estuary Wetlands. However, as water does not directly flow into the Ramsar site from the study area, and in consideration of the mitigation measures to be adopted, the development is not likely to result in a significant impact.

The study area was not assessed against the EPBC Act referral guidelines for the vulnerable Koala (CoA 2014) to determine the significance of habitat to be removed to the Koala, as this species is now listed as endangered (a higher degree of endangerment), and this policy document is no longer current.

On this basis, the Matters of NES listed under EPBC Act are not considered to be subject to significant impacts and referral of the proposed development to the Minister for the Environment will not be required.

8.2 FISHERIES MANAGEMENT ACT 1994

The watercourse identified within the study area, Grahamstown Drain, is considered as Type 1, Class 2 in accordance with the *Policy and guidelines for fish habitat conservation and management* (DPI 2013). The void, which is currently filled with water, is not considered key fish habitat as it is classified as an artificial pond (DPI 2013). However, no species listed under the FM Act were assessed as having a medium or greater likelihood of occurring within the study area, therefore further consideration of implications relevant to the FM Act are not discussed.

8.3 WATER MANAGEMENT ACT 2000

Specific guidelines addressing instream works (NSW Office of Water 2012) have been developed to support Controlled Activities. The aims and objectives of these guidelines should be achieved by following the relevant design considerations and recommendations which may include the undertaking of a maintenance period. Both these guidelines provide advice on the type and level of information that must be submitted for assessment as part of the controlled activity approval process.

Recommendations to ensure that the proposed development meets these criteria have been made in Section 5.0.

8.4 PORT STEPHENS LOCAL ENVIRONMENTAL PLAN (2013)

The project has minimised impacts to native vegetation and flora and fauna habitats and is therefore consistent with the environmental (biodiversity) related objectives of the Rural Landscape (RU2) zoning in the Port Stephens LEP (2013). The proposed activities are listed as Permitted with Consent.

8.5 SEPP COASTAL MANAGEMENT 2018

Coastal Management SEPP aims to promote a co-ordinated approach to land use planning in the coastal zone of NSW in a manner consistent with the objects of the Coastal Management Act 2018 (CM Act).

The subject land is not within a 'coastal zone' as defined by clause 6 of this policy and therefore the Coastal Management SEPP does not apply to this project.

8.6 SEPP (KOALA HABITAT PROTECTION) 2020

Core Koala habitat is defined by State Environmental Planning Policy (Koala Habitat Protection) 2020 (Koala SEPP 2020) as an area with resident population of Koalas, as evidenced by attributes such as breeding females and recent sightings of and historical records of a population. There are 1300 records of Koala within ten kilometres of the study area (the locality) including records within the study area, the most recent record within the locality is from 2019. Potential Koala Habitat is defined by Koala SEPP 2020 as 'areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower stratum of the tree component'.

The study area supports known and/ or potential habitat for Koalas. The development is therefore required to demonstrate compliance with Koala SEPP 2020. Compliance of the development with the provisions of Appendix 4 of the Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) constitutes compliance with Koala SEPP 2020.

A Koala habitat assessment was undertaken for the development in accordance with the guidelines provided in Appendix 6 of the CKPoM.

Preliminary assessment

I. The proposed development occurs through land listed by the CKPOM as an area of preferred koala habitat and associated 50m buffers with some areas of link over cleared (Figure 8).

II. Inspection of the study area was undertaken and the proposed layout options for the subject land were walked to determine presence or absence of koala habitat. Preferred Koala feed tree species were recorded within 80 metres of the proposed subject land. The subject land contains predominantly low-moderate condition native vegetation with some areas containing moderate-good condition native vegetation. Previously cleared land providing infrequently used vehicle tracks also occur within the subject land. Most of the native vegetation within the subject land consists of PCT1717 with Swamp Mahogany being the primary feed tree species recorded, nearby but not within the subject land. A small number of Forest Red Gums (*Eucalyptus tereticornis*) are also located within the in the southwestern corner of the study area (Figure 4). No feed tree species, including Swamp Mahogany were observed within the subject land in this vegetation community. Feed tree species will be avoided during construction.

Vegetation mapping

The subject land contains habitat mapped as preferred Koala habitat within the Port Stephens Koala Habitat Planning Map (Figure 8). However, site investigation within the subject land determined that it does not contain any preferred Koala feed tree species and has been selected to avoid areas containing Koala feed tree species, in particular Swamp Mahogany. The subject land will avoid removal of vegetation as far as practicable, and where native vegetation does require removal or trimming this predominantly consists of low-moderate condition native vegetation (PCT 1717). Vegetation within the study area is mapped in Figure 4.

Koala habitat identification

Due to the discrepancy between the LGA-wide Koala Habitat mapping and site-specific vegetation mapping, a revision of the Koala habitat was undertaken within the study area (Figure 9) in accordance with Preferred and Supplementary Koala habitat definitions (Lunney *et al.* 1998).

Although habitat within the study area is considered suitable for Koala and it was mapped as Primary Koala habitat, most of the land within the study area does not contain any Koala feed trees with only two small clusters present in the southwestern corner of the study area containing Swamp Mahogany and Forest Red Gums individuals (Figure 4).

These Koala feed trees clusters constituted between 10% and 35% of the overstorey vegetation in these areas, meeting the definition of Preferred Koala Habitat. However, the remainder of the native vegetation within the study area (PCT 1717) is considered supplementary Koala habitat due to the absence of Koala feed tree individuals (Figure 9).

Habitat assessment conducted within the subject land included searching for signs of Koala and Koala feed trees. No Koalas were observed within the subject land or study area adjacent to the subject land, no signs of koala were observed. No scats were observed within the subject land. Pre-clearing assessment will be conducted to detect individuals utilising the subject land prior to removal and clearing supervision will be undertaken as part of the actions to avoid and minimise impact (Section 4.1).

All developments within Port Stephens Local Government Area are required to comply with the provisions of Appendix 4 of the CKPOM in order to comply with Koala SEPP 2020. In order to comply with the CKPOM, developments within and adjacent to land containing primary Koala habitat need to address performance criteria. Using the results of the Koala habitat assessment, the development was assessed against the performance criteria outlined in Appendix 4 of the CKPOM. The results of this assessment are provided in Table 23 below.

Table 23 Koala performance criteria assessment

Appendix 4 – Performance criteria	Comments	Compliance y/n
1. Development works cannot be located to avoid removal of koala habitat	Development has been located to minimise removal of native vegetation, including vegetation within preferred Koala habitat.	Y

Appendix 4 – Performance criteria	Comments	Compliance y/n
2. Development aims to minimise removal of Koala habitat	Overall, the development has been designed to avoid removal of native vegetation where practicable, including preferred Koala habitat. Where possible, trees within the subject land will be retained. Overall, the proposal will require removal of 5.47 hectares of native vegetation, lacking preferred Koala feed trees, of which 4.03 hectares is in low-moderate condition.	Y
4. Koala habitat assessment used to determine development footprint	Koala habitat assessment was undertaken to identify and map locations of preferred Koala feed trees and detect signs of koala activity. The results of the Koala habitat assessment were used to refine the development layout as per points 1 and 2 above. No koala food tree will be removed by the proposal.	Y
a. Must minimise removal of vegetation within Preferred Koala Habitat or Habitat Buffers	Development has been located to minimise removal of native vegetation where practicable, including vegetation within preferred Koala habitat or habitat buffers.	Y
b. Maximise retention and minimise degradation of vegetation within Supplementary Koala Habitat and Habitat linking Areas	Overall, the development has been designed to avoid removal of native vegetation where practicable, including Supplementary Koala habitat. Overall Supplementary Koala habitat is 5.35 hectares. No habitat linking areas would be impacted by the proposal.	Y
c. Minimise removal of Koala feed trees	Koala habitat assessment was undertaken to identify and map locations of preferred Koala feed trees. The results of the Koala habitat assessment were used to refine the development layout as per points 1 and 2 above. No koala food trees will be removed by the proposal.	Y
d. Make provision for restoration of Koala Habitat within Habitat Buffers and Habitat Linking Areas	Vegetation within the subject land will be removed for the proposed works. Given the level of impact and surrounding retained habitat and implementation of a VMP or alternatively establishment of a Biodiversity Stewardship Site in areas of native vegetation to be retained, we request that Port Stephens waive this provision given compliance with point 1, 2 and 4 above.	Y
e. Make provision for long term Koala habitat management.	Given the level of impact on predominantly low-moderate condition native vegetation, previously cleared areas within the subject land and surrounding retained habitat we request that Port Stephens waive this provision given compliance with point 1, 2 and 4 above.	Y
f. Avoid compromising safe Koala movement across the site.	Koala feed trees and removal of other trees has been avoided as far as practical; the extent of native vegetation removal is no larger than approximately 5.47 hectares. The removal of vegetation will be limited predominantly to low-moderate condition vegetation and exotic-dominated areas. The proposal is not considered likely to result in substantial or significant impact to Koala movement across the site. Nevertheless, due to its position in the landscape, the vegetation to be removed will result in the loss of a portion of a linking vegetated corridor, decreasing overall corridor functionality. However, corridor and connective habitat which permits Koala movement between large areas of habitat will be maintained to the immediate south of the study area in an east-west direction. Indeed, the most recent records for Koala in proximity to the study area are restricted to this vegetative corridor. Therefore, the proposal is not considered to compromise safe koala movement across the study area.	Y

Appendix 4 – Performance criteria	Comments	Compliance y/n
g. Vegetation clearing restricted to building envelopes, infrastructure and fire fuel reduction.	Clearing will be restricted to the identified subject land. Clearing will be minimised where possible with retention of Koala feed trees prioritised.	Y
h. Minimise threats from dogs, motor vehicles and swimming pools.	The development will not increase or decrease the impacts by dogs on Koalas as it will not involve an action that will increase dog visitation to the subject land. The site is on privately-owned land. However, future use of the subject land is likely to involve construction of residential allotments and dwellings. As a result, dog ownership within the subject land is likely to occur, however, it is anticipated that dogs will be kept within fenced yards and present a marginal threat to the Koala. Similarly, the establishment of any swimming pools would likely require fencing, also presenting a marginal threat to the Koala. The proposed development will result in increased vehicle movements within the study area for the purposes of initial construction. Beyond this initial construction, future use of the subject land is likely to involve construction of residential allotments and dwellings. As a result, residential vehicles and through traffic may present a minor threat to the Koala. Overall, the construction works and future residential use of the subject land may increase the existing risk of vehicle strike to the Koala under the existing vehicle usage regime. Measures proposed to increase awareness and reduce vehicle speeds in the vicinity of the study area are expected to result in an overall negligible increase in risk to Koala from vehicle strike.	Y

The results of these assessments have determined that the development will be consistent with the objectives of the Port Stephens Council CKPoM, and therefore with Koala SEPP 2020, provided the recommended safeguards are implemented.

8.7 BIOSECURITY ACT 2015

Seven priority weed species for the Hunter Region, which includes the Port Stephens LGA, were recorded in the study area and are listed in Table 24 with their associated biosecurity duties.

Table 24 Priority weeds within the study area

Scientific name	Common name	General Biosecurity Duty
Senecio madagascariensis	Fireweed	Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not, import into the State or sell.
***Cortaderia* sp.**	Pampas Grass	Exclusion zone: Upper Hunter local government area. Core infestation area: Port Stephens, Maitland, Cessnock, Lack Macquarie, Newcastle and MidCoast local government areas. Whole region: The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Land managers should mitigate the risk of the plant being introduced to their land. Within Core infestation: Land managers reduce impacts from the plant on priority assets. Land managers prevent spread from their land where feasible.
Lantana camara	Lantana	Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not, import into the State or sell.
Alternanthera philoxeroides	Alligator Weed	*Biosecurity Regulation 2017* - Part 5, Division 2 (Alligator weed biosecurity zone) An owner or occupier of land in the Alligator weed biosecurity zone on which there is the weed *Alternanthera philoxeroides* (Alligator Weed) must: a. if the weed is part of a new infestation of the weed on the land, notify the local control authority for the land as soon as practicable in accordance with Part 6, and b. eradicate the weed or if that is not practicable destroy as much of the weed as is practicable and suppress the spread of any remaining weed. Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not, import into the State or sell.
Asparagus plumosus ***Asparagus scandens***	Asparagus weeds including Climbing Asparagus Fern, Asparagus Fern	Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not, import into the State or sell.
Salvinia molesta		Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not, import into the State or sell.

9.0 CONCLUSION

This assessment has been completed in accordance with the BAM methodology on behalf of Raymond Terrace Parklands. The study area assessment identified areas of the following PCTs within the subject land:

- PCT 1717 Swamp Sclerophyll Forest on Coastal Floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions (low-moderate and moderate-good condition).
- PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (moderate condition).

PCT 1717 (low-moderate and moderate-good condition) is consistent with Swamp Sclerophyll Forest EEC listed under the BC Act and Coastal Swamp Sclerophyll Forest listed under the EPBC Act. PCT 1071 (moderate condition) is consistent with Freshwater Wetlands EEC listed under the BC Act.

A total of 18.83 hectares of native vegetation was recorded within the study area, which is a total of 44.06ha in size. The subject land was identified for the proposed development, in consideration of the biodiversity values known and likely to occur within the study area. This resulted in minimisation of biodiversity impacts to the removal or modification of 5.47 hectares of native vegetation and associated habitat, of which 4.03 hectares is in low-moderate condition, represented by the Swamp Sclerophyll Forest / Coastal Swamp Sclerophyll Forest EEC (5.35 hectares) and the Freshwater Wetlands EEC (0.12 hectares).

Threatened flora and fauna were not recorded within the subject land during the field investigation undertaken in accordance with the BAM. However, due to project timeframe constraints, habitat for several threatened species was assumed within the subject land.

Measures to mitigate potential indirect impacts to biodiversity values are detailed in Section 4.0.

Given the proposal is unlikely to have a significant residual impact on any EPBC Act listed fauna species, referral to the Commonwealth Minister for the Environment is not deemed necessary for the current proposal (refer to section 8.1 and Appendix 4 for further details).

It is not anticipated that the proposed development will impact any candidate species or ecological communities at risk of Serious and Irreversible Impact as outlined in Section 10.2 of the BAM (refer to Appendix 3 for further details).

Residual impacts to native vegetation will require retirement of 81 ecosystem credits and 1289 species credits in accordance with the Biodiversity Offsets Scheme, as outlined in Table 25 and Table 26.

Table 25 Summary of ecosystem credits.

PCT Code	Plant Community Type Name	Ecosystem credits required
1717	Swamp Sclerophyll Forest on Coastal Floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions	78
1071	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	3
	Total	81

Table 26 Summary of species credits.

Species Credit Species	Species credits required
Burhinus grallarius **(Bush Stone-curlew)**	89
Cercartetus **nanus (Eastern Pygmy-possum)**	89
Hoplocephalus bitorquatus **(Pale-headed Snake)**	89
Lathamus discolor **(Swift Parrot)**	2
Litoria aurea **(Green and Golden Bell Frog)**	81
Litoria brevipalmata **(Green-thighed Frog)**	36
Myotis macropus **(Southern Myotis)**	73
Pandion cristatus **(Eastern Osprey)**	61
Petaurus norfolcensis **(Squirrel Glider)**	81
Phascogale tapoatafa **(Brush-tailed Phascogale)**	81
Phascolarctos cinereus **(Koala)**	81
Planigale maculata **(Common Planigale)**	89
Uperoleia mahonyi **(Mahony's Toadlet)**	89
Asperula asthenes **(Trailing Woodruff)**	89
Grevillea parviflora **subsp.** ***parviflora*** **(Small-flower Grevillea)**	81
Pterostylis chaetophora	89
Tetratheca juncea **(Black-eyed Susan)**	89
Total	1289

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APPENDICES

APPENDIX 1 – BAM PLOT DATA

Table A. 1 Flora species identified within each BAM plot with their cover and abundance. Column header 'N, E, HTE' stands for Native, Exotic, High Threat Exotic. BC Act refers to the *Biodiversity Conservation Act 2016*, EPBC Act refers to the *Environment Protection and Biodiversity Conservation Act 1999*.

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
BAM1								
Apiaceae	*Centella asiatica*	Indian Pennywort	N	-	-	Forb (FG)	0.5	100
Apiaceae	*Cyclospermum leptophyllum*	Slender Celery	E	-	-	Exotic	0.2	20
Apocynaceae	*Araujia sericifera*	Moth Vine	HTE	-	-	Exotic	1.0	3
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	HTE	-	-	Exotic	5.0	100
Asteraceae	*Cirsium vulgare*	Spear Thistle	E	-	-	Exotic	1.0	5
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	E	-	-	Exotic	5.0	1,000
Asteraceae	*Erechtites valerianifolia*	Brazilian Fireweed	E	-	-	Exotic	0.5	5
Asteraceae	*Gamochaeta calviceps*	Cudweed	E	-	-	Exotic	0.1	1
Asteraceae	*Senecio madagascariensis*	Fireweed	HTE	-	-	Exotic	2.0	100
Asteraceae	*Tagetes minuta*	Stinking Roger	E	-	-	Exotic	0.5	20
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	N	-	-	Forb (FG)	1.0	20
Convolvulaceae	*Calystegia sepium*		N	-	-	Other (OG)	2.0	5
Cyperaceae	*Cyperus brevifolius*		E	-	-	Exotic	1.0	50
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	HTE	-	-	Exotic	8.0	200
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	N	-	-	Other (OG)	0.2	5
Fabaceae (Faboideae)	*Glycine* spp.		N	-	-	Other (OG)	0.1	5
Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic	E	-	-	Exotic	0.2	5
Iridaceae	*Romulea rosea*	Onion Grass	HTE	-	-	Exotic	0.5	20

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
Juncaceae	*Juncus fockei*		N	-	-	Grass & grasslike (GG)	0.3	5
Juncaceae	*Juncus usitatus*		N	-	-	Grass & grasslike (GG)	3.0	50
Lamiaceae	*Lycopus australis*	Australian Gipsywort	N	-	-	Forb (FG)	3.0	100
Oxalidaceae	*Oxalis* spp.		N	-	-	Forb (FG)	0.1	5
Poaceae	*Entolasia marginata*	Bordered Panic	N	-	-	Grass & grasslike (GG)	1.0	30
Poaceae	*Ischaemum australe*		N	-	-	Grass & grasslike (GG)	1.0	100
Poaceae	*Paspalum dilatatum*	Paspalum	HTE	-	-	Exotic	15.0	200
Poaceae	*Phalaris aquatica*	Phalaris	E	-	-	Exotic	3.0	50
Poaceae	*Phragmites australis*	Common Reed	N	-	-	Grass & grasslike (GG)	4.0	100
Polygonaceae	*Persicaria decipiens*	Slender Knotweed	N	-	-	Forb (FG)	3.0	50
Polygonaceae	*Persicaria strigosa*		N	-	-	Forb (FG)	2.0	20
Ranunculaceae	*Ranunculus plebeius*	Forest Buttercup	N	-	-	Forb (FG)	2.0	100
Verbenaceae	*Lantana camara*	Lantana	HTE	-	-	Exotic	35.0	20
BAM2								
Convolvulaceae	*Calystegia sepium*		N	-	-	Other (OG)	1	5
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	N	-	-	Fern (EG)	70	1000
Lamiaceae	*Lycopus australis*	Australian Gipsywort	N	-	-	Forb (FG)	1	5
Poaceae	*Phragmites australis*	Common Reed	N	-	-	Grass & grasslike (GG)	65	1000
Polygonaceae	*Persicaria strigosa*		N	-	-	Forb (FG)	1	20
Verbenaceae	*Lantana camara*	Lantana	HTE	-	-	Exotic	3	2
BAM3								
Apocynaceae	*Parsonsia straminea*	Common Silkpod	N	-	-	Other (OG)	5.0	10
Asparagaceae	*Asparagus plumosus*	Climbing Asparagus Fern	HTE	-	-	Exotic	0.1	1
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	E	-	-	Exotic	0.1	2
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda	E	-	-	Exotic	0.2	2

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
Casuarinaceae	*Casuarina glauca*	Swamp Oak	N	-	-	Tree (TG)	20.0	30
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	N	-	-	Other (OG)	3.0	100
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	N	-	-	Other (OG)	0.1	1
Meliaceae	*Melia azedarach*	White Cedar	N	-	-	Tree (TG)	0.1	1
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	N	-	-	Tree (TG)	35.0	20
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	HTE	-	-	Exotic	5.0	30
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	HTE	-	-	Exotic	0.1	1
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	N	-	-	Shrub (SG)	20.0	15
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	HTE	-	-	Exotic	0.1	3
Poaceae	*Entolasia marginata*	Bordered Panic	N	-	-	Grass & grasslike (GG)	0.3	20
Poaceae	*Megathyrsus maximus*	Guinea Grass	E	-	-	Exotic	70.0	5,000
Poaceae	*Oplismenus aemulus*	Australian Basket Grass	N	-	-	Grass & grasslike (GG)	2.0	100
Rhamnaceae	*Alphitonia excelsa*	Red Ash	N	-	-	Tree (TG)	8.0	10
Verbenaceae	*Lantana camara*	Lantana	HTE	-	-	Exotic	10.0	15
BAM4								
Casuarinaceae	*Casuarina glauca*	Swamp Oak	N	-	-	Tree (TG)	4	1
Ericaceae	*Astroloma pinifolium*	Pine Heath	N	-	-	Shrub (SG)	0.2	4
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	N	-	-	Tree (TG)	10	20
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	HTE	-	-	Exotic	0.2	2
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	N	-	-	Shrub (SG)	0.5	3
Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree	N	-	-	Tree (TG)	1	3
Pinaceae	*Pinus elliottii*	Slash Pine	HTE	-	-	Exotic	35	300
Poaceae	*Melinis repens*	Red Natal Grass		-	-	Exotic	3	20
Proteaceae	*Banksia integrifolia*	Coast Banksia	N	-	-	Tree (TG)	1	3

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
BAM5								
Araliaceae	*Schefflera actinophylla*	Umbrella Tree	HTE	-	-	Exotic	3	1
Asparagaceae	*Asparagus scandens*	Asparagus Fern	HTE	-	-	Exotic	0.2	2
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda	E	-	-	Exotic	2	20
Casuarinaceae	*Casuarina glauca*	Swamp Oak	N	-	-	Tree (TG)	5	20
Euphorbiaceae	*Homalanthus populifolius*		N	-	-	Shrub (SG)	0.2	1
Lobeliaceae	*Pratia purpurascens*	Whiteroot	N	-	-	Forb (FG)	0.2	10
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	HTE	-	-	Exotic	2	10
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	HTE	-	-	Exotic	0.5	5
Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree	N	-	-	Tree (TG)	0.5	3
Pinaceae	*Pinus elliottii*	Slash Pine	HTE	-	-	Exotic	40	20
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	N	-	-	Shrub (SG)	5	8
Poaceae	*Megathyrsus maximus*		E	-	-	Exotic	15	1000
Poaceae	*Melinis repens*	Red Natal Grass	E	-	-	Exotic	0.8	10
Rhamnaceae	*Alphitonia excelsa*	Red Ash	N	-	-	Tree (TG)	2	5
Verbenaceae	*Lantana camara*	Lantana	HTE	-	-	Exotic	20	30

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
Opportunistic Species								
Adiantaceae	*Pellaea falcata* var. *falcata*	Sickle Fern	N	-	-	Fern (EG)	-	-
Amaranthaceae	*Alternanthera philoxeroides*	Alligator Weed	HTE	-	-	Exotic	-	-
Apiaceae	*Foeniculum vulgare*	Fennel	E	-	-	Exotic	-	-
Apiaceae	*Hydrocotyle bonariensis*		E	-	-	Exotic	-	-
Arecaceae	*Livistona australis*	Cabbage Palm	N	-	-	Other (OG)	-	-
Arecaceae	*Syagrus romanzoffiana*	Cocos Palm	E	-	-	Exotic	-	-
Asteraceae	*Ambrosia artemisiifolia*	Annual Ragweed	E	-	-	Exotic	-	-
Asteraceae	*Conyza* spp.	A Fleabane	E	-	-	Exotic	-	-
Asteraceae	*Hypochaeris radicata*	Catsear	E	-	-	Exotic	-	-
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	E	-	-	Exotic	-	-
Asteraceae	*Taraxacum officinale*	Dandelion	E	-	-	Exotic	-	-
Chenopodiaceae	*Einadia nutans*	Climbing Saltbush	N	-	-	Forb (FG)	-	-
Commelinaceae	*Tradescantia fluminensis*	Wandering Jew	HTE	-	-	Exotic	-	-
Convolvulaceae	*Ipomoea cairica*		HTE	-	-	Exotic	-	-
Convolvulaceae	*Ipomoea indica*	Morning Glory	HTE	-	-	Exotic	-	-
Cyperaceae	*Bolboschoenus spp.*		N	-	-	Grass & grasslike (GG)	-	-
Cyperaceae	*Carex appressa*	Tall Sedge	N	-	-	Grass & grasslike (GG)	-	-
Cyperaceae	*Cladium procerum*		N	-	-	Grass & grasslike (GG)	-	-
Cyperaceae	*Cyperus aggregatus*		E	-	-	Exotic	-	-
Cyperaceae	*Cyperus odoratus*		N	-	-	Grass & grasslike (GG)	-	-
Cyperaceae	*Cyperus polystachyos*		N	-	-	Grass & grasslike (GG)	-	-
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge	N	-	-	Grass & grasslike (GG)	-	-
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	N	-	-	Shrub (SG)	-	-
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine	N	-	-	Other (OG)	-	-

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
Fabaceae (Faboideae)	*Kennedia rubicunda*	Dusky Coral Pea	N	-	-	Other (OG)	-	-
Fabaceae (Mimosoideae)	*Acacia longifolia*		N	-	-	Shrub (SG)	-	-
Fabaceae (Mimosoideae)	*Acacia podalyriifolia*	Queensland Silver Wattle	N	-	-	Shrub (SG)	-	-
Fabaceae (Mimosoideae)	*Acacia saligna*	Golden Wreath Wattle	E	-	-	Exotic	-	-
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	HTE	-	-	Exotic	-	-
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	E	-	-	Exotic	-	-
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	E	-	-	Exotic	-	-
Menispermaceae	*Stephania japonica*	Snake vine	N	-	-	Other (OG)	-	-
Moraceae	*Morus alba*	White Mulberry	E	-	-	Exotic	-	-
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	N	-	-	Shrub (SG)	-	-
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	N	-	-	Tree (TG)	-	-
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	N	-	-	Shrub (SG)	-	-
Nymphaeaceae	*Nymphaea capensis*	Cape Waterlily	E	-	-	Exotic	-	-
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	HTE	-	-	Exotic	-	-
Phytolaccaceae	*Phytolacca octandra*	Inkweed	E	-	-	Exotic	-	-
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	E	-	-	Exotic	-	-
Poaceae	*Briza subaristata*		HTE	-	-	Exotic	-	-
Poaceae	*Bromus catharticus*	Praire Grass	E	-	-	Exotic	-	-
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	HTE	-	-	Exotic	-	-
Poaceae	*Chloris gayana*	Rhodes Grass	HTE	-	-	Exotic	-	-
Poaceae	*Cynodon dactylon*	Common Couch	N	-	-	Grass & grasslike (GG)	-	-
Poaceae	*Echinochloa crus-galli*	Barnyard Grass	E	-	-	Exotic	-	-
Poaceae	*Eleusine tristachya*	Goose Grass	E	-	-	Exotic	-	-
Poaceae	*Eragrostis curvula*	African Lovegrass	HTE	-	-	Exotic	-	-

Family	Scientific Name	Common Name	N, E, HTE	BC Act Status	EPBC Act Status	BAM Growth Form Group	Cover	Abundance
Poaceae	*Eragrostis tenuifolia*	Elastic Grass	E	-	-	Exotic	-	-
Poaceae	*Hyparrhenia hirta*	Coolatai Grass	HTE	-	-	Exotic	-	-
Poaceae	*Isachne globosa*	Swamp Millet	N	-	-	Grass & grasslike (GG)	-	-
Poaceae	*Microlaena stipoides*	Weeping Grass	N	-	-	Grass & grasslike (GG)	-	-
Poaceae	*Setaria parviflora*		E	-	-	Exotic	-	-
Poaceae	*Sporobolus africanus*	Parramatta Grass	E	-	-	Exotic	-	-
Polygonaceae	*Rumex sagittatus*	Rambling Dock	E	-	-	Exotic	-	-
Primulaceae	*Anagallis arvensis*	Scarlet Pimpernel	E	-	-	Exotic	-	-
Proteaceae	*Grevillea robusta*	Silky Oak	N	-	-	Tree (TG)	-	-
Pteridaceae	Cheilanthes sieberi *subsp. sieberi*	Rock Fern	N	-	-	Fern (EG)	-	-
Salviniaceae	*Salvinia molesta*		HTE	-	-	Exotic	-	-
Scrophulariaceae	*Verbascum virgatum*	Twiggy Mullein	E	-	-	Exotic	-	-
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	E	-	-	Exotic	-	-
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	E	-	-	Exotic	-	-
Solanaceae	*Solanum pseudocapsicum*	Madeira Winter Cherry	E	-	-	Exotic	-	-
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi	N	-	-	Grass & grasslike (GG)	-	-
Verbenaceae	*Verbena bonariensis*	Purpletop	E	-	-	Exotic	-	-
Vitaceae	*Cissus clematidea*	Native Grape	N	-	-	Other (OG)	-	-

APPENDIX 2 – BIODIVERSITY CREDIT REPORT

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00030357/BAAS17094/22/00030359	EC103 Residential Subdivision BDAR - changed condition class low to low-moderate	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alan Midgley	19/04/2022	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17094	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
9	19/04/2022	BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	1717_Low-moderate	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Low-moderate	4.03		
2	1717_Moderate-good	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Moderate-good	1.32		
3	1071_Moderate	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	0.12	1	
4	1717_Exotic	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Exotic	1	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00030357/BAAS17094/22/00030359	EC103 Residential Subdivision BDAR - changed condition class low to low-moderate	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alan Midgley	19/04/2022	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17094	Part 4 Developments (General)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
9	BOS Threshold: Biodiversity Values Map and area clearing threshold	19/04/2022

* 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	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Australian Painted Snipe	Rostratula australis	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Barking Owl	Ninox connivens	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Black Bittern	Ixobrychus flavicollis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

Black-tailed Godwit	Limosa limosa	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Blue-billed Duck	Oxyura australis	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Broad-billed Sandpiper	Limicola falcinellus	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Comb-crested Jacana	Irediparra gallinacea	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Curlew Sandpiper	Calidris ferruginea	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Eastern Grass Owl	Tyto longimembris	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Eastern Osprey	Pandion cristatus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Freckled Duck	Stictonetta naevosa	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Glossy Black-Cockatoo	Calyptorhynchus lathami	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Great Knot	Calidris tenuirostris	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Koala	Phascolarctos cinereus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Little Bent-winged Bat	Miniopterus australis	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Little Eagle	Hieraaetus morphnoides	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Little Lorikeet	Glossopsitta pusilla	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Magpie Goose	Anseranas semipalmata	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Regent Honeyeater	Anthochaera phrygia	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Spotted Harrier	Circus assimilis	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Square-tailed Kite	Lophoictinia isura	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Swift Parrot	Lathamus discolor	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
Varied Sittella	Daphoenositta chrysoptera	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

White-bellied Sea-Eagle	Haliaeetus leucogaster	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
White-fronted Chat	Epthianura albifrons	1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
White-throated Needletail	Hirundapus caudacutus	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast
		1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

Threatened species Manually Added

None added

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

BAM Candidate Species Report

Proposal Details

Assessment Id 00030357/BAAS17094/22/00030359	Proposal Name EC103 Residential Subdivision BDAR - changed condition class low to low-moderate	BAM data last updated * 24/11/2021
Assessor Name Alan Midgley	Report Created 19/04/2022	BAM Data version * 50
Assessor Number BAAS17094	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 9	Date Finalised 19/04/2022	BOS entry trigger BOS Threshold: Biodiversity Values Map and 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
Asperula asthenes Trailing Woodruff	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Cercartetus nanus Eastern Pygmy-possum	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus parramattensis subsp. decadens Eucalyptus parramattensis subsp. decadens	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	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	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?
Hieraaetus morphnoides Little Eagle	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?
Hoplocephalus bitorquatus Pale-headed Snake	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Lathamus discolor Swift Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria aurea Green and Golden Bell Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria brevipalmata Green-thighed Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Maundia triglochinoides Maundia triglochinoides	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca biconvexa Biconvex Paperbark	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Myotis macropus Southern Myotis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pandion cristatus Eastern Osprey	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Persicaria elatior Tall Knotweed	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Planigale maculata Common Planigale	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pterostylis chaetophora Pterostylis chaetophora	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Uperoleia mahonyi Mahony's Toadlet	Yes (assumed present)	☐ 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

BAM Candidate Species Report

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Black-tailed Godwit	Limosa limosa	Refer to BAR
Broad-billed Sandpiper	Limicola falcinellus	Refer to BAR
Charmhaven Apple	Angophora inopina	Refer to BAR
Curlew Sandpiper	Calidris ferruginea	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Great Knot	Calidris tenuirostris	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
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
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Rough Doubletail	Diuris praecox	Refer to BAR
Wallum Froglet	Crinia tinnula	Refer to BAR

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00030357/BAAS17094/22/00030359	EC103 Residential Subdivision BDAR - changed condition class low to low-moderate	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alan Midgley	19/04/2022	50
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17094	Finalised	19/04/2022
Assessment Revision	**Assessment Type**	**BOS entry trigger**
9	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map and area clearing threshold

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast												
1	1717_Low-moderate	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	23.8	23.8	4	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		48
2	1717_Moderate-good	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	45.6	45.6	1.3	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		30
											Subtotal	**78**

Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast												
4	1717_Exotic	Not a TEC	15.6	15.6	1	PCT Cleared - 68%	High Sensitivity to Potential Gain			1.75		0
											Subtotal	**0**
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion												
3	1071_Moderate	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	47.4	47.4	0.12	PCT Cleared - 75%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		3
											Subtotal	**3**
											Total	**81**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Asperula asthenes / Trailing Woodruff (Flora)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Vulnerable	False	3

1717_Exotic	15.6	15.6	1			Vulnerable	Vulnerable	False	8
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Vulnerable	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Vulnerable	False	48
								Subtotal	**89**
Burhinus grallarius / Bush Stone-curlew (Fauna)									
1071_Moderate	47.4	47.4	0.12			Endangered	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Endangered	Not Listed	False	8
1717_Moderate-good	45.6	45.6	1.3			Endangered	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Endangered	Not Listed	False	48
								Subtotal	**89**
Cercartetus nanus / Eastern Pygmy-possum (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Vulnerable	Not Listed	False	8
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48
								Subtotal	**89**
Grevillea parviflora subsp. parviflora / Small-flower Grevillea (Flora)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Vulnerable	False	3
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Vulnerable	False	30

1717_Low-moderate	23.8	23.8	4			Vulnerable	Vulnerable	False	48
								Subtotal	**81**
Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Vulnerable	Not Listed	False	8
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48
								Subtotal	**89**
Lathamus discolor / Swift Parrot (Fauna)									
1717_Low-moderate	23.8	23.8	0.12			Endangered	Critically Endangered	True	2
								Subtotal	**2**
Litoria aurea / Green and Golden Bell Frog (Fauna)									
1071_Moderate	47.4	47.4	0.12			Endangered	Vulnerable	False	3
1717_Exotic	15.6	15.6	1			Endangered	Vulnerable	False	8
1717_Moderate-good	45.6	45.6	1.3			Endangered	Vulnerable	False	30
1717_Low-moderate	23.8	23.8	3.4			Endangered	Vulnerable	False	40
								Subtotal	**81**
Litoria brevipalmata / Green-thighed Frog (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	2

1717_Exotic	15.6	15.6	0.3			Vulnerable	Not Listed	False	2
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	22
1717_Low-moderate	23.8	23.8	1.1			Vulnerable	Not Listed	False	10
								Subtotal	**36**
Myotis macropus / Southern Myotis (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	3.4			Vulnerable	Not Listed	False	40
								Subtotal	**73**
Pandion cristatus / Eastern Osprey (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	2
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	23
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	36
								Subtotal	**61**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48

								Subtotal	**81**
Phascogale tapoatafa / Brush-tailed Phascogale (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48
								Subtotal	**81**
Phascolarctos cinereus / Koala (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Vulnerable	False	3
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Vulnerable	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Vulnerable	False	48
								Subtotal	**81**
Planigale maculata / Common Planigale (Fauna)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Vulnerable	Not Listed	False	8
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48
								Subtotal	**89**
Pterostylis chaetophora / Pterostylis chaetophora (Flora)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Vulnerable	Not Listed	False	8

1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Not Listed	False	48
								Subtotal	**89**
Tetratheca juncea / Black-eyed Susan (Flora)									
1071_Moderate	47.4	47.4	0.12			Vulnerable	Vulnerable	False	3
1717_Exotic	15.6	15.6	1			Vulnerable	Vulnerable	False	8
1717_Moderate-good	45.6	45.6	1.3			Vulnerable	Vulnerable	False	30
1717_Low-moderate	23.8	23.8	4			Vulnerable	Vulnerable	False	48
								Subtotal	**89**
Uperoleia mahonyi / Mahony's Toadlet (Fauna)									
1071_Moderate	47.4	47.4	0.12			Endangered	Not Listed	False	3
1717_Exotic	15.6	15.6	1			Endangered	Not Listed	False	8
1717_Moderate-good	45.6	45.6	1.3			Endangered	Not Listed	False	30
1717_Low-moderate	23.8	23.8	4			Endangered	Not Listed	False	48
								Subtotal	**89**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00030357/BAAS17094/22/00030359

Proposal Name
EC103 Residential Subdivision BDAR - changed condition class low to low-moderate

BAM data last updated *
24/11/2021

Assessor Name
Alan Midgley

Assessor Number
BAAS17094

BAM Data version *
50

Proponent Names

Report Created
19/04/2022

BAM Case Status
Finalised

Assessment Revision
9

Assessment Type
Part 4 Developments (General)

Date Finalised
19/04/2022

BOS entry trigger
BOS Threshold: Biodiversity Values Map and 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.

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	5.4	0	78	78
1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Not a TEC	1.0	0	0	0

1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911	-	1071_Moderate	No	3	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.

1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1717_Low-moderate	No	48	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.

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1717_Moderate-good	No	30	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.

1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798	Coastal Swamp Forests >=50% and <70%	1717_Exotic	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.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Asperula asthenes / Trailing Woodruff	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Burhinus grallarius / Bush Stone-curlew	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Cercartetus nanus / Eastern Pygmy-possum	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00

Grevillea parviflora subsp. parviflora / Small-flower Grevillea	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Hoplocephalus bitorquatus / Pale-headed Snake	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Lathamus discolor / Swift Parrot	**1717_Low-moderate**	0.1	2.00
Litoria aurea / Green and Golden Bell Frog	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	5.8	81.00
Litoria brevipalmata / Green-thighed Frog	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	2.8	36.00
Myotis macropus / Southern Myotis	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	4.8	73.00
Pandion cristatus / Eastern Osprey	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	61.00
Petaurus norfolcensis / Squirrel Glider	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Phascogale tapoatafa / Brush-tailed Phascogale	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00

Phascolarctos cinereus / Koala	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Planigale maculata / Common Planigale	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Pterostylis chaetophora / Pterostylis chaetophora	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Tetratheca juncea / Black-eyed Susan	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Uperoleia mahonyi / Mahony's Toadlet	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00

Credit Retirement Options

Like-for-like credit retirement options

Asperula asthenes / Trailing Woodruff	Spp	IBRA subregion
	Asperula asthenes / Trailing Woodruff	Any in NSW
Burhinus grallarius / Bush Stone-curlew	Spp	IBRA subregion
	Burhinus grallarius / Bush Stone-curlew	Any in NSW

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Spp	IBRA subregion
	Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Any in NSW
Hoplocephalus bitorquatus / Pale-headed Snake	Spp	IBRA subregion
	Hoplocephalus bitorquatus / Pale-headed Snake	Any in NSW
Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW
Litoria aurea / Green and Golden Bell Frog	Spp	IBRA subregion
	Litoria aurea / Green and Golden Bell Frog	Any in NSW
Litoria brevipalmata / Green-thighed Frog	Spp	IBRA subregion
	Litoria brevipalmata / Green-thighed Frog	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion

	Myotis macropus / Southern Myotis	Any in NSW
Pandion cristatus / Eastern Osprey	Spp	IBRA subregion
	Pandion cristatus / Eastern Osprey	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascogale tapoatafa / Brush-tailed Phascogale	Spp	IBRA subregion
	Phascogale tapoatafa / Brush-tailed Phascogale	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW
Pterostylis chaetophora / Pterostylis chaetophora	Spp	IBRA subregion
	Pterostylis chaetophora / Pterostylis chaetophora	Any in NSW

Tetratheca juncea / Black-eyed Susan	Spp	IBRA subregion
	Tetratheca juncea / Black-eyed Susan	Any in NSW
Uperoleia mahonyi / Mahony's Toadlet	Spp	IBRA subregion
	Uperoleia mahonyi / Mahony's Toadlet	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00030357/BAAS17094/22/00030359

Proposal Name

EC103 Residential Subdivision BDAR - changed condition class low to low-moderate

BAM data last updated *

24/11/2021

Assessor Name

Alan Midgley

Assessor Number

BAAS17094

BAM Data version *

50

Proponent Name(s)

Report Created

19/04/2022

BAM Case Status

Finalised

Assessment Revision

9

Assessment Type

Part 4 Developments (General)

Date Finalised

19/04/2022

BOS entry trigger

BOS Threshold: Biodiversity Values Map and 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.

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	5.4	0	78	78.00
1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3.00
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Not a TEC	1.0	0	0	0.00

1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911	-	1071_Moderate	No	3	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 3 or higher threat status	1071_Moderate	No	3	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1717_Low-moderate	No	48	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.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1717_Moderate-good	No	30	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

	Forested Wetlands	Tier 3 or higher threat status	1717_Low-moderate	No	48	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	1717_Moderate-good	No	30	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798	Coastal Swamp Forests >=50% and <70%	1717_Exotic	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
	Forested Wetlands	Tier 3 or higher threat status	1717_Exotic	No	0	IBRA Region: Sydney Basin, 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
Asperula asthenes / Trailing Woodruff	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Burhinus grallarius / Bush Stone-curlew	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Cercartetus nanus / Eastern Pygmy-possum	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Hoplocephalus bitorquatus / Pale-headed Snake	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Lathamus discolor / Swift Parrot	**1717_Low-moderate**	0.1	2.00
Litoria aurea / Green and Golden Bell Frog	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	5.8	81.00
Litoria brevipalmata / Green-thighed Frog	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	2.8	36.00
Myotis macropus / Southern Myotis	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	4.8	73.00

Pandion cristatus / Eastern Osprey	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	61.00
Petaurus norfolcensis / Squirrel Glider	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Phascogale tapoatafa / Brush-tailed Phascogale	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Phascolarctos cinereus / Koala	**1071_Moderate, 1717_Moderate-good, 1717_Low-moderate**	5.5	81.00
Planigale maculata / Common Planigale	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Pterostylis chaetophora / Pterostylis chaetophora	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Tetratheca juncea / Black-eyed Susan	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00
Uperoleia mahonyi / Mahony's Toadlet	**1071_Moderate, 1717_Exotic, 1717_Moderate-good, 1717_Low-moderate**	6.5	89.00

Credit Retirement Options

Like-for-like options

Asperula asthenes/ Trailing Woodruff	Spp	IBRA region

	Asperula asthenes/Trailing Woodruff		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	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.
Burhinus grallarius/ Bush Stone-curlew	Spp		IBRA region
	Burhinus grallarius/Bush Stone-curlew		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Endangered	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.
Cercartetus nanus/ Eastern Pygmy-possum	Spp	IBRA region	
	Cercartetus nanus/Eastern Pygmy-possum	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Grevillea parviflora subsp. parviflora/ Small-flower Grevillea	Spp	IBRA region	
	Grevillea parviflora subsp. parviflora/Small-flower Grevillea	Any in NSW	

Grevillea parviflora subsp. parviflora/ Small-flower Grevillea	**Variation options**		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	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.
Hoplocephalus bitorquatus/ Pale-headed Snake	Spp		IBRA region
	Hoplocephalus bitorquatus/Pale-headed Snake		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	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.
Lathamus discolor/ Swift Parrot	Spp	IBRA region	
	Lathamus discolor/Swift Parrot	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	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.
Litoria aurea/ Green and Golden Bell Frog	Spp	IBRA region	
	Litoria aurea/Green and Golden Bell Frog	Any in NSW	
	Variation options		

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	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.
Litoria brevipalmata/ Green-thighed Frog	Spp		IBRA region
	Litoria brevipalmata/Green-thighed Frog		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.

Myotis macropus/ Southern Myotis	Spp		IBRA region
	Myotis macropus/Southern Myotis		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Pandion cristatus/ Eastern Osprey	Spp		IBRA region
	Pandion cristatus/Eastern Osprey		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	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.
Petaurus norfolcensis/ Squirrel Glider	Spp	IBRA region	
	Petaurus norfolcensis/Squirrel Glider	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Phascogale tapoatafa/ Brush-tailed Phascogale	Spp	IBRA region	
	Phascogale tapoatafa/Brush-tailed Phascogale	Any in NSW	
	Variation options		

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Phascolarctos cinereus/ Koala	Spp	IBRA region	
	Phascolarctos cinereus/Koala	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.

Planigale maculata/ Common Planigale	Spp		IBRA region
	Planigale maculata/Common Planigale		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Pterostylis chaetophora/ Pterostylis chaetophora	Spp		IBRA region
	Pterostylis chaetophora/Pterostylis chaetophora		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Flora	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.
Tetratheca juncea/ Black-eyed Susan	Spp	IBRA region	
	Tetratheca juncea/Black-eyed Susan	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	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.
Uperoleia mahonyi/ Mahony's Toadlet	Spp	IBRA region	
	Uperoleia mahonyi/Mahony's Toadlet	Any in NSW	
	Variation options		

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	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.

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00030357/BAAS17094/22/00030359		9	19/04/2022

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Alan Midgley	BAAS17094	EC103 Residential Subdivision BDAR - changed condition class low to low-moderate	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (General)	19/04/2022	BOS Threshold: Biodiversity Values Map and area clearing threshold

PCT list

Price calculated	PCT common name	Credits
Yes	**1717 -** Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	78
Yes	**1071 -** Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	3
Yes	**1717 -** Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	0

Species list

Biodiversity payment summary report

Price calculated	Species	Credits
Yes	***Asperula asthenes*** (Trailing Woodruff)	89
Yes	***Burhinus grallarius*** (Bush Stone-curlew)	89
Yes	***Cercartetus nanus*** (Eastern Pygmy-possum)	89
Yes	***Grevillea parviflora subsp. parviflora*** (Small-flower Grevillea)	81
Yes	***Hoplocephalus bitorquatus*** (Pale-headed Snake)	89
Yes	***Lathamus discolor*** (Swift Parrot)	2
Yes	***Litoria aurea*** (Green and Golden Bell Frog)	81
Yes	***Litoria brevipalmata*** (Green-thighed Frog)	36
Yes	***Myotis macropus*** (Southern Myotis)	73
Yes	***Pandion cristatus*** (Eastern Osprey)	61
Yes	***Petaurus norfolcensis*** (Squirrel Glider)	81
Yes	***Phascogale tapoatafa*** (Brush-tailed Phascogale)	81
Yes	***Phascolarctos cinereus*** (Koala)	81
Yes	***Planigale maculata*** (Common Planigale)	89
Yes	***Tetratheca juncea*** (Black-eyed Susan)	89
Yes	***Pterostylis chaetophora*** (Pterostylis chaetophora)	89
Yes	***Uperoleia mahonyi*** (Mahony's Toadlet)	89

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Hunter	**1717 -** Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Yes	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.83%	$130.43	2.7038	$4,005.11	78	$312,398.30
Hunter	**1071 -** Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Yes	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.83%	$276.14	1.9060	$8,479.46	3	$25,438.38

Hunter	**1717 -** Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	No	Coastal Swamp Forests >=50% and <70%	20.69%	$189.52	0.9910	$5,907.96	0	$0.00

Subtotal (excl. GST)	**$337,836.68**
GST	**$33,783.67**
Total ecosystem credits (incl. GST)	**$371,620.35**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10068	***Asperula asthenes*** (Trailing Woodruff)	Vulnerable	$173.02	20.6900%	$80.00	89	$25,704.79
10113	***Burhinus grallarius*** (Bush Stone-curlew)	Endangered	$309.97	20.6900%	$80.00	89	$40,415.15
10155	***Cercartetus nanus*** (Eastern Pygmy-possum)	Vulnerable	$495.24	20.6900%	$80.00	89	$60,315.76
10373	***Grevillea parviflora subsp. parviflora*** (Small-flower Grevillea)	Vulnerable	$54.59	20.6900%	$80.00	81	$11,816.66

10412	***Hoplocephalus bitorquatus*** (Pale-headed Snake)	Vulnerable	$495.24	20.6900%	$80.00	89	$60,315.76
10455	***Lathamus discolor*** (Swift Parrot)	Endangered	$309.97	20.6900%	$80.00	2	$908.21
10483	***Litoria aurea*** (Green and Golden Bell Frog)	Endangered	$5,974.37	20.6900%	$238.97	81	$603,404.80
10485	***Litoria brevipalmata*** (Green-thighed Frog)	Vulnerable	$463.67	20.6900%	$80.00	36	$23,025.72
10549	***Myotis macropus*** (Southern Myotis)	Vulnerable	$741.31	20.6900%	$80.00	73	$71,152.15
10585	***Pandion cristatus*** (Eastern Osprey)	Vulnerable	$86.51	20.6900%	$80.00	61	$11,248.94
10604	***Petaurus norfolcensis*** (Squirrel Glider)	Vulnerable	$495.24	20.6900%	$80.00	81	$54,894.12
10613	***Phascogale tapoatafa*** (Brush-tailed Phascogale)	Vulnerable	$463.67	20.6900%	$80.00	81	$51,807.87
10616	***Phascolarctos cinereus*** (Koala)	Vulnerable	$495.24	20.6900%	$80.00	81	$54,894.12
10635	***Planigale maculata*** (Common Planigale)	Vulnerable	$463.67	20.6900%	$80.00	89	$56,924.70
10799	***Tetratheca juncea*** (Black-eyed Susan)	Vulnerable	$158.64	20.6900%	$80.00	89	$24,160.17
20280	***Pterostylis chaetophora*** (Pterostylis chaetophora)	Vulnerable	$173.02	20.6900%	$80.00	89	$25,704.79
20325	***Uperoleia mahonyi*** (Mahony's Toadlet)	Endangered	$1,730.17	20.6900%	$80.00	89	$192,964.65

Subtotal (excl. GST) **$1,369,658.36**

	GST	**$136,965.84**
Total species credits (incl. GST)		**$1,506,624.20**
	Grand total	**$1,878,244.55**

APPENDIX 3 – SWIFT PARROT SERIOUS AND IRREVERSIBLE IMPACT (SAII) ASSESSMENTS

Swift Parrot

Future development on the subject land would result in an impact on a potential SAII entity through the proposed removal of 0.12 hectares of potential Swift Parrot (*Lathamus discolor*) mapped important habitat (Figure 13). Detailed vegetation mapping within the subject land identified the area of potential habitat for the species is consistent with low-moderate condition native vegetation (Figure 13).

This section presents the additional impact assessment provisions for threatened fauna species that may be considered an SAII entity, as required by Section 9.1 of the BAM.

a. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

The proposed development is 6.47 hectares in area within a 44.4-hectare parcel of land, most of which consists of a waterbody (21.1 hectares). Nonetheless, effort has been made through the proposal planning and design process to avoid features of higher conservation value previously identified by an initial Flora and fauna and offsets assessment report prepared for the study area (Biosis 2016) as well as de Witt Ecology surveys and this BDAR.

The Threatened Biodiversity Data Collection specifies that the draft Swift Parrot Important Areas mapping should be used to determine species presence or absence within the subject land. Part of the subject land is currently shown on the Swift Parrot Important Areas mapping (Figure 13). The species was not recorded during field surveys within the study area.

To avoid direct and indirect impacts on this species, and because it is not known if the species could occur within the subject land, mitigation measures will be implemented prior to construction within the subject land. These measures include conducting pre-clearance surveys for Swift Parrot prior to proposed works (Table 12). Conducting targeted surveys for Swift Parrot in conjunction with advice and records from DPIE and Birdlife Australia (who have prepared the mapping based on monitoring data since 2000) is not considered to be required based on the absence of preferred feed trees within the subject land.

As shown on Figure 13, impact would be avoided to around 10.1 hectares of Swift Parrot Important habitat (based on the important area mapping) based on the location of the subject land.

The proposed development will, where practicable, avoid higher condition, intact areas of potential Swift Parrot foraging habitat which is likely to be resilient to indirect impacts arising from the proposal.

b. the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification

Development on the subject land would result in an impact on a potential SAII entity through the proposed removal of 0.12 hectares of low-moderate condition native vegetation mapped as a Swift Parrot Important Area (Figure 13).

The Swift Parrot occurs as a single, migratory population (Saunders D.L. and Tzaros C. L., 2011). The total Swift Parrot population is estimated to be no more than 1000 pairs and is at best stable but most likely continuing to decline, given the continued mortality of birds and the ongoing loss of habitat (Saunders D.L. and Tzaros C. L., 2011). The most recent Swift Parrot record within the locality occurred in August 2007.

During the winter migration period, the majority of the population frequents eucalypt woodlands and forests in Victoria and New South Wales (Saunders D.L. and Tzaros C. L., 2011). The Swift Parrot relies on eucalyptus forests for forging habitat feeding extensively on nectar and lerp and other items from eucalypt foliage (Saunders D.L. and Tzaros C. L., 2011). Key foraging habitats during this time are Hunter Lowland Red Gum Forest, Lower Hunter Spotted Gum – Ironbark Forest, River-Flat Eucalypt Forest on Coastal Floodplains and Swamp Sclerophyll Forest on Coastal Floodplains (Saunders D.L. and Tzaros C. L., 2011).

The proposal will directly impact a total of 5.35 hectares of Swamp Sclerophyll Forest on Coastal Floodplains (of which 0.12 hectares is included in the important area mapping), one of the key foraging habitats that occurs within the subject land. This comprises 30.5% of the total area (17.53 hectares) of Swamp Sclerophyll Forest on Coastal Floodplains within the broader study area. The proposal will also directly impact a total of 0.12 hectares of Freshwater Wetlands on Coastal Floodplains, which is not a key foraging habitat for this species.

In the coastal areas of NSW, the species utilises key tree species including Swamp Mahogany (*Eucalyptus robusta*), Forest Red Gum (*Eucalyptus tereticornis*), Blackbutt (*Eucalyptus pilularis*) and Spotted Gum (*Corymbia maculata*) (Saunders D.L. and Tzaros C. L., 2011). None of these key tree species occur within the subject land with Swamp Mahogany and Forest Red Gum being present in low abundance along the south-eastern boundary of the study area.

The proposal will directly impact a total of 5.47 hectares of native vegetation, composed of PCT 1717 Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest (5.35 ha) and PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (0.12 ha). PCT 1717 is chiefly composed of low-moderate condition vegetation (4.03 hectares) with a vegetation integrity score of 23.8. These areas do not contain Eucalyptus species with the potential to provide foraging habitat for Swift Parrot.

Due to their nomadic behaviour in response to flowering feed trees, it is difficult to estimate the direct and indirect impacts on a local population of Swift parrot. However, given that the direct impact on foraging habitat within the subject site is restricted to 5.35 hectares of chiefly low-moderate condition native vegetation and the area of foraging habitat avoided within the study area is 12.18 hectares, it is unlikely that the size of the Swift Parrot local population would be directly or indirectly impacted by the development.

c. the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact

Thresholds for SAII entities are designed to assist in determining whether an impact will be a potential SAII. Any impact from development could potentially be considered serious and irreversible for the Swift Parrot. As such, a conservative approach to the threshold for this species has been taken, and the threshold has been assumed to be zero hectares.

The development proposed within the subject land would result in the removal of 0.12 hectares of vegetation mapped as important habitat for the Swift Parrot (i.e. of 0.12 hectares above the threshold of zero).

d. the likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to:

(i) an estimate of the change in habitat available to the local population as a result of the proposed development

Birdlife Australia has prepared a model of the Swift Parrot predicted habitat within the Lower Hunter region. This modelling is being increasingly used as a means to predict areas for occurrence for the species, analysing species records and to identify areas of predicted occurrence The model indicates that the study area has a low to moderate level of value for Swift Parrot (Roderick 2013).

Given the temporally and spatially variable long-distance movements of Swift Parrots, and their specialised breeding and foraging requirements, calculating area of occupancy (AOO) for the species is challenging (TSSC, 2016). In New South Wales, habitat mapping has been limited by the availability of suitable vegetation types. Due to the highly fragmented nature of some Swift Parrot sites in New South Wales, some important habitats, such as those within coastal urban environments, are not evident from vegetation mapping alone (Saunders D.L. and Tzaros C. L., 2011). Therefore, Swift Parrot records need to be combined with vegetation mapping to get a clearer indication of habitat use in New South Wales. The Hunter region is recognised as a priority site for the population.

The approximate areas of draft Swift Parrot Important Areas within the Sydney Basin IBRA region is 45,000 hectares. The proposal will reduce the available foraging habitat for the Swift Parrot population in the Sydney

Basin IBRA region from approximately 45,000 hectares to approximately 44,994.65 hectares. This represents a 0.01% reduction in available foraging habitat in the Sydney Basin IBRA subregion.

(ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and

The proposal will impact on 0.12 hectares of native vegetation mapped as a Swift Parrot Important Area. However, 5.35 hectares of potential Swift Parrot foraging habitat (native vegetation) will be removed (Figure 13). Clearing of 0.12 hectares of native vegetation will further fragment mapped Swift Parrot Important Areas. Swift Parrots are capable of moving long distances in response to changing food availability and landscape scale (TSSC, 2016) so habitat fragmentation does not impede their ability to access or isolate suitable foraging habitat. However, fragmentation of forest habitat is known to increase competition for resources with other species such as large aggressive honeyeaters as well as introduced birds and bees (TSSC, 2016).

(iii) modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant –pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development.

Swift Parrots are a migratory species who rely on the availability of suitable foraging habitat in NSW and Victoria during the winter months as part of their life cycle. Whilst on the mainland the Swift Parrot disperses widely to forage on flowers and psyllid lerps in Eucalyptus species. There is strong evidence to support a continuing decline in the area of occupancy of Swift Parrots. This is largely due to a reduction in available habitat caused by a variety of factors, including residential, agricultural and industrial development, and dieback and suppression of regeneration in agricultural and urban areas (TSSC, 2016).

The proposal will remove 0.12 hectares of native vegetation mapped as a Swift Parrot Important Area. However, most of the potential Swift Parrot foraging habitat within the study area (17.5 hectares) would not be impacted by the proposal. The proposal is not anticipated to have any noticeable impact on the life-cycle of the Swift Parrot.

e. the likely impact on the ecology of the local population. At a minimum, address the following:

(i) for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways

Migratory birds are dependent on a combination of suitable wintering, migration and breeding habitats. Identification and protection of these habitats is essential for their conservation (Saunders D.L. and Tzaros C. L., 2011). Swift Parrots breed in Tasmania and migrate to mainland Australia in autumn. During winter the parrots disperse across a broad landscape, foraging on nectar and lerps in eucalypts mainly in Victoria and New South Wales (Saunders D.L. and Tzaros C. L., 2011). In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year (Saunders D.L. and Tzaros C. L., 2011). The proposal will not remove breeding habitat and impacts will be limited to 5.35 hectares of foraging habitat mapped as important area and also mapped as low-moderate value by Birds Australia.

f. a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development

There is an estimated 45,000 hectares of available potential Swift Parrot foraging habitat in the Sydney Basin IBRA region. Despite impacting on 0.12 hectares of foraging habitat mapped as important area, the proposal will only further fragment the mapped draft Swift Parrot Important Areas by an area reduction of 0.00026% within the Sydney Basin IBRA region.

The Swift Parrot occurs as a single, migratory population (Saunders D.L. and Tzaros C. L., 2011). This population is capable of moving long distances to occupy new locations in response to changing food availability and landscape scale (TSSC, 2016) meaning the impacts will not fragment or isolate the population as a result of the proposed development.

g. the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other

population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range

As outlined above, the Swift Parrot occurs as one population. Swift Parrots breed in Tasmania and migrate to mainland Australia in autumn (Saunders D.L. and Tzaros C. L., 2011). During winter the whole population disperses across a broad landscape, foraging on nectar and lerps in eucalypts mainly in Victoria and New South Wales. Small numbers of Swift Parrots individuals are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland (Saunders D.L. and Tzaros C. L., 2011).

Movement pathways used by Swift Parrots throughout their range are not well understood. The species appear to prefer particular regions, with foraging sites used repetitively (Saunders D.L. and Tzaros C. L., 2011).

The study area is not located at the limit of the species' range and its local population only occurs on the locality on a seasonal bases.

h. The extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population

The National Recovery Plan for the Swift Parrot outlines the threats for the Swift Parrot. Urban development on the central and north coasts of NSW are listed as posing an ongoing threat of habitat loss, with an increasingly large proportion of the human population (about 86%) residing in coastal areas of Australia (Saunders D.L. and Tzaros C. L., 2011). Despite the absence of preferred feed trees within the subject land, the proposal will remove 0.12 hectares of an area mapped as potential foraging habitat for the species (draft Swift Parrot Important Areas map).

Indirect impacts that may be associated with the proposal include reduced tree regeneration, fire and competition. The proposal may also reduce the health of foraging trees for Swift Parrot. Where natural regeneration is inhibited, the health of existing mature trees and the seed source are also reduced, posing a risk to foraging habitat (Saunders D.L. and Tzaros C. L., 2011).

An increase in the incidence of accidental and deliberate fires has the potential to occur as a result of the proposal. Increases in fire frequency poses a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectivorous birds (Saunders D.L. and Tzaros C. L., 2011). Collisions with wire netting or mesh fences, windows and cars may cause mortality to Swift Parrots in urban areas throughout the species' range (Saunders D.L. and Tzaros C. L., 2011).

Continued encroachment into foraging habitat exacerbates the problem. Fragmentation of forest habitat is known to increase competition for resources with other species such as large aggressive honeyeaters as well as introduced birds and bees (TSSC, 2016). The proposed development within the subject land will avoid most of the foraging habitat for the species within the study area as well as implement additional mitigation measures listed in Section 4.

i. an estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion

As outlined above, the Swift Parrot exists as one migratory population. The Swift Parrots which inhabit NSW, including the Sydney Basin IBRA bioregion and the Hunter IBRA subregion are all part of the same population.

The approximate areas of draft Swift Parrot Important Areas within the Sydney Basin IBRA region and Hunter IBRA subregion are 45,000 hectares and 18,500 hectares respectively. The proposal will remove 0.12 hectares of native vegetation mapped as important Swift Parrot foraging habitat. This represents a reduction of less than 0.00065% in available foraging habitat within the Hunter IBRA subregion.

The National Recovery Plan for the Swift Parrot outlines the recovery actions and performance criteria for Swift Parrot (Saunders D.L. and Tzaros C. L., 2011). The Swift Parrot population is distributed across 30 Natural Resource Management regions, making management throughout the range of the species challenging (Saunders D.L. and Tzaros C. L., 2011). The Hunter – Central Rivers is recognised as a high

priority region for implementation of these recovery actions. The actions which are related to the Hunter region are outlined in the Table A. 2 below. Action 2 in particular refers to the management and protection of Swift Parrot foraging habitat.

As shown on Figure 13, around 10.1 hectares of mapped important area of Swift Parrot within the study area would not be impacted by the proposal. It is highly likely that the retained vegetation within the study area would provide equivalent or better-quality habitat for Swift Parrot than the 0.12 hectares to be impacted by the proposal.

In addition, offsets for residual negative impacts caused by the proposal will be provided to offset the impacts on 0.12 hectares of mapped important habitat for the species as required by the BAM and BOS, which will eventually be used by the BCT to secure an area of the community within the IBRA subregion in perpetuity.

Table A. 2 Swift Parrot Recovery Actions and Performance Criteria for the Hunter

Action	Description	Performance Criteria
Action 1 - Identify the extent and quality of habitat.		
Identify and map foraging and roosting habitat		
1.2a	Identify and map foraging habitat throughout the range of the species: New South Wales – refine and update habitat mapping as more vegetation mapping becomes available, including priority sites.	GIS mapping on foraging habitats and priority sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 3. Review, and if necessary, update, mapping by Year 5.
1.2b	Identify and map roosting habitat throughout the range of the species with an emphasis on communal and repeatedly used roosting sites.	GIS mapping on communal and repeatedly used roosting sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 5.
1.2c	Establish habitat phenology data collection in existing research and monitoring studies, analyse findings and incorporate into recovery program.	Consult with phenology experts on the most effective and economic way to collect useful habitat phenology data relevant to Swift Parrot habitat use by Year 3. Incorporate the collection of habitat phenology data in all relevant recovery program research and monitoring studies by Year 3. Analyse and incorporate findings into recovery program
1.3	Identify and map movement patterns throughout the range of the species.	GIS mapping on movement patterns throughout the range of the species, provided to DSEWPaC and each relevant local government and CMA by Year 5.
Action 2 - Manage and protect Swift Parrot habitat at the landscape scale.		
Manage and protect nesting and foraging habitat		

Action	Description	Performance Criteria
2.1a	Encourage and support the protection, conservation management and restoration of Swift Parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects. Relevant on-ground actions include (but are not limited to): Retaining and expanding mature and mixed age habitat and protecting and managing it by fencing and providing a buffer zone from disturbances. Enabling natural regeneration by fencing off and managing remnant vegetation and buffer zones to control grazing and other impacts caused by uncontrolled access (such as in urban areas). Re-vegetating areas and connecting remnant habitats by planting feed and nest tree species, fencing them off and managing them, where natural regeneration is not possible. Ongoing management of all the above fenced off areas would also be required, including pest, weed and fire management.	At least 5 incentive projects established each year for the protection, restoration or conservation management of Swift Parrot habitat. At least 5 conservation/management agreements initiated on private properties with Swift Parrot habitat by Year 5. At least 5 community project applications submitted for funding each year for the protection, restoration or conservation management of Swift Parrot habitat. Reports on the protection, restoration and management of Swift Parrot habitat provided at recovery team meetings.
2.1d	Provide Swift Parrot conservation information for consideration during the New South Wales. Local Government Local Environmental Planning (LEP) review process.	Swift Parrot conservation information provided to at least three key Local Government Areas for consideration during the LEP review process.
Monitor and manage for climate change		
2.2 a	Establish a climate change monitoring program to provide a basis for future adaptive conservation management.	Swift Parrot monitoring sites identified and established in association with climate monitoring stations throughout the range of the species to provide a basis for adaptive climate change conservation management plans.
2.2b	Investigate the potential impact of climate change on the Swift Parrot and its habitat.	Spatial and temporal climate change models produced for the Swift Parrot based on species records, habitat mapping and bio- climatic models throughout the range of the species. Review the potential influence of climate change on the species and identify future management strategies to address this issue.
Action 3 - Monitor and manage the incidence of collisions, competition and diseases.		
Monitor and manage the incidence of collisions		

Action	Description	Performance Criteria
3.1a	Establish and maintain a database for all reported injuries and deaths.	Collision database established. Ongoing maintenance of collision database as a component of the Swift Parrot Recovery Program database. Report on number and type of collisions throughout the range of the species at recovery team meetings annually.
3.1b	Continue to raise public awareness of the risks of collisions and how these can be minimised. Awareness campaigns to target known high risk areas such as the greater Hobart, Melbourne and Western Sydney areas, and the central coast region of New South Wales (Wyong, Gosford, Lake Macquarie and Penrith Local Government areas).	Produce and distribute a further 5000 copies of the collision prevention brochure. Produce at least two media releases per year on collision prevention for public awareness in high-risk areas.
3.1c	Develop and distribute guidelines on collision risk management to relevant planning authorities.	Guidelines on collision risk management distributed to relevant state/territory governments, as well as local governments, NRMs and CMAs in high-risk areas by Year 3.
3.2	Monitor the incidence of competition from large aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources.	Establishment of monitoring program to determine the extent of competition from larger aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources, to inform management.
3.3	Develop and implement a Psittacine Beak and Feather Disease management protocol.	PBFD monitoring protocol developed based on the DSEWPaC PBFD Threat Abatement Plan and distributed to all fauna rescue and State conservation organisations by Year 4. Protocol to include rescue and quarantine housing requirements for rehabilitated birds. All rehabilitated birds tested for PBFD prior to release. Details of the number of rehabilitated birds and their disease tests reported annually at recovery team meetings. Test all deceased specimens of Swift Parrots for PBFD.
Action 4 - Monitor population and habitat		
Collect and analyse information on population dynamics and viability		

Action	Description	Performance Criteria
4.2a	Undertake research on breeding success, survival and mortality, as well as genetic structure to provide insight into currently unknown population regulation parameters.	Establishment of an ongoing research and monitoring program investigating nesting distribution and success by Year 3. Proportions of flocks containing juveniles throughout the winter range reported annually at recovery team meetings and on the web page.
4.2b	Conduct population viability analysis (PVA) using data obtained from above research to provide a greater understanding of the dynamics and long-term viability of the population.	PVA conducted by Year 5, following the acquisition of essential population data.
Establish and maintain coordination of volunteer surveys		
4.3b	Maintain coordination of the existing long-term volunteer monitoring throughout mainland habitats.	Existing volunteer coordinator position maintained on an ongoing basis. Bi-annual volunteer surveys conducted across eastern Australia, survey results compiled and provided on web page, in newsletters and at recovery team meetings.
Action 5 - Increase community involvement in, and awareness of, the recovery program		
5.1	Provide advice, education and support to volunteers, community members, landowners, local governments and regional NRM organisations (includes presentations and workshops).	Summary of community and landowner information and education program implementation across the range of the species provided at recovery team meetings. At least one full day community education and awareness workshop held each year. At least 5 presentations to interest groups each year. Information distributed to all relevant regional NRM organisations at least twice a year to keep them informed of the recovery program. Swift Parrot information produced and distributed to community groups, management agencies, schools and other education institutions on request.

Action	Description	Performance Criteria
5.2	Assess the level of indigenous interest in the recovery program by consulting relevant indigenous people and organisations that occur within the species' range.	Indigenous representatives from throughout the species range consulted to gauge their level and type of interest in the recovery program. Consultation to commence in Year 4. Given the large number of potential indigenous groups and people to consult, this process would be incremental throughout the recovery program. Updates on consultation and interest to be provided at each recovery team meeting. Indigenous parties identified as having interest in the program are included in the recovery program mailing list. Interested indigenous parties consulted to determine what involvement they would like to have, and if there is any relevant traditional knowledge available on the species or its habitats, should it be appropriate to document this knowledge for recovery program purposes.
5.3	Produce and distribute the annual recovery program newsletter Swifts Across the Strait.	Newsletters produced and distributed to recovery program volunteers, community groups and NRM organisations each year.
5.4	Develop a Swift Parrot Recovery Program web page providing access to recovery plans, audio and visual identification information, survey forms, links with other conservation programs and on-line volunteer survey data entry.	Web page designed and established on the internet by Year 3. Web page reviewed, and if necessary, updated annually.
Action 6 - Coordinate, review and report on recovery process		
6.1	Maintain a recovery team that effectively organises, implements, reviews and reports on the recovery outcomes.	Volunteer program coordinators (Tasmania, Victoria, New South Wales), and breeding researchers (Tasmania) employed each year to implement recovery actions. Recovery team meetings held and minutes produced bi-annually, with the location allocated on a rotational basis between the range States. Recovery outcomes and resultant changes to recovery program reported bi-annually.

Action	Description	Performance Criteria
6.2	Develop and manage a central database for all data collected as part of the recovery program.	Swift Parrot recovery database (SPRD) developed and made accessible for on-line data entry on recovery program web page by Year 3. SPRD maintained and updated annually. All Swift Parrot records from SPRD provided to relevant Commonwealth, state and territory government departments and Birds Australia on an annual basis for inclusion in their respective atlas databases.

APPENDIX 4 SIGNIFICANT IMPACT CRITERIA ASSESSMENTS

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

Community background

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland is listed as endangered under the EPBC Act. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland is described in the Conservation Advice as often having a layered canopy, dominated by melaleucas and/or *Eucalyptus robusta* species and occurring between the Great Dividing Range and Coastline from near Gladstone in Queensland, through to the south coast of New South Wales.

The community typically occurs in low-lying coastal alluvial areas with minimal relief such as swamps, floodplain pockets, depressions, behind fore-dunes and other similar locations. The frequency and duration of water inundation, salinity and nutrient content of the soil, and latitude influences the vegetation composition of the Coastal Swamp Sclerophyll Forest.

Typically, the community is found on hydric soils that either waterlogged or intermittently or episodically inundated for typically between one to three months per year. The soils are typically unconsolidated sediments such as alluvial deposits, marine or aeolian sand or inter-barrier creek deposits that have been stained black or dark grey with humus. The structure of the community varies from open woodland to closed forest with a crown cover of at least 10% and typically no more than 70%.

Occurrence in the study area

Based on a review of the EPBC Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland Conservation Advice (DAWE 2021b), the native vegetation remnants (PCT 1717) recorded within the study area could potentially be associated with this EEC due to, but not limited to, the presence of the dominant canopy species *Melaleuca* species, particularly *Melaleuca quinquenervia*. Based on floristic attributes and patch size (>5 hectares), mapped areas of this community (including in VZ1 and VZ2 within the subject land) meet the minimum condition thresholds for this EEC (Class C2) (DAWE 2021b).

Significant impact assessment

Based on an understanding of the extent and condition of this EEC in the study area, it is concluded that project impacts are unlikely to lead to an impact on the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland, endangered ecological community. It is critical that specific mitigation measures are adhered to and the construction footprint is reduced to the minimum extent possible to avoid impacts to this EEC. An assessment and justification is provided in Table A.3.

Table A. 3 Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland, EPBC EEC assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (Critically Endangered / Endangered Community)	Likelihood of significant impact	Justification
Reduce the extent of an ecological community.	Unlikely	The proposal will impact upon approximately 5.35 hectares of PCT 1717, consisting of low-moderate condition (4.03 hectares) and moderate-good condition (1.32 hectares) vegetation. The mapped area of this PCT, meets the minimum condition thresholds for the EPBC-listed EEC as Class C2 (large patch in low condition) (Table 2 in DAWE (2021b)). Across Australia, Coastal Swamp Sclerophyll Forest has undergone a reduction in extent of between 53% and 76% since 1750. The study area contains 17.5 ha of PCT 1717 in various conditions, which are considered part of the Coastal Swamp Sclerophyll Forest. The proposal will bring a reduction of 5.35 ha of low condition (C2) vegetation with a high number of exotic *Pinus elliottii* (Slash Pine) in the canopy. The proposal would reduce the extent of this TEC by 0.0047% based on estimates of the total TEC extent within Australia (DAWE 2021b). This project will impact upon a comparatively small amount of the overall extent of the TEC and will not significantly reduce the extent of this EEC within NSW or Australia

Significant impact criteria (Critically Endangered / Endangered Community)	Likelihood of significant impact	Justification
Fragment or increase fragmentation of an ecological community.	Unlikely	The natural setting of this EEC was as large to small patches within a mosaic of coastal and floodplain communities. This community has suffered major ongoing threat from fragmentation of remnants and habitats across its range with vegetation clearing and altered hydrology reducing many large remnants to smaller, isolated and disconnected patches within a heavily modified landscape(DAWE 2021b). The project will reduce the area of the community by 5.35 ha, however this is comparatively small considering the 114,358 ha estimated extent of this community across New South Wales and Southeast Queensland. Where practicable, the proposed clearing has been located to areas of exotic / slashed vegetation and low-moderate condition areas of this TEC. The clearing of PCT 1717 will occur predominantly on existing edges of exotic vegetation and, instead of creating new vegetation fragments, it will further establish existing breaks in connectivity. This project is occurring in an already fragmented landscape with breaks in connectivity caused by existing high-speed roads and suburban development. As the proposal impacts are occurring in an already impacted area it is not expected to significantly increase fragmentation of the ecological community.
Adversely affect habitat critical to the survival of an ecological community.	Unlikely	No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. The conservation advice (DAWE 2021b) states that hydrology is a determining factor in the occurrence of this community and should therefore be considered as important for the integrity of this community. As the proposal will compact existing soils and raise the elevation of land with fill, it is possible that this will impact on the condition of adjoining Swamp Sclerophyll Forest though it is unclear to what level (if any) the impact will be. In considering the risk from changed hydrology, the maintenance of nearby existing watercourses is a large component of the mitigation of risk. The study area receives water from a fourth and second order watercourse: Grahamstown Drain and Windeyers Creek (respectively). As these watercourses are not expected to be impacted by the proposal, it is likely that they will continue to supply water to groundwater dependant ecosystems, including Coastal Swamp Sclerophyll Forest. Overall, it is not anticipated that the proposal will adversely affect habitat critical to the survival of an ecological community.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Unlikely	The conservation advice (DAWE 2021b) states that hydrology is a determining factor in the occurrence of this community and should therefore be considered as important for the integrity of this community. As the proposal impacts will alter the hydrology of the subject land, it is possible that this will impact on the condition of adjoining Swamp Sclerophyll Forest though the potential level of impact (if any) is unclear at this stage. However, this is considered unlikely to affect the hydrology as the remaining vegetation of the study area also receives water from a fourth and second order watercourse: Grahamstown Drain and Windeyers Creek, respectively. As these watercourses are not expected to be impacted by the proposal, it is likely that they will continue to supply water to groundwater dependant ecosystems, including Coastal Swamp Sclerophyll Forest. Overall, it is not anticipated that the proposal will modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a	Unlikely	The proposal will impact upon approximately 5.35 hectares of PCT 1717, consisting of low-moderate condition (4.03 hectares) and moderate-good condition (1.32 hectares) vegetation. As there is equivalent or higher quality vegetation of the same community in the surrounding area, it is not expected that there will be a substantial change in the species

Significant impact criteria (Critically Endangered / Endangered Community)	Likelihood of significant impact	Justification
decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.		composition of the community. As the impact to the community from this proposal (5.35 hectares) is comparatively small to that which is available in the study area (17.5 hectares), it is not expected that there will be a significant decline or loss of functionally important species.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - Assisting invasive species establishment- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	Unlikely	The proposal will involve filling the proposal area with suitable material to elevate the ground surface. The project has potential to transport invasive species onto the site through the movement of trucks and vehicles. This will be controlled through hygiene measures for the site during construction (see Table 12 and Table 13). Where practicable, the proposed clearing has been located to areas of exotic / slashed vegetation and low-moderate condition areas of this TEC. It is not anticipated that the proposal will cause a substantial reduction in the quality or integrity of an occurrence of this EEC, as the development footprint selection has been located to areas of exotic / slashed vegetation and low-moderate condition areas of this TEC, where practicable, and the construction will implement mitigation measures to limit risk.

Significant impact criteria (Critically Endangered / Endangered Community)	Likelihood of significant impact	Justification
Interfere with the recovery of an ecological community.	Unlikely	There is no direct adopted or made Recovery Plan for this ecological community and therefore recovery priorities (actions and locations) have not been formerly articulated by the Australian Government. However, there are a number of associated plans for common threats of the community that have been already developed including plans for feral cats, prevention of invasive plant disease and weed spread as well as the recovery plan for the regent honey eater. In addition to these plans the NSW Saving our Species Strategy for the NSW listed Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions aligns in part with the EPBC-listed TEC. The Saving our Species Strategy addresses a number of threats. Those actions that are particularly relevant to the proposal include: • Maintain, improve or reinstate optimal hydrological regimes. Measures may include estuary entrance management, filling in drains, installing 'smart gates' etc. • Control weeds using a 'staged approach' as per the bitou bush monitoring manual (https://www.environment.nsw.gov.au//topics/animals-and-plants/pest-animals-and-weeds/weeds/widespread-weeds/staged-approach-to-weed-control) and best practice techniques that minimise off-target damage. • Manage trails and unsealed roads adjacent to and upstream of the TEC to reduce sedimentation impacts. Avoid unnecessary disturbance of track surfaces and, where feasible, seal unsealed roads (or parts thereof). Implement appropriate sediment controls on water diversions to ensure flows are maintained but sediment loads are minimised. • Implement appropriate water sensitive design to reduce impacts of runoff on the TEC and implement best practice stormwater and soil conservation principles (e.g. identify problem stormwater input locations, install stormwater basins and maintain sediment traps etc). • Prioritise protection of sites where the TEC can migrate into adjacent areas of suitable elevation and land use, and investigate actions to facilitate the migration of the TEC, where suitable. • Improve the understanding of optimal hydrological regimes for each floristic and geomorphological variants of the TEC. For example, investigate the interaction between geomorphology and floristics, and the role of these components in TEC function and resilience. • Provide land managers and industry with information about the value of the TEC and the threats impacting it. Encourage best practice management, for example, to maintain native vegetation buffers around the TEC, prevent clearing, and/or encourage appropriate use of potential pollutants within and adjacent to the TEC. Promote use of the NSW Coastal Management Manual (State of New South Wales and Office of Environment and Heritage 2018). The proposal is not going to be directly contributing to the recovery of this TEC at this stage. It is not anticipated that the proposal will lead to a degradation of the condition of this TEC not directly impacted by the development due to implementation of hygiene and erosion control measures. The current document recommends that a Vegetation Management Plan (VMP) be implemented in order to guide the restoration or rehabilitation of the riparian corridor established by way of the retained VRZ extending 40 metres from the top of bank from Grahamstown Drain. Alternatively, vegetation to be retained within the study area may potentially be established as a future Biodiversity Stewardship Site for the purposes of offsetting the loss of native vegetation from the project. Both the VMP and Biodiversity Stewardship Site processes are likely to benefit this TECs integrity and recovery. It is unlikely to have a significant impact on the implementation of the Saving our Species Strategy outside of the study area.

Conclusion

The proposal will impact upon approximately 5.35 hectares of PCT 1717, consisting of low-moderate condition (4.03 hectares) and moderate-good condition (1.32 hectares) vegetation. This PCT is aligned with Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland class C2. Where practicable, the proposed clearing has been located to areas of exotic / slashed vegetation and low-moderate condition areas of this TEC. This equates to a small area of the TEC within the existing landscape and 0.0047% of the total TEC extent (DAWE 2021b). It is therefore considered that the clearing of 5.35 hectares of PCT 1717 for the proposal is unlikely to have a significant impact on this TEC.

It is possible that the proposal impacts may have an impact on the surrounding vegetation, including areas identified as the TEC however it is considered unlikely that this will impact areas of the TEC due to the maintenance of Grahamstown Drain and Windeyers Creek in the landscape. Therefore, it is considered unlikely that the proposal will result in a significant impact on the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland TEC and a referral is therefore not required.

Trailing Woodruff (*Asperula asthenes)*

Species background

Trailing Woodruff *(Asperula asthenes)* is listed as vulnerable under the EPBC Act. *Trailing Woodruff* is a low, trailing perennial herb with leaves in whorls of four around the stem. The species has white, tiny and fragrant flowers. It has only been recorded in NSW and has a scattered distribution from the Central Coast to near Kempsey including several records from the Port Stephens, Wallis Lakes, Forster areas. The species is known to prefer damp sites, often found along riverbanks (DEWHA, 2008a).

Occurrence in the study area

There are no records of this species within 10 km of the study area, a targeted survey was not performed for this species.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for Trailing Woodruff, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.4.

Table A. 4 Trailing Woodruff (*Asperula asthenes)*, EPBC vulnerable species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	An 'important population' is defined as a population that is necessary for the long-term survival and recovery of the species (CoA 2013). No important populations have been identified for Trailing Woodruff. There are no previous records of the species within the study area or within 10 km of the study area. Though there are waterbodies within the study area and subject land that could provide marginal habitat for this species, it is unlikely that an important population is present within the subject land based on the poorer condition of vegetation which predominantly occurs. The project will not adversely impact on existing records of this species, therefore is unlikely to impact on an important population of this species.
Reduce the area of occupancy of an important population	Unlikely	The subject land will not adversely impact an important population.
Fragment an existing important population into two or more populations	Unlikely	The project will not fragment an existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Trailing Woodruff. As the species is known to prefer damp environments, it is possible that the proposals removal of Swamp Sclerophyll Forest and Freshwater Wetland would impact the species if it were present. However, as the species has not been identified within 10 km of the study area it is unlikely to adversely impact on habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The proposed works will not adversely impact an important population. Given that there are no areas of recorded individuals for this species within 10 km, and the nature and scale of the proposal is unlikely to impact on the species pollinators or flowering, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	As the species is known to prefer damp environments, it is possible that the Swamp Sclerophyll Forest and Freshwater Wetland which occurs within the subject land could provide potential habitat for this species. However, as the species has not been identified within 10 km of the study area and the majority of the impact area has been targeted to areas of lower condition Swamp Sclerophyll Forest, exotic / slashed vegetation and bare earth areas which offer poorer potential habitat for this species, it is unlikley that the proposal will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The proposal does involve greater transport to site by trucks that could spread propagules of invasive species but these will be managed through hygiene measures. The subject land already contains a substantial population of exotic species, including areas of pine-

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
the vulnerable species' habitat		dominated vegetation and managed exotic vegetation within damp locations. The proposed works are unlikely to result in an increase of invasive species. Construction activities will be managed through standard practices to avoid further spread of weeds (refer to Section 4).
Introduce disease that may cause the species to decline	Unlikely	Disease has not been identified as a threat for Trailing Woodruff. As hygiene measures will be in place, it is not expected that diseases of Trailing Woodruff will be imported to the site.
Interfere substantially with the recovery of a species	Unlikely	A National Recovery Plan for *Asperula asthenes* has not been produced, however the NSW priority actions statement (DECC, 2007) identifies the following action for Herbs and Forbs including NSW Priority Action Statement for Trailing Woodruff: • Survey should initially focus on confirming continued existence of *Asperula asthenes* at known sites, then survey adjacent suitable habitat. • Habitat condition at known sites should be monitored. • Research into seed bank dynamics and dispersal mechanisms needed. • Control weeds as they are a serious threat *to Asperula asthenes* in many locations but control by chemical means may not be suitable; priority should be given to sites with reasonable native vegetation. • Retain or enhance habitat along watercourses in areas near known populations of Asperula asthenes and exclude stock. • Maintain populations ex situ at suitable botanic gardens, regional gardens or nurseries. • Ensure the species is considered in statutory plans relevant to its distribution. • Ensure this species is considered in local government weed control program. • Provide information to the public on *Asperula asthenes*, particularly landowners adjacent to areas of known occurrence. Considering the above factors and the fact that this species was not recorded within 10 km of the study area, it is not anticipated that the project will interfere substantially with the recovery of the species.

Conclusion

Works are proposed to impact on 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and one hectare of exotic vegetation, with both areas exhibiting exotic flora in damp areas preferred by this species. The majority of the impact area is within areas of lower condition native vegetation and disturbed, exotic / slashed vegetation and bare earth areas offering limited potential habitat for this species.

No recorded individuals for this species have been identified within 10 km of the study area and the project is unlikely to disrupt the breeding cycle of an important population. As such it is considered unlikely that the proposed action will significantly impact Trailing Woodruff and a referral is therefore not required.

Small-flower Grevillea *(Grevillea parviflora* subsp. *parviflora)*

Species background

Small-flower Grevillea is listed as vulnerable under the EPBC Act. Small-flower Grevillea is a low, open to erect shrub usually 0.3−1 m high. The species has narrow leaves and white flowers with rusty brown hairs and flowers between July and December and between April and May.

Small-flower Grevillea is only known from NSW where it occurs in the Prospect-Camden and Appin areas as well as with other disjunct populations in the Lower Hunter Valley, Central Coast and Port Stephens area. The species grows on sandy to gravelly clay over shale on the crests, upper slopes or flat plains in both low-lying areas (30-65 m ASL) and higher topography (200 -300 m ASL).

The species can be found in a range of vegetation types including heath, shrubby woodland and open forest and populations are also found in disturbed sites along roads and tracks as well as open areas of habitat. Populations can vary from small (less than 20 plants) to large (more than 200 plants) (DEWHA, 2008b).

Occurrence in the study area

There are no records of this species within study area, a targeted survey was not performed for this species. The nearest record of this species is 4 km south of the study area.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for Small-flower Grevillea, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.5.

Table A. 5 Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora)*, EPBC vulnerable species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	An 'important population' is defined as a population that is necessary for the long-term survival and recovery of the species (CoA 2013). No important populations have been formally identified for *Grevillea parviflora* subsp. *parviflora*. There are no previous records of the species within the study area and the nearest record is 4 km outside of the study area. Though there are sandy soils within the study area and subject land that could provide habitat for this species, it is unlikely that an important population is present within the subject land. The project will not adversely impact on existing records of this species, therefore is unlikely to impact on an important population of this species.
Reduce the area of occupancy of an important population	Unlikely	The subject land will not adversely impact an important population.
Fragment an existing important population into two or more populations	Unlikely	The project will not fragment an existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Small-flower Grevillea. While the species is known to occur on ecosystem types similar to those within the subject land, the species has not been identified within 4 km of the study area so it is unlikely that habitat within the subject land would be considered critical for the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The proposed works will not adversely impact an important population. Given that there are no areas of recorded individuals for this species within 4 km, and the nature and scale of the proposal is unlikely to impact on the species pollinators or flowering, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	As the species is able to establish in a variety of environments, it is possible that the proposal would have an impact on the species if it were present. However, as the species has not been identified within 4 km of the study area and the area to be impacted is restricted to 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and 1 ha of exotic vegetation, it is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The proposal does involve greater transport to site by trucks that could spread propagules of invasive species but these will be managed through hygiene measures. The subject land already contains a substantial population of exotic species. The proposed works are unlikely to result in an increase of invasive species due to mitigation measures. Construction activities will be managed through standard practices to avoid further spread of weeds (refer to Section 4.0).
Introduce disease that may cause the species to decline	Unlikely	Disease has not been identified as a threat for *Grevillea parviflora* subsp. *Parviflora*, though a threat assessment to determine sensitivity to pathogens such as Phytophthora was suggested by the Saving Our Species strategy. As hygiene measures will be in place, it is not expected that diseases of *Grevillea parviflora* subsp. *parviflora* will be imported to the site.
Interfere substantially with the recovery of a species	Unlikely	A National Recovery Plan for *Grevillea parviflora* subsp. *parviflora* has not been produced, however the NSW Saving Our Species program has identified the species as data deficient (SOS 2021b). The Saving Our Species program recommended that the species receive a threat assessment to • Determine sensitivity to pathogens, • Assess recruitment and pollination success, • Examine the impacts of fire and • Use genetics to determine the diversity of individuals. Considering the above factors and the fact that this species was not recorded within 4 km of the study area, it is not anticipated that the project will interfere substantially with the recovery of *Grevillea parviflora* subsp. *parviflora*

Conclusion

Works are proposed to impact on 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, that could be habitat for Small-flower Grevillea. No recorded individuals for this species have been identified within 4 km of the study area, the project is unlikely to disrupt the breeding cycle of an important population. As such it is considered unlikely that the proposed action will significantly impact Small-flower Grevillea and a referral is therefore not required.

Black-eyed Susan (*Tetratheca juncea)*

Species background

Black-eyed Susan is listed as vulnerable under the EPBC Act. Black-eyed Susan is a low growing shrub with clumps of stems to 1 metre or more in length. Black-eyed Susan occurs in NSW, chiefly in coastal districts from Bulahdelah to Lake Macquarie. Extant populations occur in the areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes, and Cessnock, with a north-south range of about 125 kilometres and an east west range of approximately 50 kilometres. Black-eyed Susan usually grows in nutrient poor soils on ridges, in open forest and woodland with a mixed shrub understorey and grassy groundcover, but has also been recorded in heath and moist forest (DEHWA 2008d).

Occurrence in the study area

This species was not recorded within the study area during flora targeted surveys. However, since the targeted surveys were not undertaken during the flowering period (July-December), Black-eyed Susan was assumed present within the native vegetation and exotic vegetation of the subject land. Records for this species do not occur within a 10km buffer of the study area.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for *Tetratheca juncea*, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.6.

Table A. 6 *Tetratheca juncea*, EPBC vulnerable species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	An 'important population' is defined as a population that is necessary for the long-term survival and recovery of the species (CoA 2013). This species was not recorded during the field survey performed on site. There are no previous records of the species within the study area, and no records occur within the locality, therefore, it is unlikely that an important population is present on site. Areas of potential Black-eyed Susan habitat within the study area includes 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and 1 ha of exotic vegetation within the subject land. The project will not adversely impact on existing records of this species, therefore is unlikely to impact on an important population of this species.
Reduce the area of occupancy of an important population	Unlikely	The subject land will not adversely impact an important population.
Fragment an existing important population into two or more populations	Unlikely	The project will not fragment an existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Black-eyed Susan. While the species is known to occur on ecosystem types similar to those within the subject land, it is important to note that the 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and 1 ha of exotic vegetation, is not considered habitat critical to the species. In addition, there are large areas of equivalent or better-quality vegetation within the locality so it is unlikely that habitat within the subject land would be considered critical for the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The subject land will not adversely impact an important population. Given that areas of recorded individuals for this species and pollination or seed dispersal will be will not be impacted, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Clearing of the subject land is restricted to 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and 1 ha of exotic vegetation. The nature and location of this clearing will not significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
to a vulnerable species becoming established in the vulnerable species' habitat		proposal does involve greater transport to and from site by trucks that could potentially spread propagules of invasive species but these will be managed through appropriate hygiene measures. The subject land already contains a substantial population of exotic species. The proposed works are unlikely to result in an increase of invasive species, provided proposed mitigation measures are adopted. Construction activities will be managed through standard practices to avoid further spread of weeds (refer to Section 4.0).
Introduce disease that may cause the species to decline	Unlikely	Disease has not been identified as a threat for Black-eyed Susan. As hygiene measures will be in place (Section 4.0), it is not expected that diseases relevant to Black-eyed Susan will be imported to the site.
Interfere substantially with the recovery of a species	Unlikely	A National Recovery Black-eyed Susan has not been produced; however, the Approved Conservation Advice (DEHWA 2008d) identifies the relevant objectives for the recovery of the species: 1. Monitor known populations to identify key threats. 2. Identify populations of high conservation priority. 3. Ensure stormwater infrastructure and associated development involving substrate or vegetation disturbance do not adversely impact on Black-eyed Susan and manage any associated hydrological change, such as increased runoff. 4. Undertake weed control activities as appropriate using approved bush regeneration methods at priority sites on private and public land. 5. Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on Black-eyed Susan. 6. Implement suitable hygiene protocols to protect known sites from further outbreaks of dieback caused by *Phytophthora cinnamomi*. 7. Undertake appropriate seed collection and storage. Considering the above factors, the project will not interfere substantially with the recovery of Black-eyed Susan. Considering the above factors, the fact that this species was not recorded within the study area and has not previously been recorded within the locality, it is not anticipated that the project will interfere substantially with the recovery of Black-eyed Susan.

Conclusion

Works are proposed to impact on 5.47 hectares of native vegetation, of which 4.03 hectares is in low-moderate condition, and 1 ha of exotic vegetation that could be habitat for Black-eyed Susan. The nature and location of this clearing will not significantly reduce the availability of habitat within the locality.

In addition, no recorded individuals of this species have been identified within the locality and the project is unlikely to disrupt the breeding cycle of an important population. As such it is considered unlikely that the proposed action will significantly impact Black-eyed Susan and a referral is therefore not required.

Swift Parrot *Lathamus discolor*

Species background

Swift Parrot is listed as critically endangered under the EPBC Act. This species migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. tereticornis* (Forest Red Gum), *E. sideroxylon* (Mugga Ironbark) and *E. albens* (White Box).

Commonly used lerp infested trees include Inland *E. microcarpa* (Grey Box), *E. moluccana* (Grey Box), *E. pilularis* (Blackbutt) and *E. melliodora* (Yellow Box). Swift Parrot return to some foraging sites on a cyclic basis depending on food availability. Following winter, they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by *Eucalyptus globulus* (Tasmanian Blue Gum).

Occurrence in the study area

Swift Parrot was assumed present within the area mapped under the NSW Swift Parrot Important Area Map of the subject land. Detailed vegetation mapping within the subject land identified the area of mapped important habitat for the species is limited to 0.12 hectares of low-moderate condition native vegetation. Three records for this species occur within a 10km buffer of the study area. The most recent Swift Parrot record within the locality occurred in August 2007.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for Swift Parrot, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.7.

Table A. 7 Swift Parrot, EPBC critically endangered species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (endangered or critically endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	This species was not detected during field surveys. There are no previous records of the species within the study area. Three records for this species occur within a 10km buffer of the study area. The most recent Swift Parrot record within the locality occurred in August 2007. Of the area mapped under the Swift Parrot Important Area Map, detailed vegetation mapping within the subject land identified the area of potential habitat for the species is limited to 0.12 hectares of low-moderate condition native vegetation. An additional 5.3 hectares of low-moderate, and moderate-good condition PCT 1717, 0.12 hectare moderate condition PCT 1071 and one hectare of exotic vegetation containing no favoured feed trees will also require removal. The proposed development will avoid a large, intact area of potential Swift Parrot foraging habitat mapped as an important area for the species. Retained mapped Swift Parrot habitat is likely to be resilient to indirect impacts arising from the proposal and will be conserved and managed as part of a Vegetation Management Plan (VMP), or alternatively, through establishment of a Biodiversity Stewardship Site in areas of native vegetation to be retained. Hence, it is expected that the proposal is unlikely to a lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species	Unlikely	The proposal is unlikely to reduce the area of occupancy of this species based on the habitat attributes and quality of the habitat to be impacted. The proposed development will avoid a large, intact area of mapped important Swift Parrot foraging habitat in the study area.
Fragment an existing population into two or more populations	Unlikely	As a migratory species, Swift Parrots are highly mobile. Suitable habitat for this species is available throughout the locality, which extends throughout the Port Stephens LGA. Based on the availability of suitable habitat, and the size and quality of the habitat to be impacted within the subject land, it is considered that the proposed action is unlikely to fragment an existing population of this species into two or more populations.
Adversely affect habitat critical to the survival of a species	Unlikely	Habitat critical to the survival of the Swift Parrot includes; those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team. The Hunter-Central Rivers Catchment

Significant impact criteria (endangered or critically endangered species)	Likelihood of significant impact	Justification
		Management Area is identified as containing priority habitat for conservation management of Swift Parrot nesting and foraging resources. However being as this species does not breed in the region, the limited area of mapped important habitat to be impacted (0.12 hectares), the lack of recent species records, the proposal not impacting on preferred feed trees and the vast tracts of similar or better-quality potential habitat for this species available within the Hunter – Central Rivers CMA it is not anticipated that proposal will adversely affect habitat critical to the survival of the Swift Parrot (Saunders, D.L. and Tzaros, C.L. 2011).
Disrupt the breeding cycle of a population	Unlikely	The proposal is unlikely to disrupt the breeding cycle of a population given that the species does not breed in the local area; breeding is restricted to Tasmania. In addition, few records of this species occur in the locality, whilst vast tracts of similar or better-quality habitat present potential habitat for this species in the Port Stephens LGA.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Suitable habitat for this species is available throughout the local area, which extends throughout the Port Stephens LGA. Based on the availability of suitable habitat, and the size and quality of the habitat to be impacted within the subject land, it is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The proposal does involve greater transport to and from site by trucks that could potentially spread propagules of invasive species but these will be managed through appropriate hygiene measures. The subject land already contains a substantial population of exotic species. The proposed works are unlikely to result in an increase of invasive species, provided proposed mitigation measures are adopted. Construction activities will be managed through standard practices to avoid further spread of weeds (refer to Section 4.0).
Introduce disease that may cause the species to decline	Unlikely	The proposed activity is unlikely to lead to introduction of a disease that may cause the species to decline.
Interfere with the recovery of the species	Unlikely	The National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) identifies the relevant actions for the recovery of the species: • Action 1 - Identify the extent and quality of habitat. • Action 2 - Manage and protect Swift Parrot habitat at the landscape scale. • Action 3 - Monitor and manage the impact of collisions, competition and disease. • Action 4 - Monitor population and habitat. Considering the above factors, key attributes relating to the proposal include, • There are no previous records of the species within the study area, • The most recent Swift Parrot record within the locality occurred in August 2007 and • The subject land is limited in size and consists of low-moderate condition vegetation, lacking preferred feed trees for the Swift Parrot. It is not anticipated that the project will interfere substantially with the recovery of the Swift Parrot.

Conclusion

Works are proposed to impact on 5.3 hectares of low-moderate, and moderate-good condition PCT 1717, 0.12 hectares of moderate condition PCT 1071 and one hectare of exotic vegetation containing no favoured feed trees (0.12 hectares mapped as important habitat for the species). The nature and location of this clearing will not significantly reduce the availability of habitat within the study area.

In addition, no recorded individuals of this species have been identified within the study area, with the most recent Swift Parrot record within the locality occurring in August 2007. The project is unlikely to lead to a long-term decrease in the size of a population and as such it is considered unlikely that the proposed action will significantly impact Swift Parrot and a referral is therefore not required.

Green and Golden Bell Frog *Litoria aurea*

Species background

Green and Golden Bell Frog (GGBF) is listed as vulnerable under the EPBC Act. *Litoria aurea* is a large, dull olive to bright emerald green frog growing up to 85 mm in length. The back of the frog has large irregular blotches ranging from brown to rich golden-bronze. It has fully webbed hind toes but the fingers of the front feet lack webbing. Breeding occurs in spring and summer, peaking in January and February following heavy rain. Prior to the 1980s, GGBF was extremely common along the coast of New South Wales and widespread in the coastal hinterlands, southern highlands, central tablelands and southern tablelands. It is now considered absent from at least 90% of its former distribution. The species is currently found between Yuraygir National Park in New South Wales and Lake Tyers in Victoria (DoE, 2014).

Occurrence in the study area

There are no records of this species within the study area, a targeted survey was not performed for this species. The nearest record of the species is from 1973 where an individual was found 1.6 km north of the study area.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for GGBF, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.8.

Table A. 8 *Litoria aurea*, EPBC vulnerable species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	An 'important population' is defined as a population that is necessary for the long-term survival and recovery of the species (CoA 2013). The species has at least 54 identified important populations, the nearest of which is 7 km south at Hexham / Kooragang Island / Ash Island (DEWHA, 2009). The project will not adversely impact on existing records of this species and therefore is unlikely to impact on an important population of this species.
Reduce the area of occupancy of an important population	Unlikely	Impacts on the subject land will not adversely impact an important population.
Fragment an existing important population into two or more populations	Unlikely	The project will not fragment an existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for GGBF. The species is known to use a variety of habitats throughout its different life stages and in different seasons including: • A range of waterbodies from freshwater to estuarine, large to small as well as permanent to ephemeral, • A range of ecosystems including marshes, dune swales, lagoons, lakes, riverine floodplains, billabongs and estuary wetlands • They have been found in constructed water bodies such as stormwater basins, farm dams, areas bunded by earthworks, drains and ditches • They can be found in water, vegetation, between rocks and in dumped building materials such as sheet iron and bricks (DECC, 2008). Given the range of possible habitat for *Litoria aurea* is possible that the proposals removal of vegetation around Grahamstown Drain would impact the species if it were present. However, as the species has not been identified within 1.6 km of the study area and the important population is 7 km away, it is unlikely that the proposal would impact on habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The proposed works will not adversely impact an important population. Given that the only record to the north of the site is from 1973 and the existing population is 7 km to the south, it is unlikely that the changed conditions will impact breeding success or conditions of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of	Unlikely	As the species can utilise a variety of environments, it is possible that the proposals removal of vegetation would impact the species habitat if it were present. However, as the only record to the north of the site is from 1973 and the existing population is 7 km to

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
habitat to the extent that the species is likely to decline		the south, it is unlikely that the proposal would impact on availability or quality of habitat to the extent that would lead to species decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The proposal does involve greater transport to site by trucks that could spread propagules of invasive species but these will be managed through hygiene measures. The proposal will not be transporting water, a potential vector of *Gambusia.* The subject land already contains a substantial population of exotic species (such as *Gambusia*), including along Grahamstown Drain and wetland areas. The proposed works are unlikely to result in an increase of invasive species. Construction activities will be managed through standard practices to avoid further spread of weeds (refer to Section 4.0).
Introduce disease that may cause the species to decline	Unlikely	The chytrid fungus (*Batrachochytrium dendrobatidis*), resulting in chytridiomycosis of infected individuals, is considered a principle threat to GGBF (DEWHA, 2009). The proposed works are unlikely to result in the introduction of chytrid fungus. Construction activities will be managed through standard practices to avoid further spread of disease in frogs (refer to Section 4.0).
Interfere substantially with the recovery of a species	Unlikely	A National Recovery Plan for GGBF has not been produced, however the NSW Saving Our Species program has identified threats to the recovery of the population at Kooragang Island including: • Drying of breeding and refuge habitat as a result of increased temperatures and more frequent droughts, potentially leading to wetlands becoming hypersaline. • Lack of landscape connectivity leading to isolation of small populations. • Lack of landscape connectivity leading to isolation of small populations (SOS, 2021). Considering the above factors and the fact that this species only has a single record to the north of the site from 1973 and the existing population is 7 km to the south of the study area, the project is unlikely to interfere substantially with the recovery of the species.

Conclusion

Works are proposed to impact on 5.3 hectares of low-moderate, and moderate-good condition PCT 1717, 0.12 hectares of moderate condition PCT 1071 and one hectare of exotic vegetation. Though the site contains potential habitat for this species, only a single record to the north of the site from 1973 occurs for this species and the existing population is seven km to the south of the study area. As such, it is considered unlikely that the proposed action will significantly impact GGBF and a referral is therefore not required.

Koala *(Phascolarctos cinereus)*

Species background

The Koala populations of Queensland (QLD), New South Wales (NSW) and the Australian Capital Territory (ACT) are listed as endangered under the EPBC Act. The species is a tree-dwelling, medium-sized marsupial with a stocky body, large rounded ears, sharp claws and variable but predominantly grey-coloured fur. It is one of Australia's most distinctive and iconic wildlife species. The populations of QLD, NSW and the ACT have a distribution from Cairns in Queensland through to the New South Wales / Victoria border, the distribution is not continuous with some areas isolated due to clearing or unsuitable habitat. Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid areas dominated by the genus *Eucalyptus*. The distribution is limited by altitude (limited to <800m ASL), temperature and leaf moisture (DAWE, 2022; DSEWPC, 2012).

Occurrence in the study area

The NSW BioNet Atlas provided several instances of Koalas on site which are all greater than 30 years old. There are also recent records (2014) nearby to the study area.

Significant impact assessment

Based on a reasonable understanding of the habitat requirements for *Phascolarctos cinereus*, it is concluded that project impacts are unlikely to lead to a significant impact. An assessment and justification is provided in Table A.9.

Table A. 9 Koala (*Phascolarctos cinereus*), EPBC endangered species assessment against Significant Impact Criteria (CoA 2013)

Significant impact criteria (endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	The Koala populations of QLD, NSW and ACT are considered and assessed by the Threatened Species Scientific Committee as one population (DAWE 2022). This population is formed by multiple sub-populations separated by cleared land or unsuitable habitat. The latest conservation advice refers to several different methods of identifying subpopulations including state government systems, genetic analysis and climate sensitivity. The system with the finest detail is the NSW framework for spatial prioritisation of koala conservation areas (SOS 2020). This identifies Port Stephens as being an Area of Regional Koala Significance with moderate resilience and security. While the Port Stephens Area of Regional Koala Significance fringes the study area, neither the study area or subject land are captured under the Area of Regional Koala Significance. Though a targeted survey was not performed and this species can be cryptic, no *Phascolarctos cinereus* were observed during surveys. As there are recent records within the locality of the study area, it is possible that Koala sporadically forage within the locality. However, as recent records do not occur within the study area itself, it is not anticipated that the proposed works would lead to a long-term decrease in the size a population.
Reduce the area of occupancy of the species	Unlikely	There are recent records within the locality of the study area, and it is therefore possible that Koala may sporadically forage within the locality. However, the subject land does not provide ideal habitat for Koala to occupy, as preferred feed trees are absent (Figure 4) and there are no recent records within the subject land. As a result, it is not anticipated that the proposal will substantially reduce the area of occupancy of the species.
Fragment an existing population into two or more populations	Unlikely	The project will not fragment an existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Koala. The species is known to use a variety of habitats that are dominated by *Eucalyptus* species but there is variation between regions and seasons making assessment of Koala habitat quality based on local preferences. The CKPOM (Port Stephens Council, 2002) recommends identification of preferred habitat, which has been performed for the study area (see Figure 9).

Significant impact criteria (endangered species)	Likelihood of significant impact	Justification
		The mapping of koala habitat showed that there is preferred habitat in the study area but not in the Subject Land. Where practicable, proposal impacts are focused to low-moderate condition native vegetation (mapped as supplementary vegetation) and exotic vegetation. As the species has not been identified within the study area recently, the proposal is unlikely to adversely impact on habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Unlikely	As the proposed works do not occur within an Area of Regional Koala Significance, are not mapped as preferred Koala habitat (lacks preferred feed trees) and in consideration of the proposed mitigation measures (Section 4.0), the proposed works are unlikely to result in a disruption of the breeding cycle of the Koala.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Refined Koala habitat mapping of the study area (see Figure 9) has shown that preferred Koala habitat is not present within the Subject Land. As the species can utilise supplementary habitat, the proposal will decrease the availability of lower quality habitat available for this species. Supplementary habitat will be reduced by the proposal by 5.35 ha, other vegetation by 0.1 ha and link over cleared vegetation by 1 ha. As the only records on the study area are over 30 years old, it is unlikely that the changed conditions will decrease the habitat to the extent that it will cause the species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The entirety of the study area is subject to existing weed invasion and pest animals as a result of historic use as a quarry and ongoing maintenance for powerlines and services. The proposal does involve greater transport to site by trucks that could spread propagules of invasive species, but these will be managed through hygiene measures. The subject land already contains a substantial population of exotic species. The proposed works are unlikely to result in an increase of invasive species due to mitigation measures. Construction activities will be managed through standard practices to avoid further spread of weeds and pests (refer to Section 4.0).
Introduce disease that may cause the species to decline	Unlikely	The Koala suffers from two major diseases, particular strains of *Chlamydia*, and Koala Retrovirus (TSSC, 2012). Both diseases are common within the Koala population with up to 100% of Koala's in NSW and Queensland carrying Koala Retrovirus. As both of the virus are predominantly spread through contact with infected individuals or through the germline, it is unlikely that any of the activities in the proposal will introduce disease that may lead to decline of the species
Interfere with the recovery of a species	Unlikely	The conservation advice (DAWE 2022b) identifies six strategies for conservation which include: 1. Build and share knowledge 2. Strong community engagement and partnerships 3. Increase habitat protection 4. Koala conservation is integrated into policy, and statutory and land-use plans 5. Strategic habitat restoration 6. Active metapopulation management A National Recovery Plan for Koala has been pending since 2012. The NSW Saving our Species Iconic Koala Project (OEH, 2017) aims to secure the Koala in the wild in NSW for 100 years by: • Reducing critical threats to the species • Ensuring adequate protection, management and restoration of Koala habitat • Maintaining healthy breeding populations of Koalas throughout their current range Of the issues raised in the projects Action Toolbox, the most related issues are • Loss, modification and fragmentation of habitat • Vehicle strike. The proposal is not impacting on any preferred Koala habitat and is targeted to minimise loss of supplementary habitat. It is unlikely that the project will lead to loss, modification, or fragmentation of habitat significant enough to interfere with the recovery of the Koala. The proposed development will result in increased vehicle movements within the study area. As such, the construction works may increase the existing risk of vehicle strike to

Significant impact criteria (endangered species)	Likelihood of significant impact	Justification
		the Koala under the existing vehicle usage regime. However, this is not expected to contribute significantly to the existing risk posed by Adelaide Street through traffic. Measures proposed to increase awareness and reduce vehicle speeds in the vicinity of the study area are expected to result in an overall negligible increase in risk to Koala from vehicle strike.

Conclusion

Works are proposed to impact on 5.35 hectares of low-moderate as well as moderate-good condition native vegetation considered supplementary Koala habitat, 0.1 ha moderate condition native vegetation considered other vegetation and 1 ha of exotic vegetation considered link over cleared by updated mapping following the CKPoM. Though there are records of Koalas near the study area within the previous 10 years, it is unlikely that they are utilising the Subject Land. As such it is considered unlikely that the proposed action will significantly impact *Phascolarctos cinereus* and a referral is therefore not required.

APPENDIX 5 BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT MINIMUM INFORMATION REQUIREMENTS COMPLIANCE

Typical Report Section	Information type	Minimum information	Location in this report
Introduction	Information	Brief description of the proposal	Section 1.0
		Identification of subject land boundary including: • Operation footprint • Construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1.0, Section 1.3
		General description of the subject land	Section 1.0, Section 1.2 Section 1.3
		Sources of information used in the assessment, including reports and spatial data	Section 1.4
	Maps and Tables	Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 1
	Data	NA	Supplied with submission
Landscape context	Information	general description of subject land topographic and hydrological setting, geology and soils	Section 2.4, Section 2.7, Section 2.8
		percent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 2.9
		IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 2.1
		rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 2.7.1
		wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 2.7.2
		connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 2.11
		karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	Section 2.15
		areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Section 2.14
		any additional landscape features identified in any SEARs for the proposal	Section 2.0
		NSW (Mitchell) landscape on which the subject land occurs	Section 2.2
	Maps and Tables	Site Map • Boundary of subject land • Cadastre of subject land • Landscape features identified in BAM Subsection 3.1.3	Figure 1, Figure 2, Figure 3
		Location Map • Digital aerial photography at 1:1,000 scale or finer • Boundary of subject land • Assessment area, (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development	Figure 2

Typical Report Section	Information type	Minimum information	Location in this report
		• Landscape features identified in BAM Subsection 3.1.3 • Additional detail (e.g. local government area boundaries) relevant at this scale	
		IBRA bioregions and subregions	Figure 1
		rivers, streams and estuaries	Figure 2
		wetlands and important wetlands	Figure 2
		connectivity of different areas of habitat	Figure 3
		karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features	Figure 1
		areas of outstanding biodiversity value occurring on the subject land and assessment area	NA
		any additional landscape features identified in any SEARs for the proposal	Figure 1, Figure 2
		NSW (Mitchell) landscape on which the subject land occurs	Figure 2
	Data	All report maps as separate jpeg files	Supplied with submission
		Individual digital shape files of: • subject land boundary • assessment area (i.e. subject land and 1500 m buffer area) boundary • cadastral boundary of subject land • areas of native vegetation cover • landscape features	Supplied with submission
Native vegetation	Information	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Section 3.2.1, Section 3.2.2
		Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 3.2.3
		Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Section 1.4, Section 3.1.1, Section 3.2.2
		Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 3.1
		Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	NA
		For each PCT within the subject land, describe: • vegetation class • extent (ha) within subject land • evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) • plant species relied upon for identification of the PCT and relative abundance of each species • if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) • estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))	Section 3.2.3, Section 3.2.4
		Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Section 3.3

Typical Report Section	Information type	Minimum information	Location in this report
		• assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): • identify the PCT or vegetation class for which local benchmark data will be applied • identify published sources of local benchmark data (if benchmarks obtained from published sources) • describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) • provide justification for use of local data rather than BioNet Vegetation Classification benchmark values • provide written confirmation from the decision-maker that they support the use of local benchmark data	NA
	Maps and Tables	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 4, Figure 5
		Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4, Figure 5
		Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 6
		Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4, Figure 5
		Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4, Figure 5
		Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 6, Table 4
		Table of current vegetation integrity scores for each vegetation zone within the site and including: • composition condition score • structure condition score • function condition score • presence of hollow bearing trees	Table 4, Table 5
	Data	All report maps as separate jpeg files	Supplied with submission
		Plot field data (MS Excel format)	Supplied with submission
		Plot field data sheets	Supplied with submission
		Digital shape files of: • PCT boundaries within subject land • TEC boundaries within subject land • vegetation zone boundaries within subject land • floristic vegetation survey and vegetation integrity plot locations	Supplied with submission
Threatened species	Information	Identify ecosystem credit species likely to occur on the subject land, including: • list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list	Section 3.4, Table 8

Typical Report Section	Information type	Minimum information	Location in this report
		Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list	Section 3.5, Table 9, Table 10
		From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	Section 3.6.1, Section 3.6.2, Section 3.6.3
		Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this	Section 3.6.1, Section 3.6.2
		Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome	Section 3.1.2, Section 3.1.3, Section 3.1.4, Section 3.6, Figure 6
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status • all requirements of Box 3 have been addressed in the expert report	NA
		Where use of local data is proposed (BAM Subsection 1.4.2): • identify relevant species • identify data to be amended • identify source of information for local data, e.g. published literature, additional survey data, etc. • justify use of local data in preference to VIS Classification or TBDC data • provide written confirmation from the decision-maker that they support the use of local data	NA
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	Section 3.6.3, Section 5.1.2, Table 17

Typical Report Section	Information type	Minimum information	Location in this report

		• the unit of measure for each species is documented
		• for species assessed by area:
		  ○ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)
		  ○ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied
		• for species assessed by counts of individuals:
		  ○ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))
		  ○ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken
		  ○ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	

		Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Table 9
	Maps and Tables	Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: • the ecosystem credit species removed from the list • the sensitivity to gain class of each species	Table 8
		Table detailing species credit species in accordance with BAM section 5.2 and identifying: • the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present • the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 9, Table 10
		Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 9
		Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figure 10, Figure 11, Figure 12
	Data	Digital shape files of suitable habitat identified for survey for each candidate species credit species	NA
		Survey locations including GPS coordinates of any plots, transects, grids	Supplied with submission
		Digital shape files of each species polygon including GPS coordinates of located individuals	Supplied with submission
		Species polygon map in jpeg format	Supplied with submission
		Expert reports and any supporting data used to support conclusions of the expert report	NA
		Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	NA

Typical Report Section	Information type	Minimum information	Location in this report
Prescribed impacts	Information	Identify potential prescribed biodiversity impacts on threatened entities, including: • karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) • occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) • corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) • water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) • protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) • where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Section 4.2.3, Table 14
		Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Section 4.2.3
		Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	Section 3.2.5, Section 3.6.1, Section 3.6.2
		Where the proposed development is for a wind farm: • identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5) • provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.) • predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	NA
	Maps and Tables	Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 7
		Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	NA
	Data	Digital shape files of prescribed impact feature locations	Supplied with submission
		Prescribed impact features map in jpeg format	Supplied with submission
Avoid and minimise impacts	Information	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: • modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology • routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route • alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location • alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	Section 4.1
		Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	Section 4.1.1

Typical Report Section	Information type	Minimum information	Location in this report
		Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.))	Section 4.1, Section 4.2
	Maps and Tables	Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 12, Table 15
		Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Appendix 6
		Maps demonstrating indirect impact zones where applicable	NA
	Data	Digital shape files of: • alternative and final proposal footprint • direct and indirect impact zones	Supplied with submission
		Maps in jpeg format	Supplied with submission
Assessment of impacts	Information	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 4.2.1, Table 16
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): • description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal • documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications • reporting any limitations or assumptions, etc. made during the assessment • identification of the threatened entities and their habitat likely to be affected	Section 4.2.2, Table 13

		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:
		• assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with:
		  ○ karst, caves, crevices, cliffs, rocks and other features of geological significance
		  ○ human-made structures
		  ○ non-native vegetation
		  ○ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
		  ○ movement of threatened species that maintains their life cycle
		  ○ water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
		• assessment of the impacts of wind turbine strikes on protected animals
		• assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC
			Section 4.2.3, Table 14

	Maps and Tables	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 16
	Data	NA	NA
	Information	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	Section 4.1.2, Section 4.3, Table 12, Table 15

Typical Report Section	Information type	Minimum information	Location in this report
Mitigation and Management of Impacts		• techniques, timing, frequency and responsibility • identify measures for which there is risk of failure • evaluate the risk and consequence of any residual impacts • document any adaptive management strategy proposed	
		Identification of measures for mitigating impacts related to: • displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) • indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) • mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	Section 4.1.2, Table 12
		Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Section 4.3, Table 15
	Maps and Tables	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 12, Table 15
	Data	NA	NA
Impact Summary (BAM ref. Ch 9)	Information	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: • addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land • addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land • documenting assumptions made and/or limitations to information • documenting all sources of data, information, references used or consulted • clearly justifying why any criteria could not be addressed	Section 5.1.1, Appendix 3
		Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 5.1.2
		Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 5.1.2, Section 5.1.3
		Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 5.1.3
	Maps and Tables	Map showing the extent of TECs at risk of an SAII within the subject land	NA
		Map showing location of threatened species at risk of an SAII within the subject land	Figure 13
		Map showing location of: • impacts requiring offset • impacts not requiring offset • areas not requiring assessment	Figure 7
	Data	Digital shape files of: • extent of TECs at risk of an SAII within the subject land • location of threatened species at risk of an SAII within the subject land • boundary of impacts requiring offset • boundary of impacts not requiring offset • boundary of areas not requiring assessment	Supplied with submission

Typical Report Section	Information type	Minimum information	Location in this report
		Maps in jpeg format	Supplied with submission
Impact Summary (BAM ref. Ch 10)	Information	Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including: • future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) • change in vegetation integrity score (BAM Subsection 8.1.1) • number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9) • number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	Section 5.1.2, Section 6.0, Table 18, Table 19
	Maps and Tables	Table of PCTs requiring offset and the number of ecosystem credits required	Table 18
		Table of threatened species requiring offset and the number of species credits required	Table 19
	Data	Submitted proposal in the BAM Calculator	Supplied with submission
Biodiversity credit report	Information	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Section 7.0, Table 20, Table 21
	Maps and Tables	Table of credit class and matching credit profile	Table 20, Table 21
	Data	BAM credit report in pdf format	Supplied with submission

APPENDIX 6 INITIAL INDICATIVE PROPOSED REZONING MASTERPLAN (DE WITT CONSULTING 2014)

MASTERPLAN SK2 1:1500 @ A1

(LOT 232 IN DP 593512) **251 ADELAIDE STREET, RAYMOND TERRACE**