



# Richmond Valley Regional Jobs Precinct

Biodiversity Technical Report

10 February 2023

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## Signature Page

10 February 2023

# Richmond Valley Regional Jobs Precinct

## Biodiversity Technical Report

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*This report has been prepared to inform the master planning process for Richmond Valley RJP. The findings and recommendations have been developed where possible in collaboration with other disciplines. It is acknowledged that some of the recommendations in this report may not be included in the Master Plan, such as where they are out of scope for the RJP, conflict with other elements of the project or are proposed to be managed via an alternate mechanism.*

## EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by the Department of Regional NSW (DRNSW) to undertake a program of environmental and heritage studies to support the development of the Richmond Valley Regional Jobs Precinct (RJP) Masterplan, including the preparation of this Biodiversity Technical Report. This report has been primarily based on a desktop review, alongside field survey results and presents a description of key biodiversity values within the Investigation Area and immediate surrounds.

The objective of the report is to identify and describe key biodiversity values within the RJP area (**Investigation Area**) and identifies the constraints and opportunities for the development of the future Richmond Valley Regional Job Precinct Area. It aims to test the preferred structure plan that was developed as part of a series of Integration Workshops and to establish the relevant specifications and requirements to assist in the development of the master plan. This assessment is not a Biodiversity Development Assessment Report (BDAR) and all credit obligations are provided as indicative only to support the master plan design process.

The Investigation Area covers 655 ha of land located in the Richmond Valley LGA, centred the town of Casino, NSW, and includes:

- Nammoona Industrial Precinct;
- Northern Coop Meat Company Complex; and
- Sewerage Treatment Plant and Johnson Street Industrial Areas.

From the previous desktop assessment, biodiversity values are defined as those species and communities listed as vulnerable, endangered or critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and/or the NSW *Biodiversity Conservation Act 2016* (BC Act).

A total of five Plant Community Types (PCT) were recorded across the RJP Investigation Area, all located within the Nammoona Precinct. All other areas of the RJP contained exotic or modified/planted/urban vegetation. PCTs confirmed include:

- PCT 3427 - Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest;
- PCT 3987 - Far North Floodplain Paperbark-Swamp Oak Forest;
- PCT 4001 - Northern Floodplain Paperbark Fern Swamp Forest;
- PCT 3323 - Far North Lowland Basalt Grassy Forest; and
- PCT 3964 - Far North Floodplain Fern-Forb Wetland.

These PCTs have also been field-verified as the following threatened ecological communities:

- PCT 4001 as the BC Act listed Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and the EPBC Act listed Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland;
- PCT 3987 as the BC Act listed Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and the EPBC Act listed Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland; and
- PCT 3964 as the BC Act listed Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

A total of 27 threatened flora species have been recorded in the database searches within 10km of the Investigation Area, with 8 of these species identified as 'species credit' species under the NSW Biodiversity Assessment Method (BAM), including:

- *Archidendron hendersonii* White Lace Flower;
- *Arthraxon hispidus* Hairy Jointgrass;
- *Desmodium acanthocladum* Thorny Pea;
- *Eucalyptus glaucina* Slaty Red Gum;
- *Gossia fragrantissima* Sweet Myrtle;
- *Macadamia tetraphylla* Rough-shelled Bush Nut;
- *Melaleuca irbyana* Weeping Paperbark; and
- *Syzygium hodgkinsoniae* Red Lilly Pilly.

A total of 52 threatened fauna species have been recorded within 10km of the Investigation Area.

Threatened fauna species records are generally found in areas featuring denser vegetation, riparian vegetation and water bodies such as Richmond River, Barlings Creek, and the Jabiru Geneebeinga Wetlands. Those threatened species that are listed as 'species credit' species with records in the 10km locality are summarised below, with those species in bold observed in the RJP Investigation area in databases searches or fieldwork completed for this report.

- *Anthochaera phrygia* Regent Honeyeater;
- *Burhinus grallarius* Bush Stone-curlew;
- *Cacophis harriettae* White-crowned Snake;
- *Calyptorhynchus lathami* Glossy Black-Cockatoo;
- *Carterornis leucotis* White-eared Monarch;
- *Dromaius novaehollandiae* Emu;
- ***Haliaeetus leucogaster* White-bellied Sea-Eagle;**
- *Hieraaetus morphnoides* Little Eagle;
- ***Lophoictinia isura* Square-tailed Kite;**
- ***Miniopterus australis* Little Bent-winged Bat;**
- ***Miniopterus orianae oceanensis* Large Bent-winged Bat;**
- ***Myotis macropus* Southern Myotis;**
- *Ninox connivens* Barking Owl;
- *Ninox strenua* Powerful Owl;
- *Pandion cristatus* Eastern Osprey;
- *Petauroides volans* Greater Glider;
- *Petaurus norfolcensis* Squirrel Glider;
- *Phascogale tapoatafa* Brush-tailed Phascogale;
- *Phascolarctos cinereus* Koala;
- *Planigale maculate* Common Planigale;
- ***Pteropus poliocephalus* Grey-headed Flying-fox Locality and RJP investigation area; and**

■ *Tyto novaehollandiae* Masked Owl.

Field surveys to identify biodiversity values included rapid vegetation assessment points, vegetation mapping, and targeted fauna surveys undertaken during field survey events in 3 – 16 December 2021, 4-8 April 2022 and 27 – 29 September 2022.

The following BC Act listed threatened microbat species were recorded using acoustic detectors within the Nammoona Precinct:

- *Falsistrellus tasmaniensis* Eastern False Pipistrelle (ecosystem credit species);
- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (ecosystem credit species);
- *Myotis macropus* Southern Myotis (species credit species);
- *Nyctophilus bifax* Eastern Long-eared Bat (ecosystem credit species);
- *Ozimops lumsdenae* Northern Free-tailed Bat (ecosystem credit species); and
- *Saccolaimus flaviventris* Yellow-bellied Sheath-tail-bat (ecosystem credit species).

From the microbats recorded during fieldwork, only Southern Myotis is listed as a 'species credit' species, requiring habitat polygons to be drawn in accordance with Stage 1 of the BAM. Although not directly observed on the site, the RJP was also assessed as containing habitat for Koala and Common Planigale, with historical observations and preferred foraging habitat in the form of eucalypt open forest recorded across the RJP.

Further field surveys were completed on 4 – 8 April 2022, with a focus on conducting BAM plots and conclusively verifying Plant Community Types (PCTs) and targeted survey efforts for potential Candidate Species derived from initial desktop analysis. No threatened flora species were recorded. A BAM Candidate Species list was developed following field efforts and assessment of PCTs.

The RJP presented potential PCTs that could support the koala *Phascolarctos cinereus* and additional surveys were undertaken on 27-29 September 2022, to search for presence and confirm boundaries of current habitat mapping. Survey effort included the undertaking of spotlighting transects and Spot Assessment Technique (SAT) surveys, results concluded no koala observations and no trace evidence found within the areas of mapped potential habitat. These surveys were carried out in accordance with the current BAM guidelines for koala survey and habitat mapping. As no signs or direct observations of koala were recorded within the RJP, no habitat polygons for this species have been mapped.

Hairy Jointgrass habitat polygons have been mapped in the north of the RJP, within areas of potential suitable habitat in the Nammoona precinct. This species can have unpredictable growth patterns and the survey effort applied to support the preparation of the report may not be sufficient to detect its occurrence, appearing absent for many years and then having large periods of growth. Suitable habitat for this threatened flora species is within the area to the north of the Nammoona Precinct, in areas of exotic or native dominated sedgeland or paperbark forest, with the majority of this habitat being retained in proposed conservation (C2 and C3) zones or in the existing rural (RU1) land zone. Surveys for Hairy Jointgrass would be recommended if any change in land use or development is proposed in the northern Nammoona precinct, however the current zoning in this location is not proposed to change.

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## ACRONYMS AND ABBREVIATIONS

Name	Description
Activation Precincts SEPP	State Environmental Planning Policy (Activation Precincts) 2020
ALA	Atlas of Living Australia
AOBV	Area of Outstanding Biodiversity Value
ARKS	Areas of Regional Koala Significance
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
BOS	Biodiversity Offset Scheme
BOSET	Biodiversity Offsets Scheme Entry Threshold
CKPoM	Comprehensive Koala Plan of Management
DCS	Department of Customer Service
DoEE	Department of Environment and Energy
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DRNSW	Department of Regional NSW
EECs	Endangered Ecological Community. EEC is a category of Threatened Ecological Community.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERM	Environmental Resources Management Australia Pty Ltd
Fisheries Act	Fisheries Management Act 1994
IBAs	Important Bird and Biodiversity Areas
Investigation Area	The Investigation Area for the purposes of this baseline assessment have been defined by the proponent and includes 11,408 ha of land within the Port Stephens LGA. The location and extent of the Investigation Area is illustrated in Figure 1.1.
IUCN	International Union for Conservation of Nature
LGA	Local Government Area
LLS Act	The Local Land Services Act 2013
MNES	Matter of Nation Environmental Significance
MSES	Matter of State Environmental Significance
NP&W Act	National Parks and Wildlife Act 1974
NSW TSSC	NSW Threatened Species Scientific Committee
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Protected Matters Search Tool
RAAF	Royal Australian Air Force
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
SAP	Special Activation Precinct
SAT	Spot Assessment Technique
SOS	Save our Species
SPRAT	Species Profile and Threats Database
TEC	Threatened Ecological Community. In Australia three categories exist for listing threatened ecological communities: critically endangered, endangered and vulnerable.
WONS	Weeds of National Significance

## 1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by the Department of Regional NSW (DRNSW) to undertake a program of environmental and heritage studies to support the development of the Richmond Valley Regional Jobs Precinct (RJP) Masterplan.

This report is based on a desktop review alongside field surveys that presents a description of key biodiversity values within the RJP Investigation Area and immediate surrounds. This report addresses key biodiversity values and identifies the constraints and opportunities for the future Richmond Valley RJP (refer to Figure 1-1).

This technical report has been designed to test the preferred structure plan that was developed as part of a series of Integration Workshops and aims to establish the requirements to assist in the development of the master plan.

This document is for design purposes only and has not been prepared to support any development application process. Field survey and reporting has been undertaken in accordance with the Biodiversity Assessment Method, however, this report is not a Biodiversity Development Assessment Report (BDAR) and the results provided are indicative only.

### 1.1 Project Background

The New South Wales Government Regional Job Precincts (RJPs) are an extension of the Special Activation Precinct program, focused on providing planning support to help fast track approvals to drive growth, investment and development opportunities within regional NSW.

The Regional Job Precincts (RJPs) have been identified as areas of land that are of local significance based on economic enablers. The intention of the RJPs is to encourage private investment and to generate jobs. The RJPs aim to preserve, enhance and protect the natural environment. This will include identification of key biodiversity values, as well as integration of strategies for greening the locality, maintaining or enhancing habitat connections, and improving riparian corridors.

On 4 February 2021, the Regional Jobs Precinct at Richmond Valley was announced. The focus for all RJPs is a long-term vision for job creation and economic development. The focus of the Richmond Valley RJP is to unlock new industrial lands and create more jobs in the high-value agriculture, food-processing, manufacturing and renewable energy sectors.

#### 1.1.1 Existing Development Approvals

There are two existing development approvals associated with rail and intermodal infrastructure within the Nammoona precinct of the RJP Investigation Area. These have been considered when finalising the recommendations as part of this biodiversity report, so that any recommendations do not conflict with approved developments.

##### 1.1.1.1 Pacific Intermodal

The development approval is associated with the Pacific Intermodal, an existing development consent (DA2008.0091) that is in place within the Investigation Area. This area is currently zone IN1 and the development consent authorises a 14-lot industrial subdivision, including road reserve and associated works.

This includes the clearing of vegetation associated with the development of roads and services, including cut and fill of the proposed site. The lots associated with the DA are as follows:

- Lot 1 DP 118483;
- Lot 2 DP 570138;
- Portions of Lots 9, 12 and 13 DP 755727;
- Lot 2 DP 1091888; and

- Lot 244 DP 755727.

### 1.1.1.2 Casino Rail Freight Terminal

The Casino Rail Freight Terminal development is associated with land to the north of the current industrial land within the northern portion of the RJP on Lot 1 DP576154 and Lot 2 DP547143. Currently this land is zoned RU1, with a portion of the lot zoned as C2, present as wetland/sedgeland. DA 2010.310 approves the development of a rail terminal, new rail alignment and hardstand area for the loading of containers and associated works. DA 2014.246 approves the development of a grain terminal and associated works.

## 1.2 RJP Investigation Area

The Investigation Areas as shown in Figure 1.1 are located in the Richmond Valley Local Government Area (LGA) and include:

- Nammoona Industrial Precinct: Primarily IN1 General Industrial with a small portion of RU1 Primary Production and E3 Environmental Conservation to the north (Site 1 in Fig 1.1);
- Northern Coop Meat Company Complex: Primarily IN1 General Industrial and a small component of R1 General Industrial in the south-eastern corner (site 2 in fig 1.1); and
- Sewerage Treatment Plant and Johnson Street Industrial Areas: IN1 General Industrial and RU1 Primary Production (Site 3a and 3b in fig 1.1).

The Richmond Valley Investigation area is approximately 655 Ha. This area will focus on the following opportunities;

- Recent upgrades and expansion to the Northern Rivers Livestock Exchange Nammoona Waste and Resource Recovery Centre and the Northern Cooperative Meat Company; and
- 14.5 Ha expansion site and new developments including the Utilitas Biohub and medicinal cannabis facility.

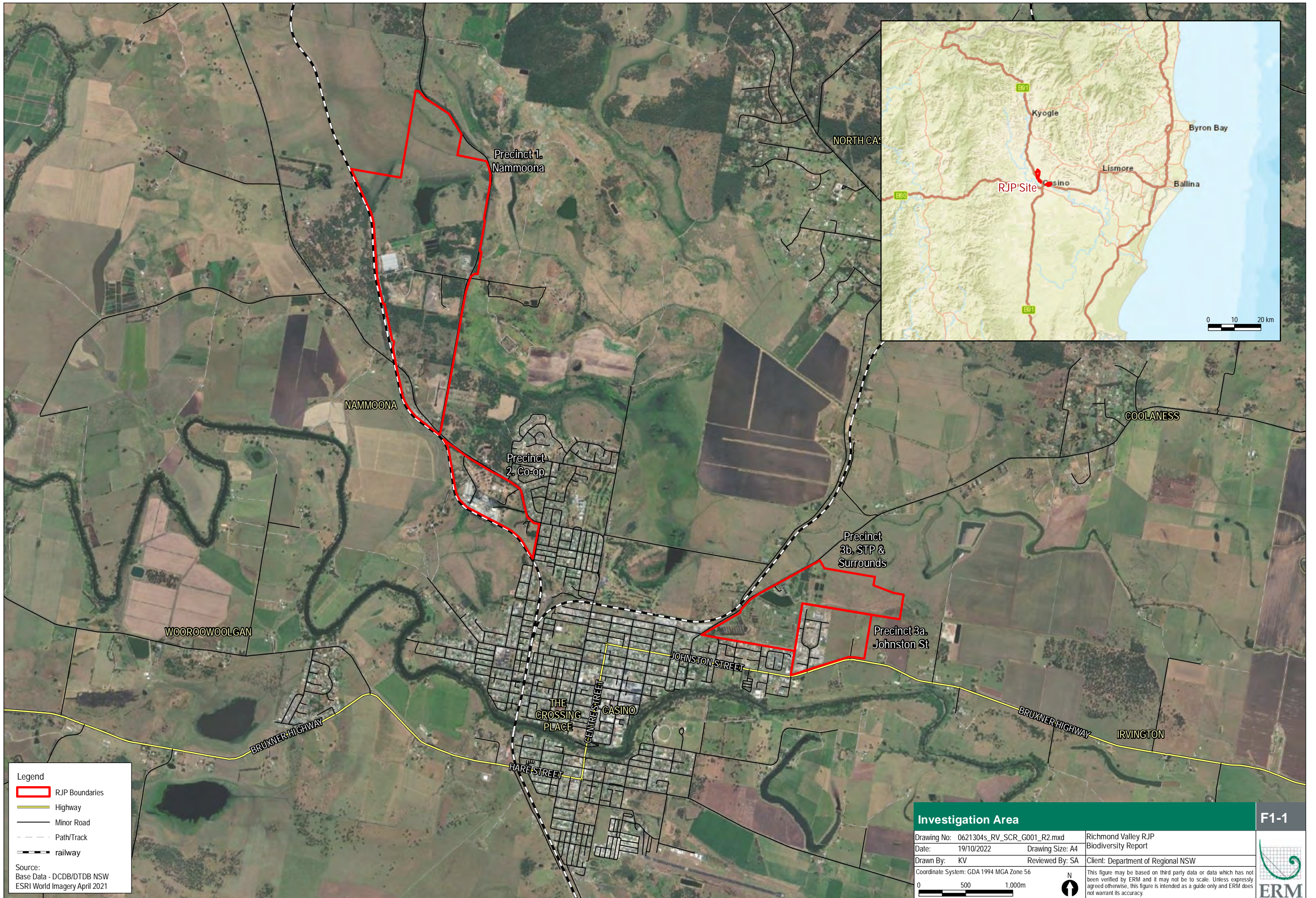
## 1.3 Draft Master Plan

A draft Master Plan has been developed in consultation with industry, governments, and professional consultants to foster development that is both sustainable and environmentally conscious (Figure 1.2).

Planning for biodiversity and conservation by structuring large scale developments, such as the Richmond Valley RJP to allow for habitat linkages, enhancement of vegetated areas and creation of nature reserves to create sustainable developments and maintaining biodiversity movement and fauna populations throughout urban and peri urban areas.

The Draft Master Plan incorporates protections of existing vegetation and biodiversity values by proposing the creation of conservation zones in areas of high value within the RJP area. Conservation zones such as Zone C2 (Environmental Conservation) and C3 (Environmental Management) included within the Draft Plan add a layer of protection to areas of conservation value through state and local planning measures.

Other areas of identified biodiversity value will remain identified in the Richmond Valley Local Environment Plan (LEP) 2012 as part of the Natural Resources – Terrestrial Biodiversity overlay.

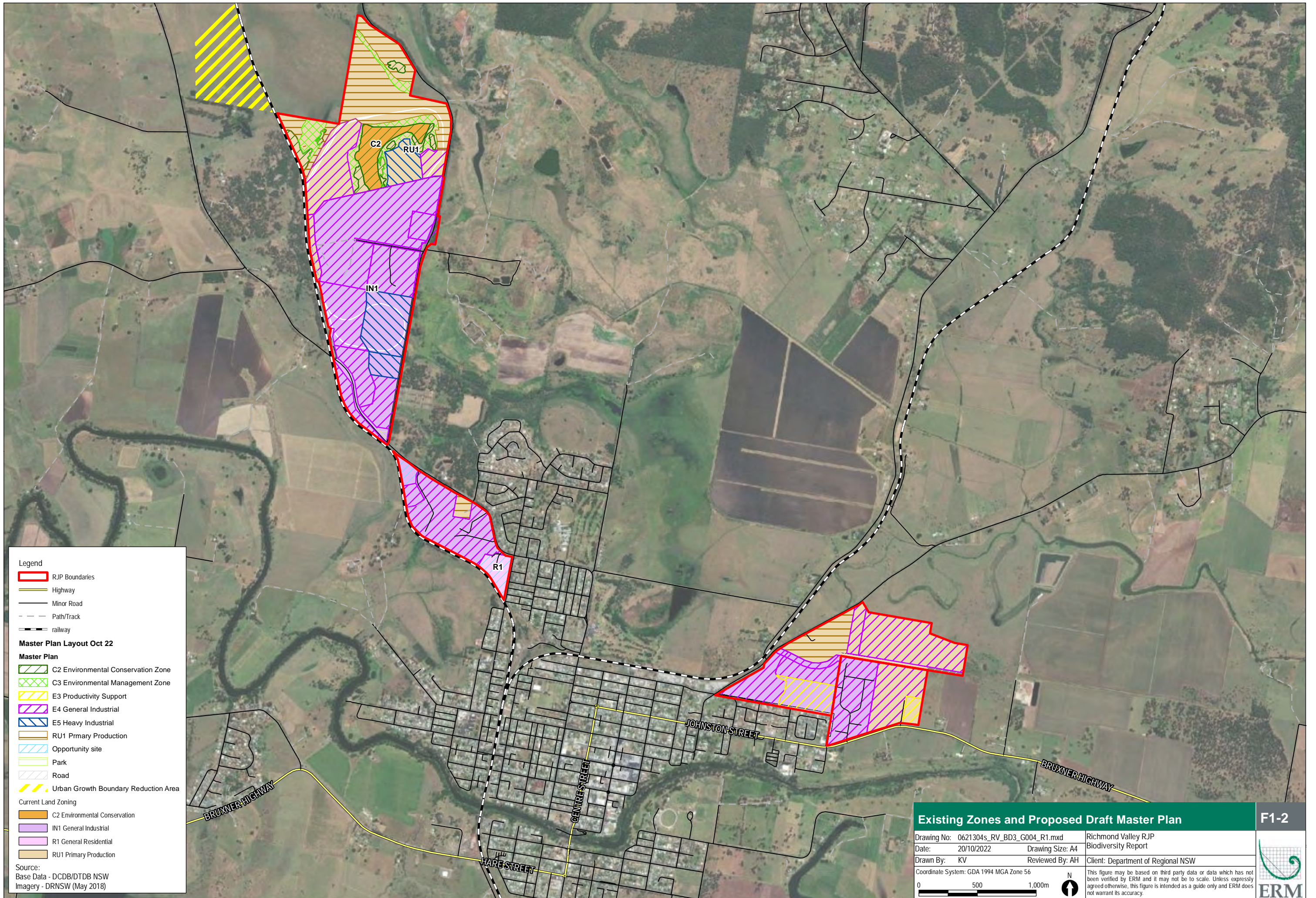


**Legend**

- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- railway

Source:  
Base Data - DCDB/DTDB NSW  
ESRI World Imagery April 2021

Investigation Area		F1-1
Drawing No: 0621304s_RV_SCR_G001_R2.mxd	Richmond Valley RJP Biodiversity Report	
Date: 19/10/2022	Drawing Size: A4	Client: Department of Regional NSW
Drawn By: KV	Reviewed By: SA	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
Coordinate System: GDA 1994 MGA Zone 56		<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 5px;">0 500 1,000m</div> <div style="text-align: center;"> <span style="font-size: 10px;">N</span>  <span style="font-size: 12px;">↑</span> </div> </div>



**Legend**

- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- railway

**Master Plan Layout Oct 22**

**Master Plan**

- C2 Environmental Conservation Zone
- C3 Environmental Management Zone
- E3 Productivity Support
- E4 General Industrial
- E5 Heavy Industrial
- RU1 Primary Production
- Opportunity site
- Park
- Road
- Urban Growth Boundary Reduction Area

**Current Land Zoning**

- C2 Environmental Conservation
- IN1 General Industrial
- R1 General Residential
- RU1 Primary Production

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Existing Zones and Proposed Draft Master Plan		F1-2
Drawing No: 0621304s_RV_BD3_G004_R1.mxd	Richmond Valley RJP Biodiversity Report	
Date: 20/10/2022	Drawing Size: A4	
Drawn By: KV	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
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## 1.4 Objectives

The objective of this biodiversity technical report is to address key biodiversity values and identify the constraints and opportunities for the future Richmond Valley RJP. Biodiversity values are defined as those species and communities listed as vulnerable, endangered or critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and/or the NSW *Biodiversity Conservation Act 2016* (BC Act). This report has been based on a desktop review as well as field surveys that and presents a description of key biodiversity values within the Investigation Area and immediate surrounds.

The Report includes:

- Identification of actual and potential biodiversity values within 10km of the Investigation Area, including the presence of listed threatened species (and their habitats) and ecological communities;
- Identification of major environmental factors that are a threat to the natural environment of the region including habitat isolation and fragmentation, climate change, erosion, groundwater dependant ecosystems and invasive species; and
- Presentation of results from field surveys and ground-truthed Plant Community Type (PCT) map and habitat assessments from field surveys completed in 3 – 16 December 2021 and April 4 – 8 2022.

This technical report has been designed to test the preferred structure plan that was developed as part of a series of Enquiry by Design Workshops and aims to establish the relevant specifications and requirements to assist in the development of the master plan.

## 2. LEGISLATIVE AND POLICY CONTEXT

This biodiversity technical report has been undertaken with consideration of Commonwealth, State and Local regulatory frameworks and associated legislation. Table 2-1 summarises the relevant legislation and policies applicable to this biodiversity report. Potential impacts to these values will be addressed as the RJP project progresses to the selection of a preferred precinct and development of the structure and master plan.

**Table 2-1 Key Legislation and Policies**

### Commonwealth Legislation

#### *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act requires approval of the Commonwealth Minister for the Environment for actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES) as assessed in accordance with the EPBC Significant Impact Guidelines 1.1. The EPBC Act is administered by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) and lists threatened species, ecological communities and other MNES. Any proposed action that is expected to have an impact on MNES must be referred to the Minister for assessment under the EPBC Act, or assessed under the existing bilateral agreement, or accredited process between the Commonwealth and the State of New South Wales (NSW).

Matters of National Environmental Significance	Application to the Investigation
World heritage properties	Not identified within the Investigation Area
National heritage places	Not identified within the Investigation Area
Ramsar wetlands of international importance	There are no Ramsar wetlands within, or adjacent to the Urban Investigation Area. The nearest Ramsar wetlands are the Moreton Bay Marine Park.
Listed threatened species and communities	PMST search identified potential for these matters to occur within the Investigation Area. Refer to Section 5.3 and Section 6.
Internationally protected migratory species	PMST search identified potential for these matters to occur within the Investigation Area. Refer to Section 3.5.1 and Section 6.4.
Commonwealth marine areas	Not identified within the Investigation Area
The Great Barrier Reef Marine Park	Not identified within the Investigation Area
Nuclear actions	Not identified within the Investigation Area
A water resource, in relation to coal seam gas development and large coal mining development	Not identified within the Investigation Area

### NSW Statutory Legislation and Guidelines

#### *Biodiversity Conservation Act 2016 (BC Act)*

The BC Act came into effect on 25 August 2017. The BC Act replaced the NSW *Threatened Species Conservation Act 1995*, the NSW *Nature Conservation Trust Act 2001* and parts of the NSW *National Parks and Wildlife Act 1974* (NP&W Act). The BC Act establishes mechanisms for:

- The management and protection of listed threatened species of native flora and fauna (excluding fish and marine vegetation) and threatened ecological communities (TECs);
- The listing of threatened species, TECs and key threatening processes;
- The development and implementation of recovery and threat abatement plans;
- The declaration of critical habitat;
- The consideration and assessment of threatened species impacts in development assessment process; and
- Biodiversity Offsets Scheme (BOS), including the Biodiversity Values Map and Biodiversity Assessment Method (BAM) to identify serious and irreversible impacts (SAII).



## NSW Statutory Legislation and Guidelines

### *Biodiversity Conservation Act 2016 (BC Act)*

The BC Act establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments. Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the BAM. A Biodiversity Values Map and Biodiversity Offsets Scheme Entry Threshold (BOSET) tool are available to identify the presence of mapped biodiversity values within land proposed for development as well as the clearing thresholds that would trigger application of the BAM.

The application of the BAM and the potential for strategic biodiversity certification will be assessed as the RJP project progresses.

### *Local Land Services Act 2013*

The Local Land Services Act 2013 (LLS Act) regulates the management of vegetation on rural land. The amendments to the LLS Act have resulted in a change to the criteria for native vegetation clearing. There are now three different land categories for clearing on rural land:

- Category 1 Exempt land is land where native vegetation can be cleared without approval from Local Land Services.
- Category 2 land is divided into:
  - Category 2 Regulated land is Category 2 land that is not Vulnerable or Sensitive regulated land. You may need authorisation from Local Land Services to clear native vegetation from rural zoned land in this category.
  - Category 2 Vulnerable regulated land is land where clearing of native vegetation may not be permitted under the Land Management (Native Vegetation) Code 2018, and a limited range of allowable activities are permitted.
  - Category 2 Sensitive regulated land is land where clearing is not permitted under the Land Management Code (Native Vegetation) Code 2018, and a limited range of allowable activities is permitted
- Excluded land is land where the *Land Management (Native Vegetation) Code 2018* and allowable activities do not apply

The LLS Act also regulates and allows for clearing on land zoned for rural purposes, which is applicable to the land proposed to remain zoned as Rural Landscapes in the north of the Nammoona precinct. This includes permissible clearing under the Rural Boundary Clearing Code for NSW, which allows for clearing within 25m of the property, which has the potential to further impact areas of native vegetation and TECs. Clearing in rural zoned land may also be completed to carry out routine land management activities associated with agriculture and other common practices in rural areas, which can include:

- Clearing to manage imminent risk;
- Firewood collection;
- Construction timber;
- Planted native vegetation;
- Private power lines;
- Airstrips;
- Traditional Aboriginal cultural activities;
- Environmental protection works;
- Sustainable grazing;
- Firebreaks;
- Mulga species for stock fodder on a landholding; and
- Maximum clearing distances for rural infrastructure.

Any clearing works on rural land that does not meet these definitions, may require approval under the LLS Act.

**NSW Statutory Legislation and Guidelines**

*Biodiversity Conservation Act 2016 (BC Act)*



**Figure 2.1 Native Vegetation Regulatory Land Map**

*Biosecurity Act 2015*

The NSW *Biosecurity Act 2015* came into effect on 1 July 2017, effectively replacing the *Noxious Weeds Act 1993*, and 13 other Acts, with a single Act. Under the *Noxious Weeds Act* all landowners had a responsibility to control noxious weeds on their property. Under the *Biosecurity Act* broadly the same responsibility will apply and will be known as a General Biosecurity Duty.

The General Biosecurity Duty states “Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.” The general biosecurity duty applies to all weeds listed in Schedule 3 of the *Biosecurity Act*. Primary weeds have been identified in different Local Government Areas (LGA) due to the level of threat infestation they represent, some of the Weeds of National Significance (WoNS) are also listed as Primary Weeds in LGAs.

A strategic plan for each weed will be required within the final precinct to define responsibilities and identify strategies and actions to control the weed species. These can be downloaded from:

<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>

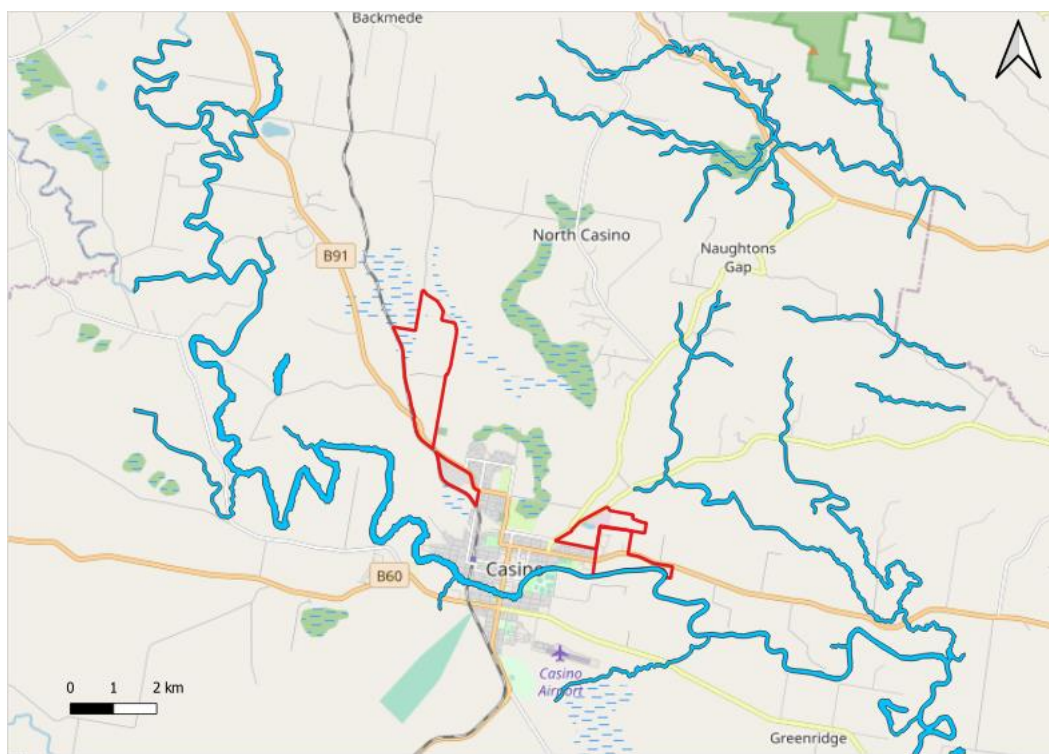
*Fisheries Management Act 1994*

The *Fisheries Management Act 1994* provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. Similar to the BC Act, the *Fisheries Management Act 1994* lists threatened species, populations and ecological communities of fish and marine vegetation.

Key fish habitat mapped for the Richmond Valley LGA is shown below. It can be seen that key fish habitat with the RJP includes watercourses towards the south of the Investigation Area.

## NSW Statutory Legislation and Guidelines

### *Biodiversity Conservation Act 2016 (BC Act)*



**Figure 2.2 Key Fish Habitat**

Schedule 6 of the *Fisheries Management Act 1994* also lists the following key threatening process that may be relevant to masterplan design process:

- Degradation of native riparian vegetation along New South Wales water courses;
- Human-caused climate change; and
- Removal of large woody debris from New South Wales rivers and streams.

Any waterway crossings will need to consider an appropriately designed structure that does not obstruct fish passage and will be designed in accordance with the Policy and Guidelines for Fish Habitat Conservation and Management and the Policy and Guidelines for Fish Friendly Waterway Crossings.

### *North Coast Regional Plan 2036*

The North Coast Regional Plan 2036 outlines directions, goals and actions that aim to guide government land use planning priorities and decisions. The plan is intended to act as an overarching framework to guide land use plans, development proposals and funding decisions. There are a total of 25 directions, those of direct relevance to biodiversity and within the scope of this report are:

- Direction 2: Enhance biodiversity, coastal and aquatic habitats, and water catchments; and
- Direction 3: Manage natural hazards and climate change.

To ensure consistency with the North Coast Regional Plan directions it is expected throughout the planning stages that the 'avoid, minimise, offset' hierarchy is implemented and areas designated with conservation values should be considered in the master plan or as part of future developments. This Biodiversity Technical Report identifies the following areas of high environmental value (HEV), that have been considered the development of the master plan for the RJP, with the section of this report containing the relevant information included:

- Biodiversity Values Map: the only area included on the Biodiversity Values map is the Richmond River;
- Over-cleared vegetation types: four Plant Community Types;
  - PCT 3987: 75.84% cleared;
  - PCT 4001: 72.88% cleared;
  - PCT 3323: 74.94% cleared; and
  - PCT 3964: 89.55% cleared.

## NSW Statutory Legislation and Guidelines

### *Biodiversity Conservation Act 2016 (BC Act)*

- Vegetation within over-cleared landscapes: the majority of the RJP occurs on the Mount Warning Exhumed Slopes Mitchell landscape, which is not listed as over-cleared. This includes the majority of the Nammoona Precinct, which contains all of the identified PCTs in the RJP Investigation Area. There is a small section of the northern most corner of the Nammoona Precinct and the Richmond River riparian zone that occurs on the Clarence – Richmond Alluvial Plains Mitchell landscape, which is classified as over-cleared;
- Threatened Ecological Communities (TEC): three TECs listed under the BC Act have been identified and mapped through field surveys within the RJP Investigation Area, including one listed under the EPBC Act (Section 5.2);
- Key habitat for threatened species: desktop and field surveys have identified habitat for three threatened fauna species within the RJP, including koala, common planigale and southern myotis (Section 6.4);

Measures to avoid and minimise biodiversity impacts are shown on Figure 10.1 of this report and include:

- Areas of **high biodiversity value** include the northern wetland area, as it contains multiple biodiversity values including two TECs listed under both the BC Act and the EPBC Act (Swamp Oak and Swamp Sclerophyll forest), and habitat for multiple threatened species including those species credit species directly observed within the RJP, Southern Myotis and Koala. This area also provides a diversity of habitat types, including foraging and roosting opportunities for migratory wetland birds; and
- Areas of **medium biodiversity value** include those areas that contain threatened species habitat in patches that are connected and considered viable to support Southern Myotis or Koala. Areas of medium value also include those area of freshwater wetland TEC, listed under the BC Act only, that occur within the area of cattle grazing, rural land to the north of the Nammoona precinct.

The land use planning approach should also consider opportunities to connect areas of biodiversity value, or through future development applications.

Impacts to high biodiversity values, particularly in areas that support multiple threatened species, including should be identified and avoided where possible. These areas will potentially contribute significantly to the offset obligation and cost associated with the development and therefore, further avoidance would reduce the ecosystem and species credit requirements and costs.

### *State Environmental Planning Policy (Biodiversity and Conservation) 2021*

On 1 March 2020 the State Environmental Planning Policy (Koala Habitat Protection) No.44 (SEPP 44) was repealed and replaced by the State Environmental Planning Policy (Koala Habitat Protection) 2019 (Koala Habitat SEPP). The requirements of the Koala Habitat SEPP have been incorporated into the State Environmental Planning Policy (Biodiversity and Conservation) 2021. The SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. The key changes to the Koala Habitat SEPP relate to the definitions of Koala habitat; list of tree species; list of councils; and development assessment process.

Key changes include:

- The number of tree species considered important to Koalas has expanded from 10 species to up to 65 species across nine distinct regions of NSW.
- A new 'Core Koala Habitat' definition being:
  - an area of land where Koalas are present;
  - or an area of land which has been assess by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable Koala habitat; and
  - where Koalas have been recorded as being present in the previous 18 years.

The SEPP applies to the Richmond Valley LGA. It is anticipated that the masterplan would, as far as practicable, aim to be consistent with the objectives of the SEPP.

Chapter 3 and Chapter 4 of the *SEPP (Biodiversity and Conservation) 2021*, deal with koala habitat protection and applies to the Richmond Valley LGA and RJP.

Chapter 3 applies to the following land use zones:

- RU1 Primary Production;
- RU2 Rural Landscape; and
- RU3 Forestry.

As The Draft Master Plan proposes to retain areas of RU2 land use zoning, chapter 3 of the SEPP applies.

For land classified as core koala habitat, a plan of management must be prepared and approved by the council and Planning Secretary.

Chapter 4 applies to the North Coast Koala Management Area, including within the Richmond Valley Local Government Area

## NSW Statutory Legislation and Guidelines

### *Biodiversity Conservation Act 2016 (BC Act)*

If the council determines a higher impact on koalas or koala habitat is likely, a koala assessment report, detailing likely and potential impacts of the development, should be developed and assessed as part of a future development applications within the RJP.

### 3. ASSESSMENT METHODOLOGY

#### 3.1 Overview

Relevant information collated during preparation of the Biodiversity Baseline Assessment Report (ERM 2021) was used to inform the field surveys and has been incorporated into this report. These information sources are provided in Table 3.1, along with additional information sources reviewed specifically for this report.

This section describes the methodology to undertake the assessment. This includes a desktop review as described below.

#### 3.2 Desktop Review

A number of desktop sources were reviewed to identify ecological values that may occur within the Investigation Area. The databases and other key sources considered are listed in Table 3-1.

A search area containing the Investigation Area. The Protected Matters Search Tool (PMST) and BioNet results were cross-checked using Atlas of Living Australia (ALA) database locations of records in the context of the actual Investigation Area boundary.

This desktop review provides information on species known or likely to occur within the Investigation Area only, based on species records, the availability of suitable habitat, breeding and roosting sites for bats, and RAMSAR sites for water birds.

**Table 3-1 Key Information Sources**

Information Source	Name	Search Date	Data Description
DAWE	PMST	13-12-21	The search tool provides predictive results of Matters of National Environmental Significance based on mapping of known and potential species distribution, habitat, ecological communities and wetlands. The outputs are based on modelling results and do not necessarily reflect known records of species or communities. The features highlighted by the search are considered further through a likelihood of occurrence assessment. Search area: Parameter of Investigation Area- 10km buffer from the following coordinates: -28.84986, 153.04598
DAWE	Species Profile and Threats Database (SPRAT)	13-12-21	The SPRAT profiles and associated conservation advice documents were consulted for the following reasons: They provide detailed information for the Likelihood of Occurrence assessment on: <ul style="list-style-type: none"> <li>■ Species distribution</li> <li>■ Species habitat preferred and general</li> </ul> The conservation advice documents are particularly important for assessing TECs found in field surveys, against the listed TEC guidelines.
ala.org.au	ALA	13-12-21	Australia national biodiversity database (supported by the National Collaborative Research Infrastructure Strategy, CSIRO). Database contains records accessed through an interactive spatial portal. Threatened species are searched to identify known records in proximity to the Investigation Area.
DPIE	BioNet	14-12-21	Data from the BioNet Atlas website [North: -28.80 West: 153.00 East: 153.10 South: -28.90]
DPI	Fisheries Spatial Data Portal	13-12-21	Data obtaining from the Fisheries Spatial Data Portal to identify key fish habitat within the Investigation Area.

Information Source	Name	Search Date	Data Description
NSW Government	SEED	13-12-21	NSW database to search and identify state environmental data. Dataset used to identify Koala Habitat suitability within and surrounding the Investigation Area and Native Vegetation Regulatory Land map.
NSW Government	Biodiversity Values Map and Threshold Tool	13-12-21	NSW Database to identify biodiversity values present within the RJP Investigation Area. This database is based on the Biodiversity Offset Scheme, and is used to determine whether it is necessary to engage the BAM assessment method.
Department of Planning and Environment (DPIE)	BAM Calculator	March 2022	An initial run of the BAM Calculator, based on available vegetation mapping, was undertaken to provide a list of threatened species to be considered for the field survey and reporting.

### 3.3 Assumptions and Limitations

The absence of a species from a database list or observational studies does not confirm its absence from the Investigation Area. The lack of existing records from databases is more likely to be reflective of targeted sampling effort, as opposed to the absence of threatening processes and species. To overcome these limitations, detailed surveys and assessment in accordance with the BAM will be undertaken to inform the masterplan.

### 3.4 Field Surveys

A staged approach to the field survey program has been utilised with reference to mapping of HEV areas and applying the approach established in Stage 1 of the BAM to collect information on the biodiversity constraints to inform the development of the preferred master plan.

Initial field surveys were undertaken from 13 – 16 December 2021 and included Rapid Vegetation Assessment Points, targeted fauna surveys, microchiropteran echolocation surveys, and ground validation of state PCT mapping. Field survey focussed on the vegetated/undeveloped areas within the Investigation Area.

Further field surveys were conducted from 4 – 8 April 2022 focussed on conducting BAM plots and conclusively verifying Plant Community Types (PCTs), with some targeted survey efforts for potential Candidate Species derived from initial desktop analysis depending on seasonal constraints.

Additional field surveys were conducted from 27 – 29 September 2022 consisting of targeted koala surveys and further confirmation of koala habitat. Field surveys included spotlighting transects and SAT surveys.

A BAM C Candidate Species list has been developed following field efforts and assessment of PCTs, with areas of potential habitat polygons mapped in Figure 7.1.

ERM ecologists Tim Callaghan and Kelsie Youman conducted baseline ecological surveys within the Richmond Valley RJP project 13 – 16 December 2021. Temperatures ranged between 13.7 to 31.4 C during survey. 52.8 mm of rain was recorded in the week prior to survey. No rain was recorded during the survey period (Bureau of Meteorology 2022).

ERM ecologists Tim Callaghan and Laura Steiniger completed the second round of field surveys from 4<sup>th</sup> – 8<sup>th</sup> April 2022. Temperatures ranged between 10.1 – 28.8 C during the survey period, with 53mm of rain recorded over the survey period and 112mm recorded in the previous week (Bureau of Meteorology, 2022).

ERM ecologists Lorena Boyle and Laura Steiniger completed the third round of field surveys, focused on targeted Koala surveys only, from the 27 – 29 September 2022. Temperatures ranged between 11.0 – 29.4 C, with 4.4mm of rain recorded over the survey period and 37mm recorded in the previous week (Bureau of Meteorology, 2022).

The field survey method did not include full targeted surveys for threatened plants in accordance with the guideline *Surveying threatened plants and their habitats* (DPE, 2020). Traverses across the RJP site were completed from 13 – 16 December 2021, during which general observations for the suitability and presence of candidate threatened plants was completed. Searches were within the correct season for the detection of Hairy Jointgrass and *Maundia triglochinos*.

Additional surveys may be required in November to target Hairy-joint Grass to remove these as a potential constraint, however both species can have unpredictable growth patterns, appearing absent for many years and then having large periods of growth. Surveys for these species would be recommended if any change in land use or development is proposed in the northern Nammoona precinct, as this is where suitable habitat for this species occurs in the RJP Investigation Area.

### 3.4.1 Rapid Vegetation Assessment Points

Flora field surveys were conducted across various vegetation communities. Rapid survey sites were undertaken. Field data collected by rapid survey includes the latitude and longitude of the survey point, dominant canopy, sub canopy, shrub and ground cover species in within the immediate vicinity of the survey point. Any high threat weeds and weeds of national significance (WoNS) were also noted during field assessment.

### 3.4.2 Vegetation Integrity Plots

BAM surveys were undertaken on 4 - 8 April 2022 to conclusively verify the Plant Community Types (PCTs) found within the Investigation Area. The BAM surveys recorded the following data:

- BAM plots record the following floristic data within a 20 m x 20 m quadrat:
  - Growth form for each native species;
  - Species name of each native and exotic species;
  - Percent foliage cover of each native and exotic species; and
  - Number of each species.
- BAM plots record the following vegetation function attributes within a 20 m x 50 m plot:
  - Number of large trees;
  - Number of trees with hollows;
  - Tree stem size class;
  - The presence of tree regeneration;
  - Length of fallen logs; and
  - Average percent groundcover of litter recorded from five 1 m x 1 m plots.

10 BAM plots were completed within the 4 – 8 April survey period.



### 3.5 Fauna Surveys

The fauna survey methodology follows standardised survey guidelines, including DEC (draft 2004) and Biodiversity Assessment Method survey requirements (DPIE, 2020) where seasonal requirements allowed. Following is a description of fauna survey methods employed for each fauna group. The initial fauna survey was conducted over the period 13 – 16 December 2021. Additional fauna monitoring was conducted by use of ANABAT for microchiropteran species and aural census for amphibians period 3 – 16 December 2021 and 4th – 8th April 2022. Fauna survey locations are presented in Figure 3.1.

Baseline fauna surveys and habitat assessments were conducted in relevant habitat areas across the RJP Richmond Valley Investigation Area. Habitat types targeted included pastures/ grassland, waterways and wetlands, forests and woodlands.

Additional surveys were undertaken on 27-29 September 2022, to search for koala presence and confirm boundaries of current habitat mapping. Survey effort included the undertaking of spotlighting transects and Spot Assessment Technique (SAT) surveys. Koala survey locations are presented in Figure 3.2 .

A summary of the fauna survey effort is provided in Table 3-2 and detailed below.

**Table 3-2 Fauna Survey Effort, Richmond Valley RJP Boundary**

Method	Survey Dates	Effort	Total Survey Effort
Diurnal Birds	13 – 16 December 2021	12 sites	3 days
Nocturnal Birds	13 – 16 December 2021	3 sites	3 survey efforts over 3 nights
Anabat Detector	13 – 16 December 2021	3 sites x 2 nights each	6 cumulative nights
Reptile Searches	13 – 16 December 2021	Opportunistic	n/a
Amphibian Surveys	13 – 16 December 2021	Aural census (2 nights) + spotlight	3 nights + spotlight
Mammal Activity Surveys	13 – 16 December 2021	Opportunistic	n/a
Koala Searches	27 – 29 September 2022	22 x SAT Surveys 11x 200m spotlight transects.	2 nights and 2 days.

#### 3.5.1 Birds

ERM ecologists completed 12 diurnal bird surveys and detected 48 common bird species within the Investigation Area. No threatened birds were detected within the Investigation Area.

Bird species were observed either by call or direct observation with survey location points recorded in latitude and longitude. Surveys targeted water bodies and wetlands for the presence of threatened migratory and wading species.

Birds were sampled by diurnal and nocturnal census and recorded opportunistically whilst undertaking other field duties. This includes direct observations of bird species and identification of their characteristic calls. The diurnal census was conducted in the mornings for a period of 20 minutes, and throughout the day opportunistically, recording all bird species heard or observed within a 1ha area (100 x 100m) area.

The nocturnal census comprised quiet listening for characteristic calls following dusk for a period of 30 minutes following dusk. Broad cast of pre-recorded calls of the threatened eastern grass owl (*Tyto longimembris*) were conducted approximately one hour after sunset. Calls were broadcast for a period of 2 minutes with a gap of 5 minutes for listening. Nocturnal surveys were undertaken for eastern grass owl across three nights in 3 locations. Eastern grass owl was not detected during the field survey.

### 3.5.2 Bats

Four Wildlife Acoustic SM2+ acoustic recorders were used over three nights of surveys to monitor and record microchiropteran (microbat) calls within suitable habitat identified within the Investigation Area. Results are shown in Section 6.1.

Acoustic monitors were deployed near watercourses, fly ways in vegetation, gullies and dams to capture microbat calls whilst on the wing.

Various microbat species bat species overlap in call frequency and structure making call identification inconclusive for these species. For example, echolocation calls of the lesser long-eared bat (*Nyctophilus geoffroyi*) and Gould's long-eared bat (*Nyctophilus gouldi*) cannot be reliably differentiated, and are therefore grouped as *Nyctophilus sp.* A degree of confidence is also attached to microbat call analysis. Confidence is dependent on the duration of the recorded call and the quality of recording.

### 3.5.3 Reptiles and Amphibians

Reptiles were searched for within micro habitat (ground logs, rocks, leaf litter) rock crevices and slabs in suitable habitat throughout the Investigation Area. Searches for reptiles were conducted opportunistically in conjunction with habitat assessments. Amphibian surveys were conducted in conjunction with nocturnal bird surveys in a wetland to the north east of the Investigation Area in Nammoona. Three frog species were detected through call and spotlighting. Including dwarf tree frog (*Litoria fallax*), striped marsh frog (*Limnodynastes peronii*) and striped rocket frog (*Litoria nasuta*).

### 3.5.4 Koalas

Relevant survey requirements specific to the koala are presented in the *Department of Planning and Environment, Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide (2022)* under the NSW Biodiversity Offset Scheme. The below survey methods were used for the RJP project:

- Nocturnal spotlighting to determine presence and density; and
- Scat Search – Spot Assessment Technique (SAT) which involves looking at the base of koala food trees for presence of koala scats.

No presence of koala was detected throughout the spotlighting and SAT locations.

#### 3.5.4.1 Spot Assessment Technique

The Spot Assessment Technique is an indirect surveying method, looking for the presence of koala scat within a given area. As per the guidelines survey locations are chosen using a grid spacing pattern of 150m for suitable habitat <50ha and 250m for suitable habitat >50ha. The total number of SAT sites required for an area of suitable habitat is determined by dividing the approximate number of hectares by 2.25 (for 150 m grid spacing) or 6.25 (for 250 m grid spacing). Areas of suitable habitat <5 ha require a minimum of three SAT sites, located in different PCTs, where relevant.

The SAT protocol is detailed in Phillips and Callaghan (2011) and was undertaken at each SAT site:

1. Locate and mark the tree of any species closest to the grid intersect coordinates – this is identified as the centre tree. To accommodate floristic variations, selection of the centre tree may vary by 10% of the sampling interval (i.e. 25 m for a 250 m grid).
2. Move outwards from the centre tree, identifying the 29 nearest trees of any species to the centre tree within the area of suitable habitat. Where the minimum sampling effort of 30 trees cannot be met, sample the highest number possible before overlapping with the adjacent SAT site.
3. Undertake a radial search for koala scat beneath each of the 30 marked trees, within a prescribed search area extending 1 m from the base of each tree. Scat search effort is a minimum of two person-minutes for each tree. For trees with a large dbh, it is expected that additional search time will be required.

4. Searches should begin with a brief inspection of the undisturbed litter or grass and grass like growth form cover within the 1 m search area. If no koala scats are detected, a more thorough inspection of the search area, involving disturbance by hand of the litter or grass and grass like growth form cover, is required.
5. The search at each tree is concluded when: a. a koala scat is detected, or b. the search time ends with no koala scat detected.
6. Where the search time ends before a koala scat is detected, the SAT survey must continue at the next nearest tree.

All 30 trees at each SAT site were sampled until a koala scat detected, or all have been sampled. Koala presence within an area of suitable habitat is confirmed by detection of a koala scat.

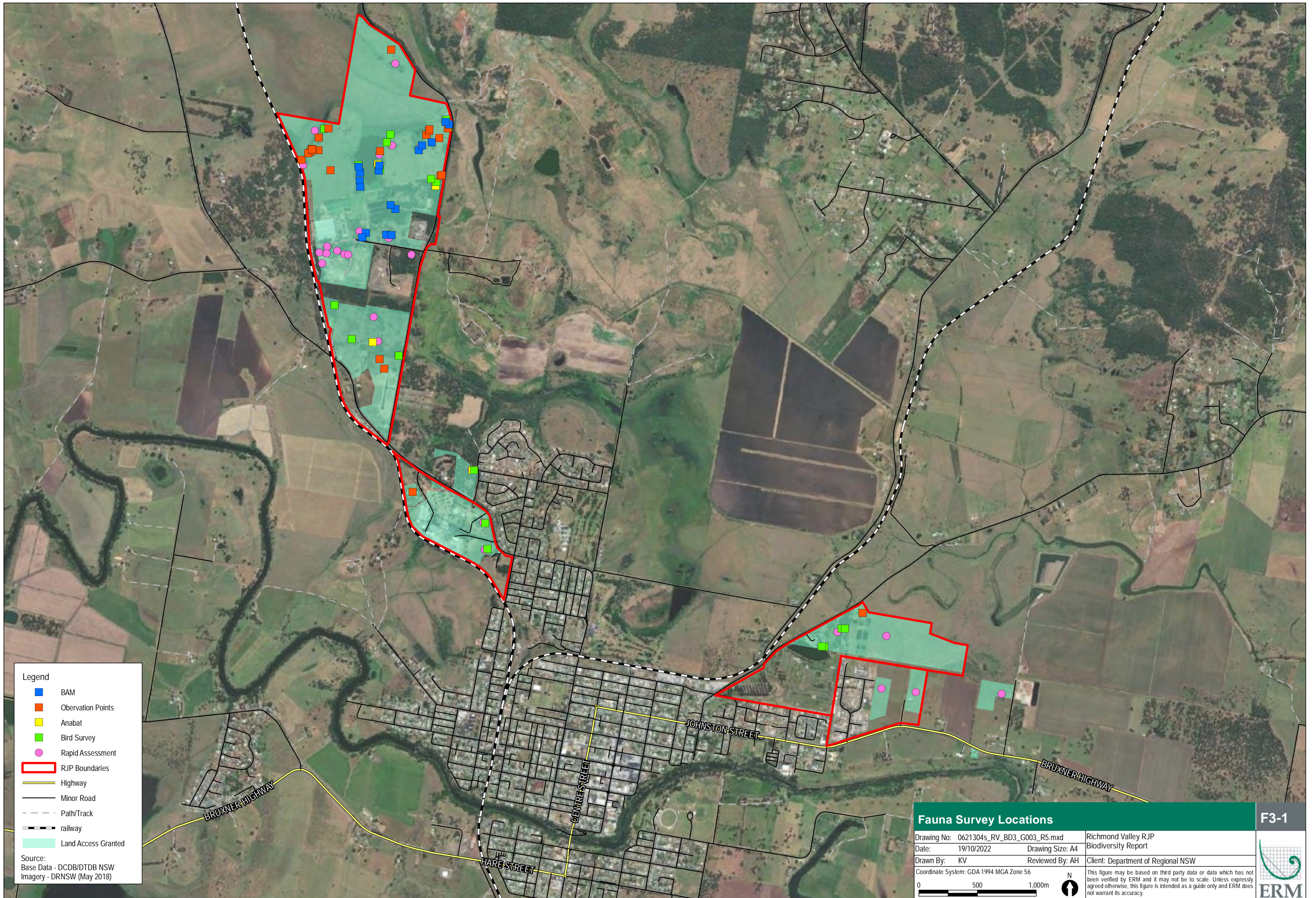
See Figure 3.2 for locations of the 22 SATs undertaken. The extent of the koala surveys within the RJP Investigation Area was limited to those lots where access was permitted. Where access was permitted surveys were conducted in accordance with the methods and survey effort required under the *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide (2022)*, however it is acknowledged that areas of potential koala habitat were not able to be surveyed. As part of any future development application in these areas, it is recommended that koala surveys are completed, in accordance with the guidelines, to refine any koala habitat polygons.

#### 3.5.4.2 Spotlighting

Spotlighting is a suitable direct survey method as the koala is a large-bodied, slow moving species with bright eye-reflectance making them easily detectable with a torch (DSEWPaC 2011). Spotlighting surveys were undertaken on foot, moving at approximately 10 m/min (van der Ree & Loyn 2002).

Two ecologists undertook spotlighting along a predetermined number of 200m long transects at night, with each transect repeated on the second night (DSEWPaC 2011). Due to land access issues, one transect at Nammoona Landfill was only walked once.

Consistent with the BAM survey guidelines, 11 x 200m transects were completed during a 6pm-11pm window. See Figure 3.2 for locations of transects.

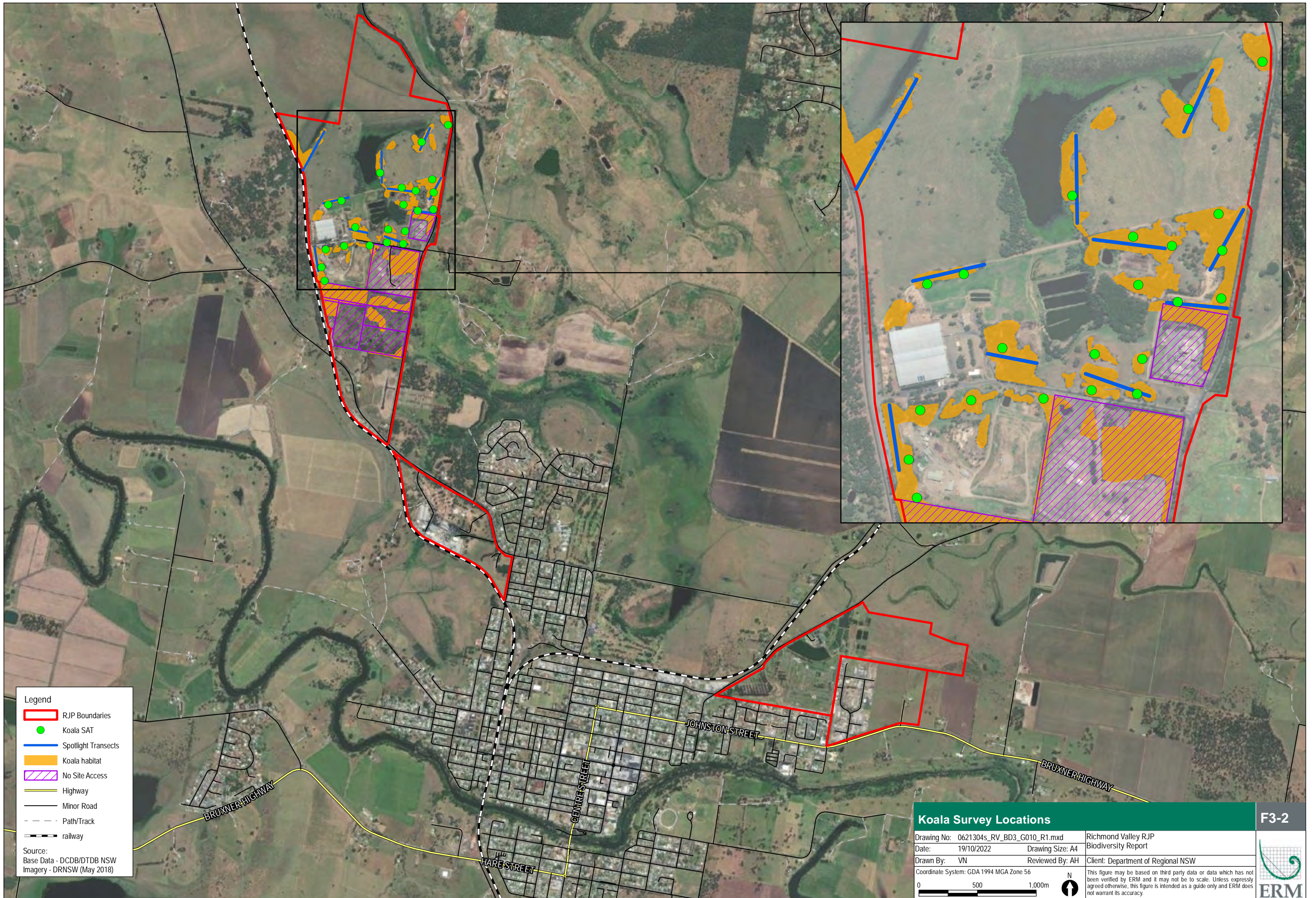


**Legend**

- BAM
- Observation Points
- Anabat
- Bird Survey
- Rapid Assessment
- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- railway
- Land Access Granted

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Fauna Survey Locations		F3-1
Drawing No: 0621304s_RV_BD3_G003_R5.mxd	Richmond Valley RJP Biodiversity Report	
Date: 19/10/2022	Drawing Size: A4	
Drawn By: KV	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 5px;">0</div> <div style="margin-right: 5px;">500</div> <div style="margin-right: 5px;">1,000m</div> <div style="margin-left: 10px;"> <div style="text-align: center; font-size: 8px;">N</div> <div style="text-align: center;">↑</div> </div> </div>		<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>
		ERM



**Legend**

- RJP Boundaries
- Koala SAT
- Spotlight Transects
- Koala habitat
- No Site Access
- Highway
- Minor Road
- Path/Track
- railway

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Koala Survey Locations		F3-2
Drawing No: 0621304s_RV_BD3_G010_R1.mxd	Richmond Valley RJP Biodiversity Report	
Date: 19/10/2022	Drawing Size: A4	
Drawn By: VN	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">0</div> <div style="margin-right: 10px;">500</div> <div style="margin-right: 10px;">1,000m</div> <div style="margin-left: 10px;"> <span style="font-size: 10px;">N</span>  <span style="font-size: 12px;">↑</span> </div> </div>		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

## 4. BIODIVERSITY VALUES

The following section presents the biodiversity values of the Investigation Area based on the findings from the desktop review and input from local technical experts.

Landscape features contain biodiversity values that are important for the site context and habitat suitability of the preferred structure plan and as such, are used to identify the threatened species likely to occur. The specific landscape feature requirements of Section 3 of the BAM are provided in Table 4-1 below and will be used in any future Biodiversity Development Assessment Report (BDAR) prepared to support the Masterplan.

**Table 4-1 Landscape Features**

Landscape Feature	Summary Notes
IBRA Bioregion IBRA Subregion	South Eastern Queensland Clarence Lowlands
(NSW) Mitchell Landscapes	Mount Warning Exhumed Slopes Clarence - Richmond Alluvial Plains
Rivers and Streams	Richmond River
Wetlands	Various Farm Dams
Connectivity	Local habitat corridors include continuous patches of habitat large enough to sustain viable populations of threatened flora and fauna and to facilitate dispersal movement. These include a combination of: <ul style="list-style-type: none"> <li>■ Richmond River and associated riparian zone. This river and riparian zone provides a link to the Border Ranges and Broadwater National Park, vital for coastal wintering migrating birds.</li> <li>■ Barlings Creek (South of the RJP Investigation Area). The Barlings Creek vegetation corridor is a link to the habitat within and around the Nammoona Waste Transfer Station, Livestock Exchange and Pacific Intermodal sites. This includes freshwater wetlands and Swamp Oak, which have been identified as threatened communities and important habitat within the RJP Investigation Area.</li> <li>■ Patchy areas of vegetation in in the norther potion of the Nammoona Industrial Precinct sector, which extends SE towards the town Investigation Area; and</li> <li>■ Eucalypt patches north of the Northern Coop Meat Company sector. This patch connects to Barlings Creek and Jabiru Geneebeinga Wetlands, which provides suitable migratory bird habitat.</li> </ul>
Native Vegetation Cover	Estimated to be 92ha.
Areas of Geological Significance	Areas of Geological Significance include karst, caves, crevices and cliffs. None of these features are expected to occur within the Investigation Area.

Landscape Feature	Summary Notes
<p>Areas of Outstanding Biodiversity Value (AOBV)</p>	<p>An area of outstanding biodiversity value (AOBV) is an area with irreplaceable biodiversity values that is of state, national or global importance. AOBVs identify the most valuable sites for biodiversity conservation in NSW outside of the national reserve system.</p> <p>No AOBV have been identified within the Investigation Area. AOBV declarations in NSW currently includes:</p> <ul style="list-style-type: none"> <li>■ Gould's Petrel – critical habitat declaration;</li> <li>■ Little penguin population in Sydney's North Harbour – critical habitat declaration;</li> <li>■ Mitchell's Rainforest Snail in Stotts Island Nature Reserve – critical habitat declaration; and</li> <li>■ Wollemi Pine – critical habitat declaration.</li> </ul>
<p><b>Patch Size:</b> (the area of intact native vegetation that occurs on the Site and the vegetation within 100 m of the next area of native vegetation in moderate to good condition. It is used to determine the habitat suitability of the Site for threatened species).</p>	<p>100ha</p>

## 5. NATIVE VEGETATION AND FLORA

### 5.1 Native Vegetation Extent

Extent of native vegetation that could be assigned a Plant Community Type (PCT) is estimated to be approximately 44 ha. This was determined through initial analysis of aerial photography, State Vegetation Type Mapping and refined via walking meanders, and RDPs during initial field survey events. Collection of additional floristic data from the vegetation integrity plots was used to assign a PCT to areas of native vegetation where possible.

### 5.2 PCT Descriptions

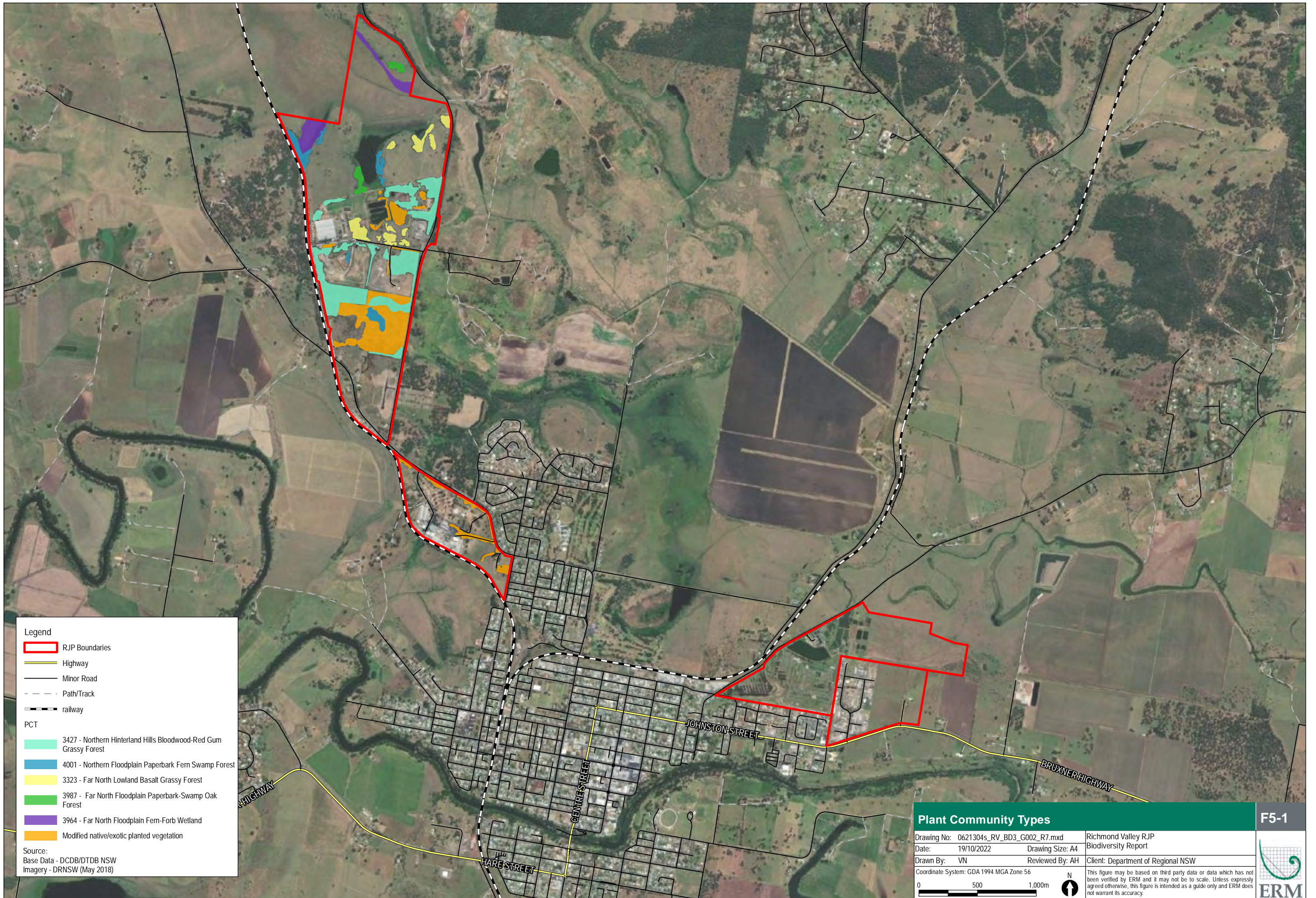
Field validation of the existing vegetation mapping identified five PCTs within the Investigation Area. Three communities are associated with TECs under the BC Act and two associated with EPBC Act listed TECs. The following PCTs (Table 5-1) were identified as occurring within the Investigation Area based on vegetation surveys utilising Rapid Assessment Technique, and BAM method.

**Table 5-1 PCT Descriptions**

PCT Number	PCT Name	TEC (EPBC Act and BC Act)	Area within RJP (ha)
4001	Northern Floodplain Paperbark Fern Swamp Forest	BC Act listed Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EPBC Act listed Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	5.9
3323	Far North Lowland Basalt Grassy Forest	No associated TECs	7.0
3987	Far North Floodplain Paperbark-Swamp Oak Forest	BC Act listed Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EPBC Act listed Coastal Swamp Oak ( <i>Casuarina glauca</i> ) Forest of New South Wales and South East Queensland	2.4
3427	Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest	None	28.3
3964	Far North Floodplain Fern-Forb Wetland	BC Act listed Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	7.05
	Modified native/exotic planted vegetation	None	27.2

As identified in Figure 5.1, the most widely mapped vegetation community within the Investigation Area is non-native/cleared vegetation, the most widely mapped native vegetation community is PCT 841 – Forest Red Gum grassy open forest (28.3ha).





**Legend**

- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- railway

**PCT**

- 3427 - Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest
- 4001 - Northern Floodplain Paperbark Fern Swamp Forest
- 3323 - Far North Lowland Basalt Grassy Forest
- 3987 - Far North Floodplain Paperbark-Swamp Oak Forest
- 3964 - Far North Floodplain Fern-Forb Wetland
- Modified native/exotic planted vegetation

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Plant Community Types		F5-1
Drawing No: 0621304s_RV_BD3_G002_R7.mxd	Richmond Valley RJP Biodiversity Report	
Date: 19/10/2022	Drawing Size: A4	
Drawn By: VN	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>		

### 5.3 Species credit species – flora

Threatened flora species assigned to species credits are those that cannot be confidently predicted to occur by vegetation and landscape features. They are also known as candidate species. The candidate species predicted to occur in the development areas of the RJP boundary by the BAM Calculator are shown in Table 5-2.

This assessment, as well as the field survey results, have identified Hairy Jointgrass as a candidate species with potential habitat mapped in areas of native sedgeland and low-lying areas of exotic pasture in the Namoonna precinct. This species is listed as vulnerable under the BC Act and the EPBC Act.

**Table 5-2 Likelihood of Occurrence Criteria**

Factor	Preferred Habitat Exists	Suitable Habitat Exists <sup>1</sup>	Habitat Does Not Exist <sup>2</sup>
Records within Investigation Area	Known	Known	Known
Records in the locality <sup>3</sup>	Likely	Potential	Unlikely
No records in the locality, but Investigation Area is within known distribution	Potential	Unlikely	Unlikely
No records in the locality, and Investigation Area is outside of distribution	Unlikely	Unlikely	Unlikely

1. *Habitat may be considered suitable, but not preferred.*

2. *Based on sources reviewed and/or field survey results.*

*'Locality' refers to a 10 km buffer of the Investigation Area.*

**Table 5-3 Species credit species – flora**

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Acronychia littoralis</i>	Scented Acronychia	E	E	Small tree to 6 m high with 5 - 16 cm long oval-shaped glossy leaves on a short stalk. The lower surface of the leaves is paler than the upper surface and there are many oil dots visible. They have a pleasant aromatic smell when crushed. The small four-petalled yellowish flowers are produced in summer on a stalk growing from the junction of the leaf and stem. Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW.	Unlikely	No	No
<i>Allocasuarina defungens</i>	Dwarf Heath Casuarina	E	E	Straggly shrub to 2 m high growing from a tuber. Like all She-oaks it has wiry foliage consisting of jointed branchlets rather than leaves. Leaves are reduced to ribs on the branchlets, projecting at the nodes as small teeth. Dwarf Heath Casuarina is found only in NSW from the Napiac area, north-west of Forster, and at Crowdy Bay.	Unlikely	No	No
<i>Ancistrachne maidenii</i>		V	-	Scrambling perennial with slender, rigid horizontal stems and ascending branches. Leaves with sparsely hairy sheath. Known from thirteen localities across New South Wales, including the Hawkesbury sandstones and Clarence Sandstones, where it is locally common in several locations	Unlikely	No	No
<i>Archidendron hendersonii</i>	White Lace Flower	V	-	A tree to 18 m tall, with light-brown bark. Its leaves are divided twice, into glossy hairless leaflets separated unequally by the midvein. Up to ten fragrant, fluffy creamy-white flowers are bunched in heads. From north Queensland south to the Richmond River in north-east NSW	Unlikely	Yes – locality – Botanic gardens	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Arthraxon hispidus</i>	Hairy Jointgrass	V	V	Creeping grass with branching, erect to semi-erect purplish stems. Leaf-blades are 2–6 cm long, broad at the base and tapering abruptly to a sharp point. Long white hairs project around the edge of the leaf. The seed-heads are held above the plant on a long fine stalk. Found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps	Potential	Yes - locality	Yes – not recorded during field surveys, however suitable habitat mapped in lower lying, sedgeland areas subject to regular inundation in the north of the Namoona precinct
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	Unlikely	No	No – not recorded during field surveys
<i>Centranthera cochinchinensis</i>	Swamp Foxglove	E	-	Occurs in northern Australia and south-east Asia and known from NSW north from Woolli. Uncommon in swampy areas and other moist sites.	Unlikely	No	No – not recorded during field surveys
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honeymyrtle <i>Melaleuca armillaris</i> scrub to open scrub.	Unlikely	No	No
<i>Cyperus aquatilis</i>	Water Nutgrass	E	-	Grows in ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs and rock outcrops in sandstone areas.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Davidsonia jerseyana</i>	Davidson's Plum	E	E	Lowland subtropical rainforest and wet eucalypt forest at low altitudes (below 300m). Many trees are isolated in paddocks and on roadsides in former rainforest habitats.	Unlikely	No	No
<i>Dendrobium melaleucaphilum</i>	Spider orchid	E	-	Grows frequently on <i>Melaleuca styphelioides</i> , less commonly on rainforest trees or on rocks in coastal districts. Occurs in coastal districts and nearby ranges, extending from Queensland to its southern distributional limit in the lower Blue Mountains. In NSW, it is currently known from seven recent collections. There has been no subsequent confirmation from the locations of three earlier (pre-1922) collections and it is possible that these are now extinct. Flowers July–October.	Unlikely	No	No
<i>Desmodium acanthocladum</i>	Thorny Pea	V	V	Occurs only in north-east NSW. It is found in the Lismore area, and there are also records from near Grafton, Coraki, Casino and the Mount Warning area. Dry rainforest and fringes of riverine subtropical rainforest. On basalt-derived soils at low elevations. Much of its habitat has been cleared for agriculture.	Unlikely	Yes – locality	No
<i>Diploglottis campbellii</i>	Small-leaved Tamarind	E	E	Confined to the warm subtropical rainforests of the NSW-Queensland border lowlands and adjacent low ranges. The forest types in which the species occurs vary from lowland subtropical rainforest to drier subtropical rainforest with a Brush Box open overstorey. Occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite.	Unlikely	No	No
<i>Drynaria rigidula</i>	Basket Fern	E	-	Grows on plants, rocks or on the ground, Usually found in rainforest but also in moist eucalypt and Swamp Oak forest.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	Green-leaved Rose Walnut	E	-	Occurs in Queensland and in north-east NSW south to Maclean. It is sparsely distributed within this range. Occurs in subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats. Records are usually from poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. The species is generally recorded at lower altitudes.	Unlikely	No	No
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Potential	Yes - locality	No – not recorded during field surveys and surveys completed in optimal season.
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	V	V	Endemic to an area of the north coast between Halfway Creek and Gibberagee State Forest. Dry or moist eucalypt forest and woodlands on sandstone to clay soils.	Unlikely	No	No
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	E	-	There are thought to be less than 20 populations of Pink Nodding Orchid in NSW, all north of Bundjalung National Park, and including Tweed Shire. The species also occurs in Queensland.	Unlikely	No	No
<i>Gossia fragrantissima</i>	Sweet Myrtle	E	E	Occurs in south-east Queensland and in north-east NSW south to the Richmond River. Mostly found on basalt-derived soils. Dry subtropical and riverine rainforest.	Unlikely	Yes - locality	No – not recorded during field surveys
<i>Indigofera baileyi</i>	Bailey's Indigo	E	-	Open woodlands on loam and clay loam soils, typically from granite or basalt, but also from sediments in the Clarence lowlands.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Lindernia alsinoides</i>	Noah's False Chickweed	E	-	Recorded in the mid-coastal areas from Bulahdelah to Coopernook, including coastal populations at Forster (e.g. Cape Hawke); and with occurrences further north at Shannon Creek west of Coutts Crossing and also at Bungawalbyn and near Casino, in the far NSW North Coast. Grows in swamp forests and wetlands along coastal and hinterland creeks	Unlikely	No	No
<i>Lindsaea incisa</i>	Slender Screw Fern	E	-	Slender Screw Fern is known from fifteen locations in New South Wales between Port Macquarie and the Queensland border. It is common in Fortis Creek National Park and Wells Crossing Flora Reserve. Also occurs in north and south-east Queensland. usually found in waterlogged or poorly drained sites along creeks, dominated by Paperbarks where ferns, sedges are common. Moist shrubby eucalypt forest on metasediments.	Unlikely	No	No
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	Confined chiefly to the north of the Richmond River in north-east NSW, extending just across the border into Queensland. Many records, particularly those further south, are thought to be propagated.	Unlikely	Yes - locality	No – not observed during field surveys
<i>Maundia triglochmoides</i>		V	-	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct.	Unlikely	No	No
<i>Melaleuca irbyana</i>	Weeping Paperbark	E	-	Found in only a few places in north-east NSW, including near Coraki, Casino and Coutts Crossing south of Grafton. Also occurs in near Ipswich in south-east Queensland. Only two populations are recorded in conservation reserves in NSW, these are Warragai Creek Nature Reserve and Bungawalbin National Park. Open eucalypt forest in poorly drained, usually clay, sandstone or alluvial soils.	Potential	Yes – Locality	No - not observed during field surveys
<i>Myrsine richmondensis</i>	Ripple-leaf Muttonwood	E	E	Known only from a few populations at Coraki, Boatharbour near Lismore, and the Cherry Tree area west of Casino. Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil and alluvial deposits.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Oberonia complanata</i>	Yellow-flowered King of the Fairies	E	-	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves.	Unlikely	No	No
<i>Oberonia titania</i>	Red-flowered King of the Fairies	V	-	Red-flowered King of the Fairies occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	Unlikely	No	No
<i>Ochrosia moorei</i>	Southern Ochrosia	E	E	Southern Ochrosia is found in north-east NSW north from the Richmond River, and in south-east Queensland. It is very sparsely distributed within this range.	Unlikely	No	No
<i>Olax angulata</i>	Square-stemmed Olax	V	V	Known from a small area east of Grafton, near Minnie Water and Wooli, mainly in Yuraygir National Park and on nearby leasehold land. Locally common. Also known from an area north of Grafton in Banyabba Nature Reserve, Fortis Creek National Park and adjoining freehold land. Dry Coastal sand dune heaths and heathy woodlands on sandy soils, often in association with Wallum Banksia ( <i>Banksia aemula</i> ). Dry sandstone Sclerophyll Forests and woodlands	Unlikely	No	No
<i>Oldenlandia galioides</i>		E	-	In north-east NSW, known from Whiporie State Forest south of Casino and one location in the Tweed district. Also occurs on the north-west plains of NSW and in Queensland, Northern Territory and Western Australia. Margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum ( <i>Eucalyptus tereticornis</i> ) woodlands.	Unlikely	No	No
<i>Peristeranthus hillii</i>	Brown Fairy-chain Orchid	V	-	An endemic Australian orchid with a pendulous habit, that grows on tree trunks and thick vines. Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and the threatened ecological community Lowland Rainforest on Floodplain.	Unlikely	No	No



Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Persicaria elatior</i>	Tall Knotweed	V	V	In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Unlikely	No	No
<i>Phaius australis</i>	Southern Swamp Orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas	Unlikely	No	No
<i>Phyllanthus microcladus</i>	Brush Sauropus	E	-	In NSW confined to a few locations in the Tweed, Brunswick, Richmond and Wilson River Valleys with an outlying population near Grafton. Also occurs in south-east Queensland. Usually found on banks of creeks and rivers, in streamside rainforest or dry rainforest.	Unlikely	No	No
<i>Polygala linariifolia</i>	Native Milkwort	E	-	Sandy soils in dry eucalypt forest and woodland with a sparse understorey. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of <i>Eucalyptus caleyi</i> , <i>Eucalyptus dealbata</i> and <i>Callitris</i> , and in yellow podsolic soil on granite in layered open forest. Other associated species include <i>Eucalyptus trachyphloia</i> , <i>Eucalyptus sphaerocarpa</i> , <i>Angophora floribunda</i> , <i>Angophora leiocarpa</i> , <i>Lophostemon suaveolens</i> , <i>Corymbia henryi</i> , <i>Allocasuarina torulosa</i> and <i>Wahlenbergia</i> species in the understorey.	Unlikely	No	No
<i>Prostanthera sejuncta</i>		-	-	It grows in woodlands and open forests areas dominated by <i>Eucalyptus bancroftii</i> , <i>Lophostemon suaeveolens</i> , <i>Angophora subvelutina</i> , <i>Eucalyptus pilularis</i> , with a mid-layer of <i>Allocasuarina littoralis</i> , <i>Leptospermum Leptospermum brachyandrum</i> , and <i>Banksia oblongifolia</i> . It less commonly occurs in Blackbutt Wet Sclerophyll Forests on sheltered slopes and also drier rocky woodlands.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Rotala tripartita</i>		E	-	<i>Rotala tripartita</i> is a riparian species that often grows in free-standing water with sedges. There appear to be extreme fluctuations in abundance of the species, with plants observed to germinate prolifically and establish in large numbers after substantial rainfall. Individuals disappear above-ground during dry periods and may only persist during these times in the soil seed-bank.	Unlikely	No	No
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	V	V	A restricted range from the Richmond River in north-east NSW to Gympie in Queensland. Locally common in some parts of its range, but otherwise sparsely distributed. Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils.	Unlikely	Yes - locality	No – not recorded during field surveys
<i>Tephrosia filipes</i>		V	-	Relatively widespread in Queensland but in NSW confined to the north-eastern section on the escarpment east of Tenterfield south to west of Grafton. Grows in a range of woodland and forest habitats on soils derived from granite, sandstone or metasediments.	Unlikely	No	No

## 5.4 High Threat Weeds

A number of high threat weeds (HTW), Primary Weeds and Weeds of National Significance (WONS) were recorded across the Investigation Area, as shown in Table 5-4. Treatment and or removal prior to disturbance of these areas is recommended to prevent further spread and resultant degradation and loss of biodiversity.

**Table 5-4 High Threat Weeds**

Scientific Name	Common Name	Survey Location	NSW Priority Weeds (North Coast)	WONS
<i>Cinnamomum camphora</i>	Camphor laurel	20211215 Q1 20211214 Q3 20220407 BAM 2	-	-
<i>Eragrostis curvula</i>	African lovegrass		✓	-
<i>Lantana camara</i>	Lantana	20211214 Q1, 20211214 Q2 20211213 Q1 20211215 Q1 20211215 Q4 20211215 Q3 20211214 Q3 20211214 Q4 20220405 BAM1 20220406 BAM3 20220407 BAM2 20220407 BAM3		✓
<i>Senecio madagascariensis</i>	Fire weed	20211215 Q2 20211215 Q7 20220405 BAM1	✓	✓
<i>Cestrum parqui</i>	Green cestrum	20211214 Q4	✓	-

## 6. FAUNA AND HABITATS

### 6.1 Microbats

Microbat calls were sampled using one Anabat Swift detector and three songmeters BAT2+. Passive monitoring was undertaken from 13 to 16 December 2021. The data was analysed using Anabat Insight and Kaleidoscope Pro.

Call identification for this dataset was based on call keys and descriptions published for Queensland (Reinhold *et al.*, 2001) and New South Wales (Pennay *et al.*, 2004). Species' identification was further refined using the probability of occurrence of each species based on their geographic distribution (Churchill, 2008, Van Dyck and Strahan, 2008).

The reliability of identification is as follows:

- **Definite** - one or more calls where there is no doubt about the identification of the species;
- **Probable** - most likely to be the species named, low probability of confusion with species that use similar calls; and
- **Possible** - call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls

The majority of calls were considered to be of medium to good quality calls.

A total of 2,107 sequence files were analysed. of these files 729 in this dataset contained background noise or resulted in poor quality calls that did not provide bat calls for analysis. While some call sequences were recognised as bat calls, the quality was not sufficient to assign species identification.

A total of 12 microbat species were either confirmed 'definite', 'probable' or 'possible' within the Investigation Area.

Calls from *Nyctophilus sp* have been confirmed across the Investigation Areas. Three species of *Nyctophilus* possibly occur within the Investigation Area. *N bifax* is listed Vulnerable under the BC Act. The call of this genes cannot be distinguished from each other.

The following threatened species were recorded on site:

- *Falsistrellus tasmaniensis* Eastern False Pipistrelle (ecosystem credit species);
- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (ecosystem credit species);
- *Myotis macropus* Southern Myotis (species credit species);
- *Nyctophilus bifax* Eastern Long-eared Bat (ecosystem credit species);
- *Ozimops lumsdenae* Northern Free-tailed Bat (ecosystem credit species); and
- *Saccolaimus flaviventris* Yellow-bellied Sheath-tail-bat (ecosystem credit species).

A summary of the species identified through bat call analysis is provided in Table 6-1, with threatened species highlighted in bold text. SM4 did not record any calls and is likely due to an error in the device, given the relatively high number of species detected on the Anabat located to the east.

These microbat species can all use hollow bearing trees, or in the case of Southern Myotis structures such as culverts, building eaves and bridges, as roost sites. They are likely to forage over the wetland area and adjacent watercourses.

**Table 6-1 Summary of Bat Call Analysis**

Species	BC Act	EPBC Act	Anabat 1	SM2	SM3	SM4
<i>Austronomus australis</i>	LC	NOC	Definite	-	Definite	-
<i>Chalinolobus gouldii</i>	LC	NOC	Definite	-	Definite	-
<b><i>Falsistrellus tasmaniensis</i></b> <b>Eastern False Pipistrelle</b>	V	NOC	Probable	Probable	-	-
<b><i>Micronomus norfolkensis</i></b> <b>Eastern Coastal Free-tailed Bat</b>	V	NOC	Possible	-	-	-
<b><i>Myotis macropus</i></b> <b>Southern Myotis</b>	V	NOC	Possible	-	Possible	-
<b><i>Nyctophilus sp</i></b>	V	V	Possible	-	Possible	-
<b><i>Ozimops lumsdenae</i></b> <b>Northern Free-tailed Bat</b>	V	NOC	-	Definite	-	-
<i>Ozimops ridei</i>	LC	NOC	Possible	-	-	-
<i>Rhinolophus megaphyllus</i>	LC	NOC	Definite	Definite		
<b><i>Saccolaimus flaviventris</i></b> <b>Yellow-bellied Sheath-tail-bat</b>	V	NOC	Definite	Definite	-	-
<i>Scotorepens greyii</i>	LC	NOC	Probable	-	-	-
<i>Vespadelus pumilus</i>	LC	NOC	-	Definite	-	-

## 6.2 Birds

ERM ecologists completed 12 diurnal bird surveys and detected 48 common bird species within the Investigation Area. No threatened birds were detected within the Investigation Area. Nocturnal surveys were undertaken for eastern grass owl across three nights in 3 locations. Eastern grass owl was not detected during the field surveys. Bird species identified within the Investigation Area are outlined in Table 6-2.

**Table 6-2 Bird Species Detected in Richmond Valley RJP Investigation Area**

Common Name	Scientific Name
Common miner	<i>Acridotheres tristis</i>
Noisy miner	<i>Manorina melanocephala</i>
Australian King-Parrot	<i>Alisterus scapularis</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Dusky Woodswallow	<i>Artamus cyanopterus</i>
Sulfur-crested Cockatoo	<i>Cacatua galerita</i>
Little Corella	<i>Cacatua sanguinea</i>
Pheasant Coucal	<i>Centropus phasianinus</i>
Double-banded Plover	<i>Charadrius bicinctus</i>
Little Bronze-Cuckoo	<i>Chrysococcyx minutillus</i>
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Australian Raven	<i>Corvus coronoides</i>

Common Name	Scientific Name
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Black Swan	<i>Cygnus atratus</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Common Cicadabird	<i>Edolisoma tenuirostris</i>
Galah	<i>Eolophus roseicapilla</i>
Eastern Koel	<i>Eudynamys orientalis</i>
Dollarbird	<i>Eurystomus orientalis</i>
Peaceful Dove	<i>Geopelia striata</i>
White-throated Gerygone	<i>Gerygone olivacea</i>
Magpie Lark	<i>Grallina cyanoleuca</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Varied Triller	<i>Lalage leucomela</i>
Brown Honeyeater	<i>Lichmera indistincta</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Noisy Miner	<i>Manorina melanocephala</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>
Black-faced Monarch	<i>Monarcha melanopsis</i>
Olive-backed Oriole	<i>Oriolus sagittatus</i>
Striated Pardalote	<i>Pardalotus striatus</i>
House sparrow	<i>Passer domesticus</i>
Australian Pelican	<i>Pelecanus conspicillatus</i>
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Royal Spoonbill	<i>Platalea regia</i>
Purple Swamp Hen	<i>Porphyrio porphyrio</i>
Grey Fantail	<i>Rhipidura albiscapa</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Weebill	<i>Smicronis brevirostris</i>
Australasian fig bird	<i>Sphecotheres vieilloti</i>
Spotted Dove	<i>Streptopelia chinensis</i>
Pied Currawong	<i>Strepera graculina</i>
Double-barred Finch	<i>Taeniopygia bichenovii</i>
Australian White Ibis	<i>Threskiornis molucca</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Masked Lapwing	<i>Vanellus miles</i>

### 6.3 Ecosystem Credit Species

Threatened species assigned to ecosystem credits are those that can be reliably predicted to occur based on the vegetation and/or landscape features within the RJP boundary (also referred to as the 'subject land' within the BAM). It also includes species with a low probability of detection using targeted surveys. They are also known as predicted species and do not require targeted survey.

This list is automatically populated in the BAM Calculator and based on the PCTs present within the RJP includes:

- *Anthochaera phrygia* (Breeding) (Regent Honeyeater);
- *Botaurus poiciloptilus* (Australasian Bittern);
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo);
- *Ephippiorhynchus asiaticus* (Black-necked Stork);
- *Glossopsitta pusilla* (Little Lorikeet);
- *Haliaeetus leucogaster* (White-bellied Sea-Eagle);
- *Hirundapus caudacutus* (White-throated Needletail);
- *Ixobrychus flavicollis* (Black Bittern);
- *Lophoictinia isura* (Square-tailed Kite);
- *Macropus dorsalis* (Black-striped Wallaby);
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat);
- *Miniopterus australis* (Little Bent-winged Bat);
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat);
- *Ninox strenua* (Powerful Owl);
- *Oxyura australis* (Blue-billed Duck);
- *Pandion cristatus* (Eastern Osprey);
- *Phascolarctos cinereus* (Koala);
- *Pomatostomus temporalis temporalis* (Grey-crowned Babbler);
- *Pteropus poliocephalus* (Grey-headed Flying-fox);
- *Rostratula australis* (Australian Painted Snipe);
- *Scoteanax rueppellii* (Greater Broad-nosed Bat);
- *Stictonetta naevosa* (Freckled Duck); and
- *Tyto novaehollandiae* (Masked Owl).

### 6.4 Species Credit Species - Fauna

Threatened species assigned to species credits are those that cannot be confidently predicted to occur by vegetation and landscape features. They are also known as candidate species. The candidate species predicted to occur in the development areas of the RJP boundary by the BAM Calculator are shown in Table 6-4. A number of these species are only classed as candidate species in relation to their breeding habitat, i.e., the species only requires targeted survey if suitable breeding habitat occurs at the RJP boundary.

**Table 6-3 Likelihood of Occurrence Criteria**

<b>Factor</b>	<b>Preferred Habitat Exists</b>	<b>Suitable Habitat Exists<sup>1</sup></b>	<b>Habitat Does Not Exist<sup>2</sup></b>
Records within Investigation Area	Known	Known	Known
Records in the locality <sup>3</sup>	Likely	Potential	Unlikely
No records in the locality, but Investigation Area is within known distribution	Potential	Unlikely	Unlikely
No records in the locality, and Investigation Area is outside of distribution	Unlikely	Unlikely	Unlikely

1. *Habitat may be considered suitable, but not preferred.*
2. *Based on sources reviewed and/or field survey results.*
3. *'Locality' refers to a 10 km buffer of the Investigation Area.*



**Table 6-4 Species Credit Species – Fauna**

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V	-	Rufous Bettongs are small marsupials, 70 to 80 cm long from nose to tail. They have reddish-brown fur, including on the muzzle. Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter. They sleep during the day in cone-shaped nests constructed of grass in a shallow depression at the base of a tussock or fallen log. At night they feed on grasses, herbs, seeds, flowers, roots, tubers, fungi and occasionally insects	Unlikely	No	No
<i>Anthochaera Phrygia</i> (Breeding)	Regent Honeyeater	CE	CE	Mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Potential foraging only	Yes – Locality (Bionet Record)	No – not within mapped important area
<i>Argynnis hyperbius</i>	Laced Fritillary	E	CE	Nymphalid butterfly with a wingspan of 60-66 mm. The upperside of the wings is pale orange-brown with numerous black spots and a black band on the scalloped wing margins giving a laced appearance. The underside of the fore-wing is pinkish-orange with numerous black spots. Restricted to south-east Queensland and north-east NSW in open swampy coastal areas where the larval food plant Arrowhead Violet <i>Viola betonicifolia</i> occurs.	Unlikely	No	No
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Potential	Yes – Locality	No – not recorded during field surveys

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.			
<i>Cacophis harriettae</i>	White-crowned Snake	V	-	Coastal and near-coastal areas from central eastern Queensland south to the vicinity of Coffs Harbour in north-east NSW. The western limit is the Legume area near the NSW-Queensland border; however, their stronghold appears to be the middle Clarence Valley.	Potential	Yes – Locality	No – limited habitat suitability
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	Unlikely	No	No – not recorded during field surveys
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	Potential	Yes – Locality	No – not recorded during field surveys and no suitable hollows recorded
<i>Carterornis leucotis</i>	White-eared Monarch	V	-	The species is endemic to the coastal lowlands and eastern slopes of the Great Divide of eastern Australia, extending from Cape York Peninsula south to north-eastern NSW. In NSW, White-eared Monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range. There are occasional records south of the Clarence River, near Woolgoolga and around Port Macquarie. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.	Potential	Yes - Locality	No – not recorded during field surveys
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				<p>Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.</p> <p>Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.</p> <p>Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (<i>Pseudocheirus peregrinus</i>) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.</p>			
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	<p>Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.</p>	Unlikely	No	No
<i>Crinia tinnula</i>	Wallum Froglet	V	-	<p>Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.</p> <p>The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Eggs of 1.1-1.2mm are deposited in water with a pH of &lt;6 and tadpoles take 2-6 months to develop into frogs.</p>	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.			
<i>Desmodium acanthocladum</i>	Thorny Pea	V	V	Occurs only in north-east NSW. It is found in the Lismore area, and there are also records from near Grafton, Coraki, Casino and the Mount Warning area. Dry rainforest and fringes of riverine subtropical rainforest. On basalt-derived soils at low elevations. Much of its habitat has been cleared for agriculture.	Unlikely	Yes – locality	No
<i>Dromaius novaehollandiae</i> - endangered population	Emu	E	-	The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant species, and over long distances. On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.	Unlikely	Yes – locality	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	The White-bellied Sea-Eagle has been recorded in the SAP boundary and broader region. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest)	Potential	Yes – Locality and RJP	No – no stick nests observed during field survey
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	This species occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Likely	Yes - Locality	No – no stick nests observed during field survey

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	In NSW it has historically been 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. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas.	Unlikely	No	No
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V	-	Rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Stephens' Banded Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day. At night it hunts frogs, lizards, birds and small mammals.	Unlikely	No	No
<i>Lathamus discolor</i>	Swift Parrot	E	CE	The Swift Parrot is endemic to south-eastern Australia, breeding only in Tasmania during spring and summer. It migrates to mainland Australia in the autumn and winter months. Within the Hunter and Mid Coast regions, Swift Parrots have been found to forage regularly in Spotted Gum and Swamp Mahogany forests.	Unlikely	No	No
<i>Lichenostomus fasciularis</i>	Mangrove Honeyeater	V	-	The primary habitat of the species is mangrove woodlands and shrublands but Mangrove Honeyeaters also range into adjacent forests, woodlands and shrublands, including casuarina and paperbark swamp forests and associations dominated by eucalypts or banksias. They occasionally forage in parks and gardens of coastal towns and villages. Mangrove Honeyeaters eat nectar, from flowers, and invertebrates, including marine snails and crabs. They generally forage in mangroves, mainly taking food from among the foliage but also feeding at flowers, and from the trunks and roots. They also sometimes forage among flowering trees and shrubs in adjacent habitats.	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	<p>Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.).</p> <p>Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available.</p>	Unlikely	No	No
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	<p>Isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland. Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland.</p>	Unlikely	No	No
<i>Litoria olongburensis</i>	Olongburra Frog	V	V	<p>The Olongburra Frog is an "acid" frog confined to the coastal sandplain wallum swamps. Their life-cycle is adapted to the acidic pH (2.8-5.5) of these wetlands. Frogs are highest in abundance in relatively undisturbed wallum swamps.</p> <p>Breeding habitat is characterised by the presence of emergent sedges, with upright species such as <i>Baumea</i> spp. and <i>Schoenus</i> spp. preferred by adult frogs for perching. Frogs can be found in breeding habitat all year. However, little is known about habitat use when breeding is not occurring and drier areas adjacent to primary habitat may also be utilised.</p>	Unlikely	No	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	<p>Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.</p> <p>In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.</p>	Known	Yes - RJP	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	V	-	<p>Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally, found in well-timbered areas.</p> <p>Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.</p> <p>They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.</p>	Known	Yes – RJP	No breeding habitat present within the RJP.
<i>Miniopterus orianaean oceanensis</i>	Large Bent-winged Bat (Breeding)	V	-	<p>Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.</p> <p>Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.</p> <p>Maternity caves have very specific temperature and humidity regimes.</p> <p>At other times of the year, populations disperse within about 300 km range of maternity caves.</p> <p>Cold caves are used for hibernation in southern Australia.</p>	Known	Yes - RJP	No breeding habitat present within the RJP.
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	<p>Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation.</p> <p>Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.</p> <p>Although generally found within about 20m of the stream, outside the breeding season, the Giant Barred Frog may disperse away from the stream (e.g. 50m or</p>	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				further). It is a generalist feeder, with large insects, snails, spiders and frogs included in its diet.			
<i>Myotis macropus</i>	Southern Myotis	V	-	Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Known	Yes RJP (ERM Fieldwork and Bionet)	Yes – recorded during field surveys and suitable habitat present.
<i>Ninox connivens</i>	Barking Owl	V	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Breeding occurs in the hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators.	Likely	Yes – Locality (Bionet Record)	No – no breeding hollows recorded during field surveys
<i>Ninox strenua</i>	Powerful Owl (Breeding)	V	-	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats.	Potential	Yes - Locality	No – no breeding hollows recorded during field surveys



Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Pandion cristatus</i>	Eastern Osprey (Breeding)	V	-	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. .	Unlikely	Yes - locality	No – no stick nests recorded during field surveys
<i>Peristeranthus hillii</i>	Brown Fairy-chain Orchid	V	-	An endemic Australian orchid with a pendulous habit, that grows on tree trunks and thick vines. Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and the threatened ecological community Lowland Rainforest on Floodplain.	Unlikely	No	No
<i>Petalura litorea</i>	Coastal Petaltail	E	-	In NSW it is known from a very small number of locations, including Brooms Head, Tucabia, Diggers Camp and Bonville. The Coastal Petaltail occupies a variety of permanent to semi-permanent coastal freshwater wetlands.	Unlikely	No	No
<i>Petauroides volans</i>	Greater Glider	-	V	Greater Gliders are forest dependent and prefer older tree age classes in moist forest types. They use hollow-bearing trees for shelter and nesting, with each family group using multiple den trees within its home range. They eat mainly young eucalypt leaves, with a preference for certain species.	Potential	Yes - Locality	
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	The species is widely though sparsely distributed in eastern Australia. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites.	Potential	Yes - Locality	No – no suitable tree hollows recorded during field surveys

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater.	Potential	Yes - locality	No – low habitat quality
<i>Phascolarctos cinereus</i> <i>Breeding</i>	Koala	V	E	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.	Potential	Yes - locality	No – low habitat quality. No signs recorded during field surveys
<i>Planigale maculata</i>	Common Planigale	V	-	The species reaches its confirmed southern distribution limit on the NSW lower north coast however there are reports of its occurrence as far south as the central NSW coast west of Sydney. Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. They are fierce carnivorous hunters and agile climbers, preying on insects and small vertebrates, some nearly their own size.	Potential	Yes - locality	Yes – suitable habitat present in the form of eucalypt forests PCT 3427 and 3323
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				<p>of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.</p> <p>The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil.</p>			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	<p>Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.</p> <p>Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.</p> <p>Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young..</p>	Known	Yes - RJP	No – no known camps within the RJP
<i>Thersites mitchellae</i>	Mitchell's Rainforest Snail	E	CE	<p>Found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. It has also been recorded from some adjacent mid-elevation areas including Wilsons River and Mount Jerusalem.</p> <p>Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat.</p> <p>Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees.</p>	Unlikely	No	No
<i>Todiramphus chloris</i>	Collared Kingfisher	V	-	<p>Collared Kingfishers are virtually restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves.</p> <p>They sometimes occur in terrestrial forests or woodlands bordering mangroves, where they will nest in holes in trees or in arboreal termitaria. They are sometimes seen in streets or gardens in built-up areas bordering mangrove vegetation.</p>	Unlikely	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Description	Likelihood of Occurrence within RJP boundary	Recorded Within RJP or Locality	Further Consideration
				<p>Nests are usually in holes in trunks of large, live or dead mangrove trees, though they sometimes nest in hollows or in arboreal termite nests in large eucalypts or paperbarks adjacent to mangroves or estuarine foraging habitats.</p> <p>They are often seen perched on rock walls, jetties, piles or on the ground on tidal flats. They also sometimes occur in parks and gardens along foreshores.</p>			
<i>Tyto novaehollandiae breeding</i>	Masked Owl	V	-	<p>Lives in dry eucalypt forests and woodlands from sea level to 1100 m.</p> <p>A forest owl, but often hunts along the edges of forests, including roadsides.</p> <p>The typical diet consists of tree-dwelling and ground mammals, especially rats.</p> <p>Pairs have a large home-range of 500 to 1000 hectares.</p> <p>Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.</p>	Potential	Yes - locality	No – no large tree hollows for breeding recorded during field surveys.
<i>Vespadelus trouhtoni</i>	Eastern Cave Bat	V	-	<p>A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.</p>	Unlikely	No	No

## 7. THREATENED SPECIES HABITAT

Initial field surveys showed that habitat varied throughout the Investigation Area the northern portion of the study area contained large areas of wetlands with mature stands of broad leaved paperbark (*Melaleuca quinquenervia*), swamp box (*Lophostemon suaveolens*) and swamp oak (*Casuarina glauca*). These areas are suitable for amphibian and aquatic species (both breeding and foraging habitat) as well as migratory, wading and shore birds (foraging and breeding habitat with exclusion of migratory species). Mature eucalypt forest found with the central northern area, dominated by pink bloodwood (*Corymbia intermedia*) provide potential habitat for arboreal mammals and bird species where hollows are present as well as foraging habitat for fauna such as nectivorous birds, flying fox (*Pteropus spp*), koala (*Phascolarctos cinereus*) and glider species (*Petaurus spp.*) Much of the central area has been previously cleared for prior land use and is characterised by large infestations of weeds and a lack of native species diversity.

Additional field surveys were completed in September 2022, utilising the methods from the Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (June 2022) to assess areas of potential koala habitat for the presence of this species. There were no observations or signs of any koalas within the RJP Investigation Area during these surveys. Based on the methods for mapping species polygons in the BAM Survey Guide, no areas of koala habitat polygons are mapped within the RJP Investigation Area

The majority of the Investigation Areas broad habitat types are classified as Non-native/cleared vegetation and Pink/Red Bloodwood. Minor sedgeland/wetland is present within the Nammoona Industrial Precinct, along with a small fragment of broad leaved paperbark. Forest present within the Investigation area is mostly fragmented, with scattered and sparse vegetation spread across the Investigation Area. South of Johnson Street houses a minor patch of Forest Redgum Complex, with a minor patch of Lowland redgum within the sewage treatment sector.

These habitat and vegetation types are utilised by the listed threatened fauna species credit species below in Table 7-1. The majority of these threatened species inhabit forests, woodlands, and wetlands including Bloodwood and eucalypt forests.

The clearing and modification of the understorey and ground habitat particularly affect species that hunt, forage or shelter within the lower strata, such as *Phascogale tapoatafa*, *Falco hypoleucos*, and *Macropus dorsalis*.

Species that include, Glossy Black-cockatoo and large forest owl species that rely on large hollow forming trees, often Eucalypts, to provide habitat and sites for nesting., which were absent from the Investigation Area.

Wetland vegetation in the north of the Nammoona Industrial sector provides essential habitat and foraging for species such as *Ephippiorhynchus asiaticus* and Freckled Duck.

Riparian vegetation along Richmond River and Barlings River provide habitat and vegetation linkage from and through the Investigation Area and towards coastal National parks such as Border Ranges and Broadwater National Park. This vegetation link provides a large area of wildlife habitat facilitating movement and migration of wildlife species. By facilitating the movement of different species across a landscape, each remnant habitat can receive the necessary processes that it requires in order to function correctly and thus maintain an adequate level of ecosystem health.

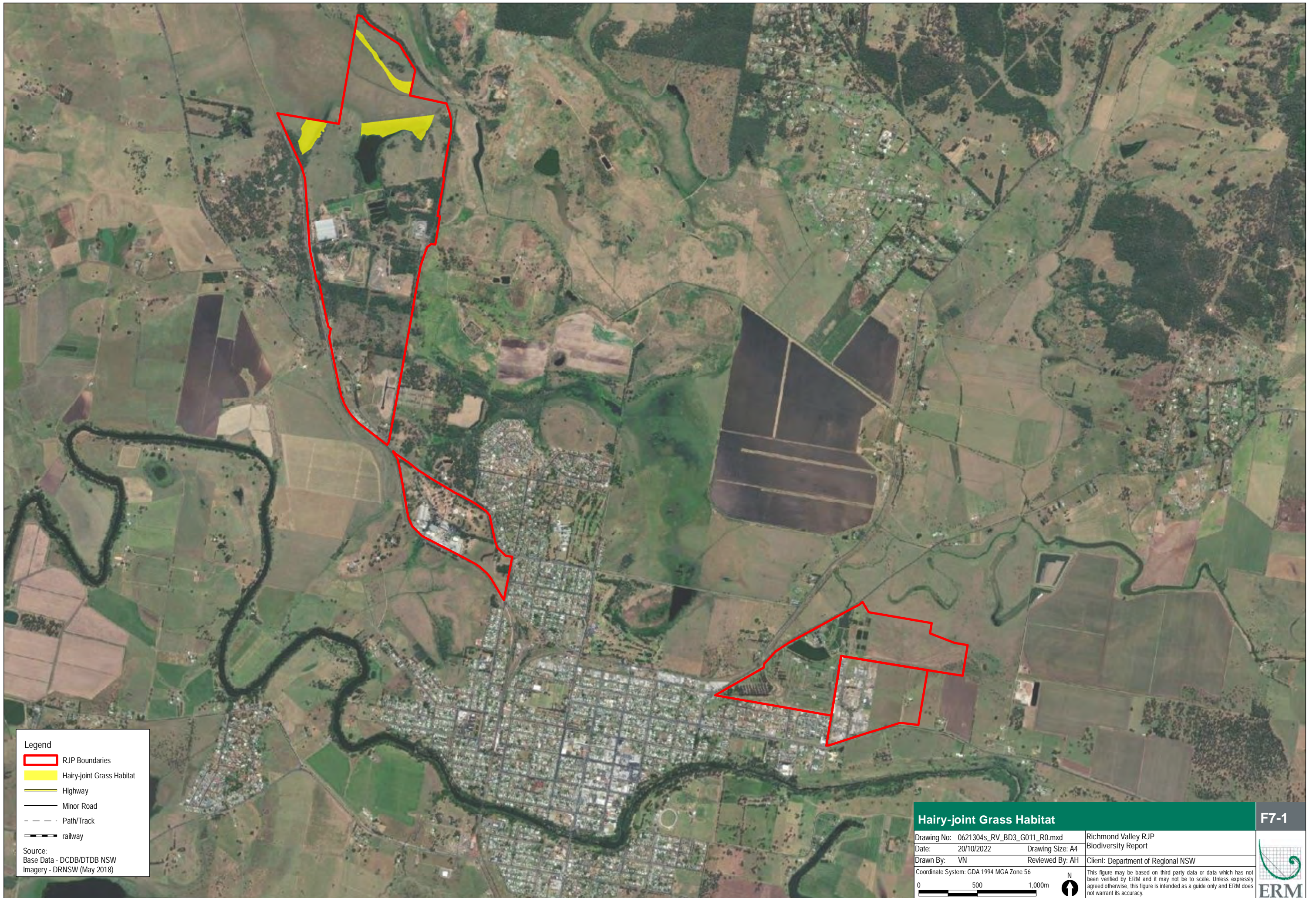
Habitat for species credit species confirmed to be present within the RJP has been identified through desktop assessment and field based surveys for threatened species. Following the detailed likelihood of occurrence, field surveys and habitat assessments three species credit species are considered known or with the potential to occur within the RJP Investigation Area. These include one flora species and two fauna species, specifically:

- Hairy Jointgrass;
- Southern myotis; and
- Common planigale

A description of the habitat requirements for these species, as taken from Bionet and relevant guidelines and the habitat within the RJP for these three species is provided in Table 7-1.

**Table 7-1 Species Credit Species and Habitat Polygons**

Species Credit Species	Bionet Guidance on Habitat Features	Habitat Polygon
Hairy Jointgrass	<p>Hairy-joint Grass was not recorded during field surveys, however survey effort was not sufficient to detect this species as it's growth can be variable and optimal time for detection is November – March.</p> <p>No specific guidance is provided on how to derive habitat polygons for Hairy Jointgrass. It is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps. It can also occur in low-lying, swampy areas that contain exotic groundcover species.</p>	<p>Areas of low-lying native and non-native sedgeland and pasture have been mapped as containing potential habitat for Hairy Jointgrass. This includes areas of PCT 3964, as well as low lying areas to the north of the wetland in the Nammoona precinct (Figure 7.1).</p>
Southern Myotis	<p>The species was allocated to species credit because it is dependent on waterways with pools of 3m wide or greater for foraging (which will be protected under legislation), habitat surrounding waterways is used for breeding and roosting. It was also detected during field surveys through acoustic detectors</p> <p>All habitat on the subject land where the subject land is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land must be mapped. Use aerial imagery to map waterbodies with pools/ stretches 3m or wider on or within 200m of the subject land. Species polygon boundaries should align with PCTs on the subject land to which the species is associated that are within 200m of waterbodies mapped.</p>	<p>Dams and water holding ponds more than 3m wide were mapped and a 200m buffer applied. All PCTs within the development footprint forming habitat associations for the species, as listed in the BioNet database, were included within the habitat polygons where they were located with 200m of the dams. No waterways &gt;3m wide were identified.</p> <p>Habitat polygons for Southern Myotis are mapped in Figure 7.2 and include all areas of PCT 3427, 4001, 3323, and 3987</p>
Common Planigale	<p>No specific guidance is provided on how to derive habitat polygons for the species.</p> <p>Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. Common Planigale was not detected during field surveys, however survey effort was not sufficient to exclude presence in the RJP Investigation Area.</p>	<p>Habitat polygons for the common planigale include those PCTs containing suitable habitat present in the form of eucalypt forests or native sedgelands associated with PCT 3427, 3323 and 3964 (Figure 7.2)</p>

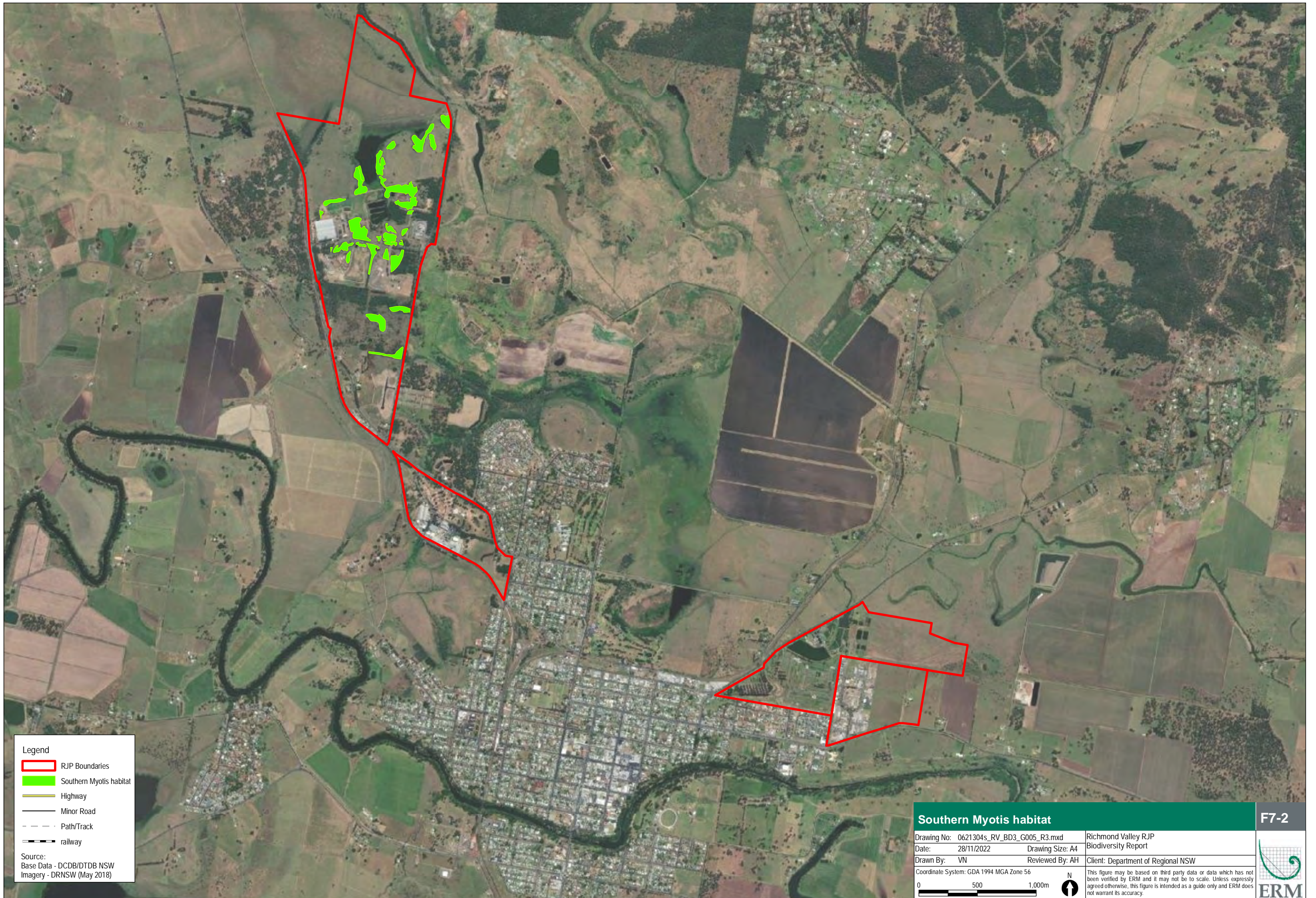


**Legend**

- RJP Boundaries
- Hairy-joint Grass Habitat
- Highway
- Minor Road
- Path/Track
- railway

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Hairy-joint Grass Habitat		F7-1
Drawing No: 0621304s_RV_BD3_G011_R0.mxd	Richmond Valley RJP Biodiversity Report	
Date: 20/10/2022	Drawing Size: A4	
Drawn By: VN	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 5px;">0</div> <div style="margin-right: 5px;">500</div> <div style="margin-right: 5px;">1,000m</div> <div style="margin-left: 5px;"> </div> </div>	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.	



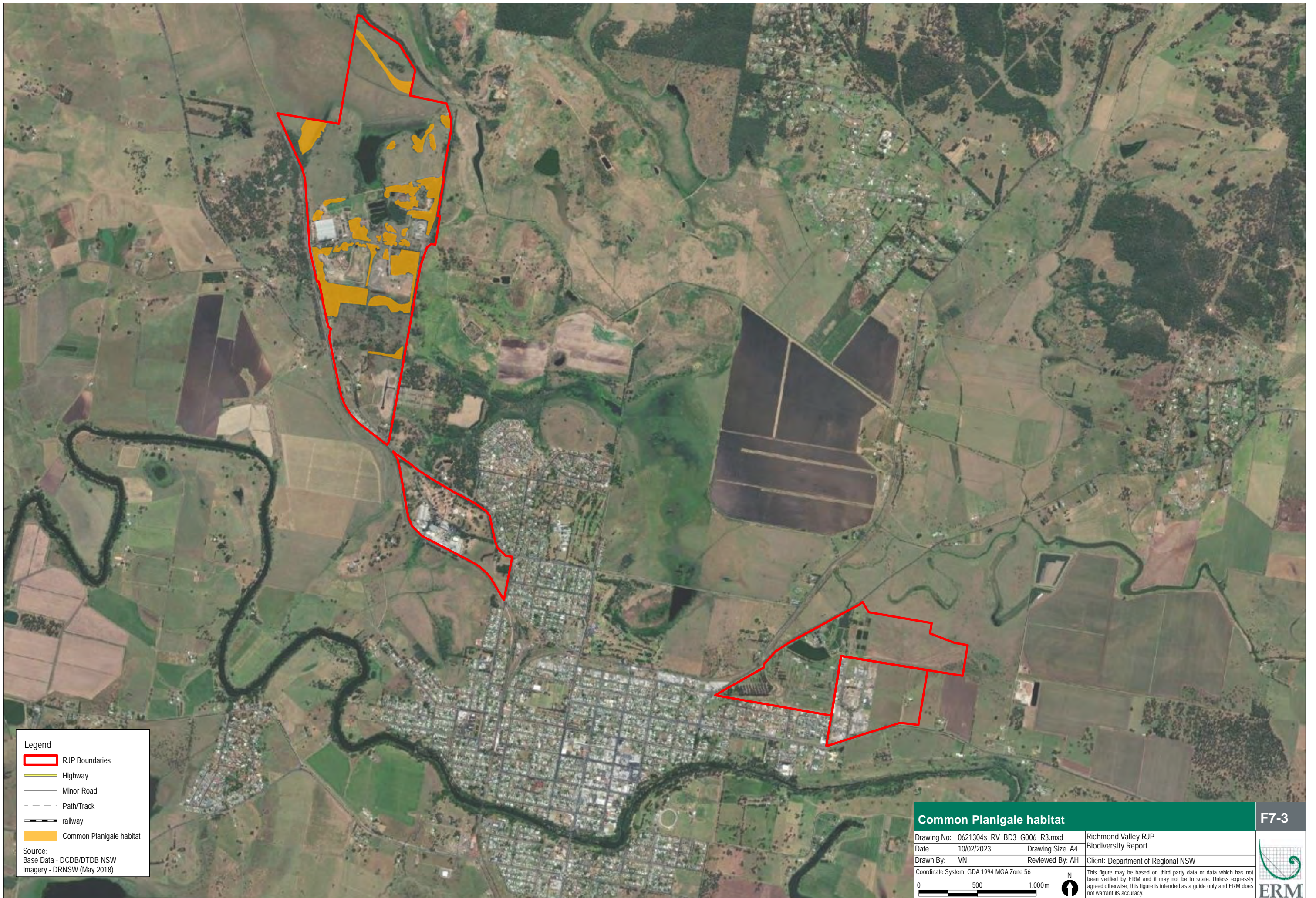
**Legend**

- RJP Boundaries
- Southern Myotis habitat
- Highway
- Minor Road
- Path/Track
- railway

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Southern Myotis habitat		F7-2
Drawing No: 0621304s_RV_BD3_G005_R3.mxd	Richmond Valley RJP Biodiversity Report	
Date: 28/11/2022	Drawing Size: A4	
Drawn By: VN	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 5px;">0</div> <div style="margin-right: 5px;">500</div> <div style="margin-right: 5px;">1,000m</div> <div style="margin-left: 5px;"> </div> </div>	<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>	
ERM		





**Legend**

- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- railway
- Common Planigale habitat

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Common Planigale habitat		F7-3
Drawing No: 0621304s_RV_BD3_G006_R3.mxd	Richmond Valley RJP Biodiversity Report	
Date: 10/02/2023	Drawing Size: A4	
Drawn By: VN	Reviewed By: AH	Client: Department of Regional NSW
Coordinate System: GDA 1994 MGA Zone 56		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">0</div> <div style="margin-right: 10px;">500</div> <div style="margin-right: 10px;">1,000m</div> <div style="margin-left: 10px;"> <span style="font-size: 8px;">N</span>  </div> </div>		<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>

## 8. POTENTIAL SERIOUS AND IRRIVERSIBLE IMPACTS (SAII)

Species and ecological communities with a 'very high' biodiversity risk weighting are potential serious and irreversible impact (SAII) entities. Principles for determining serious and irreversible impacts are set out in clause 6.7 of the Biodiversity Conservation Regulation 2017. An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- it will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline;
- it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size;
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution; and
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Of the species and communities identified in the as being associated with the Richmond Valley RJP area, there are currently no SAI entities identified

The approval authority is responsible for deciding whether an impact is serious and irreversible. This decision is to be made in accordance with principles set out in clause 6.7 of the Biodiversity Conservation Regulation 2017. The approval authority must take any impacts to these species into consideration and determine whether there are any additional and appropriate measures that will minimise those impacts if approval is to be granted.

## 9. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act requires approval of the Commonwealth Minister for the Environment for actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES) as assessed in accordance with the EPBC Significant Impact Guidelines 1.1. Any proposed action that is expected to have an impact on MNES must be referred to the Minister for assessment under the EPBC Act, or assessed under the existing bilateral agreement, or accredited process between the Commonwealth and the State of New South Wales (NSW).

While the masterplan is not a development application, it is expected that proposed actions arising following the masterplans commencement will likely be referred and will be assessed separately during the development application stage. The need for referral will depend on the scale and significance of any impacts to MNES species.

A summary of MNES occurring within the Investigation Area is provided in Table 9-1.

**Table 9-1 Summary of MNES**

<b>Matter of National Environmental Significance</b>	<b>Impact</b>
World Heritage Properties There are no World Heritage Properties located at the Investigation Area or within the surrounding 10km buffer.	Nil
National Heritage Places There are no National Heritage Places located at the Investigation Area or within the surrounding 10km buffer.	Nil
Wetlands of International Significance (Ramsar) The Hunter Estuary Wetlands Ramsar site is located within the Investigation Area. The Myall Lakes Ramsar site is located within 10 km of the Investigation Area.	Nil
Threatened Species or Ecological Communities listed in the EPBC Act Threatened species have been recorded within the Investigation Area. Two EPBC Act listed TECs is confirmed to be present, with identified Coastal Swamp Oak Forest and Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland occurring around the Nammoona Precinct wetland area One EPBC Act listed threatened flora species is listed as potentially present, with habitat mapped for Hairy Jointgrass	Refer to Section 6 and Section 5
Migratory Species listed in the EPBC Act Migratory species have been recorded within the Investigation Area.	Nil
Commonwealth Marine Environment There are no Commonwealth marine areas located within the Investigation Area or within the surrounding 10km buffer.	Nil
Nuclear Actions The Investigation Area does not involve nuclear actions and is not located within a 10km buffer of an area of nuclear action.	Nil
<b>Great Barrier Reef Marine Park</b> The Investigation Area is not located within the Great Barrier Reef Marine Park or within a 10km buffer.	Nil
<b>A water resource, in relation to coal seam gas development and large coal mining development</b> The Investigation Area is not associated with coal seam gas development and is not a coal mining activity.	Nil

## 10. SUMMARY AND RECOMMENDATIONS

The Draft Master Plan for the Richmond Valley RJP has been produced and informed by environmental concepts that foster the preservation of local biodiversity and threatened species. The RJP Investigation Area contains a number of key biodiversity values which include three NSW BC Act TECs.

Six threatened microbat species were identified throughout the two field survey events, an additional ten threatened species were identified as occurring within the Investigation Area during the desktop review process. High threat weeds and WoNS were located within the Investigation Area and will require treatment and or removal prior to disturbance of these areas to prevent further spread and resultant degradation and loss of biodiversity.

Vegetated areas within the RJP boundary contain areas of high biodiversity value including:

- Potential occurrence of NSW and federally listed Threatened Ecological Communities;
- Vegetated habitat corridors and linkages; and
- Threatened species habitat for Southern Myotis, Common Planigale and Hairy Jointgrass.

Direct and indirect impacts to threatened species, caused by direct loss of habitat has been considered in the development of the Draft Master Plan. This has included identifying areas of biodiversity constraint and applying an appropriate conservation zoning to areas that have the highest value. This includes the existing farm dam.

though further surveys are required to inform credit obligations as part of any future development application to implement the master plan.

### 10.1 Biodiversity Values and Master Plan Approach

The BAM requires that the avoid, minimise, offset hierarchy is applied to development projects and therefore, any future BDAR or BCAR will be required to outline measures taken to avoid impacts to biodiversity and provide justification where avoidance is not applied. The avoid, minimise and offset hierarchy has been applied through the Master Planning and Design process, including workshops undertaken to inform a final Master Plan for the RJP development. The existing conservation area associated with the wetland in the northern intermodal site and the Richmond River have been expanded and protected, with an additional environmental management conservation zones designed to protect areas of

Areas designated with conservation value which should be considered in the master plan or as part of future developments to avoid and minimise biodiversity impacts are shown on Figure 10.1.

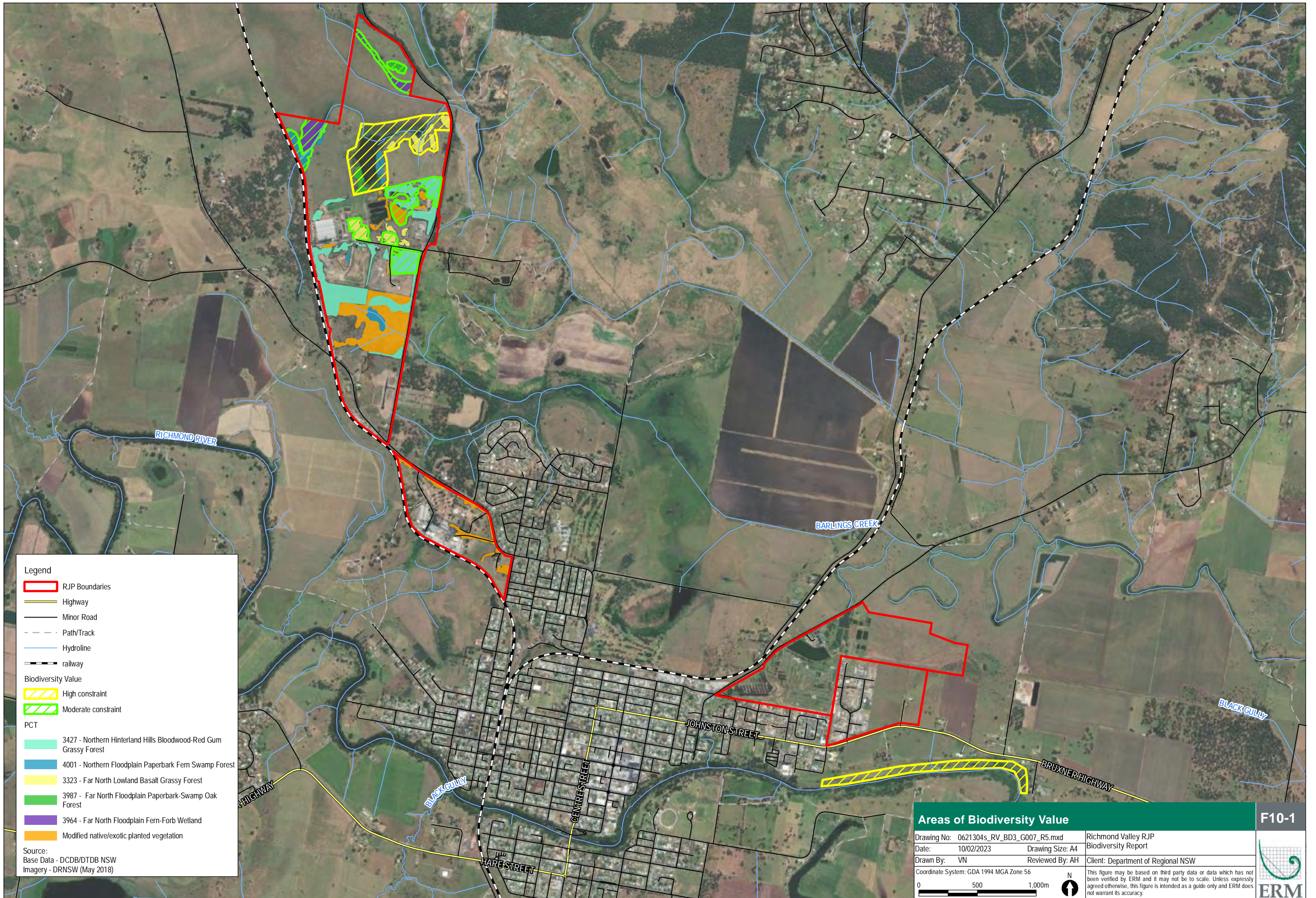
- Areas of **high biodiversity value** include the northern wetland area in the Nammoona Precinct, as it contains multiple biodiversity values including two TECs that are listed under both the BC Act and the EPBC Act (Swamp Oak and Swamp Sclerophyll forest), and habitat for multiple threatened species including those species credit species directly recorded within the RJP or with potential habitat mapped, including Hairy Jointgrass, Southern Myotis and Common Planigale. This area also provides a diversity of habitat types, including foraging and roosting opportunities for migratory wetland birds; and
- Areas of **medium biodiversity value** include those areas that contain threatened species habitat in patches that are connected and considered viable to support Southern Myotis or Common Planigale. Areas of medium value also include those areas of freshwater wetland TEC, listed as threatened under the BC Act only, that occurs within the area of cattle grazing, rural land to the north of the Nammoona precinct.

Other areas of native vegetation mapped as PCTs should also be considered a low constraint to development, as they still do provide biodiversity values and may trigger the requirement for biodiversity credits, depending on the areas of clearing required to implement future developments. Under the BC Act, developments that result in a significant impact to biodiversity or exceed the Biodiversity Offset Scheme clearing area threshold, will be required to prepare a Biodiversity Development Assessment Report (BDAR) and calculate offset credit requirements.

The land use planning approach should also consider opportunities to connect areas of biodiversity value, through future development applications. These corridors should be a minimum width of 50m to remain viable for fauna movement opportunities, to reduce any impacts from edge effects. Impacts to high biodiversity values, particularly in areas that support multiple threatened species, including should be identified and avoided where possible. These areas will potentially contribute significantly to the offset obligation and cost associated with the development and therefore, further avoidance would reduce the ecosystem and species credit requirements and costs.

Providing connected corridors and green infrastructure throughout the master plan area should also be considered in the landscaping design during the implementation of the developments, as the threatened fauna species that have the potential to occur in the RJP Investigation area can use artificial or modified environments. This should include consideration for the following in any development codes or performance criteria:

- Providing species lists of native trees from the PCTs that occur in the RJP Investigation Area to be used as roosting or foraging resources for native microbats. Species lists should include a combination of *Eucalyptus*, *Corymbia* and *Melaleuca spp.* as tree plantings for any corridors, street tree, landscaping or park trees. These tree species are used by;
- Any linear corridors planted as buffers must be a minimum of 50m wide and be designed and planted with native groundcovers, grasses, forbs, shrubs and trees characteristic of the PCTs within the RJP Investigation Area. The detailed design of these corridors should also include habitat enhancements such as large logs, bush rock and artificial hollows to improve habitat quality for native fauna. This approach has the potential to provide habitat for Common Planigale, which requires more complex ground cover such as logs, rocks and deeper leaf litter;
- Including water sensitive urban design principles in the any proposed stormwater management system, such as bioretention basins, vegetated swales or constructed wetlands. Southern Myotis will forage on insects over waterbodies, including artificial wetlands and farm dams; and
- Plan and implement an ecological restoration plan for areas of medium and high biodiversity value that have been protected in C2 and C3 zones. This plan should focus on management of exotic grasses and improvement of water quality within the existing wetland. Areas of buffer plantings at the interface of the conservation zones and adjacent developable or RU1 land should be implemented to protect the biodiversity values in these areas. This should include more dense plantings of native species, to manage nutrients and pollutants in runoff, weed incursion and changes to noise or light environments.



**Legend**

- RJP Boundaries
- Highway
- Minor Road
- Path/Track
- Hydroline
- railway

**Biodiversity Value**

- High constraint
- Moderate constraint

**PCT**

- 3427 - Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest
- 4001 - Northern Floodplain Paperbark Fern Swamp Forest
- 3323 - Far North Lowland Basalt Grassy Forest
- 3987 - Far North Floodplain Paperbark-Swamp Oak Forest
- 3964 - Far North Floodplain Fern-Forb Wetland
- Modified native/exotic planted vegetation

Source:  
Base Data - DCDB/DTDB NSW  
Imagery - DRNSW (May 2018)

Areas of Biodiversity Value		F10-1
Drawing No: 0621304s_RV_BD3_G007_R5.mxd	Richmond Valley RJP Biodiversity Report	
Date: 10/02/2023	Drawing Size: A4	Client: Department of Regional NSW
Drawn By: VN	Reviewed By: AH	
Coordinate System: GDA 1994 MGA Zone 56		
0	500	1,000m
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