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NEWCASTLE SYDNEY

Ecological Assessment Report

Proposed Manning River Bridge

2414 Thunderbolts Way, Tibbuc NSW

Prepared for: Rob Blain
c/- Midcoast Planning

November 2024

AEP Ref: 3261

Revision: 03

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Document Control

Document Name	Ecological Assessment Report for Manning River Bridge, Lot 64 DP 778073, 2414 Thunderbolts Way, Tibbuc NSW.
Project Number	3261
Client Name	Rob Blain c/- Midcoast Planning
AEP Project Manager	Natalie Black
AEP Project Team	Natalie Black Brendon Young Thomas Stephens Jarod Baxter

Revision

Revision	Date	Author	Reviewed	Approved
00	05/07/2023	Brendon Young	Natalie Black	Natalie Black
01	30/07/2023	Brendon Young	Thomas Stephens	Natalie Black
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Distribution

Revision	Date	Name	Organisation
00	05/07/2023	Tony Fish	Midcoast Planning
01	30/07/2023	Tony Fish	Midcoast Planning
02	01/11/2024	Tony Fish	Midcoast Planning
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Executive Summary

Anderson Environment & Planning was commissioned by Midcoast Planning on behalf of Rob Blain (the client) to undertake an Ecological Assessment Report (EAR) for a proposed bridge and associated civil works to provide access to Lot 64 DP 778073, 2414 Thunderbolts Way, Tibbuc NSW (the Subject Site). The Subject Site is crown land and is zoned RU1 Primary Production. Lot 64 DP 778073 is currently zoned RU1 Primary Production and C3 Environmental Management. No native vegetation will be impacted by the proposed development.

This report is specifically intended to indicate the likelihood of the proposed development having a significant impact on potentially occurring threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the NSW *Environmental Planning & Assessment Act 1979*, the NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Fisheries Management Act 1994* (FM Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Fieldwork was conducted to ground-truth regional vegetation mapping and confirm historical clearing within the riparian zone for a property access road. Native vegetation within the Subject Site is consistent with Plant Community Type (PCT) 4079 – *Northern Hinterland Grassy River Oak Forest* which is mapped within the locality. PCT 4079 is not associated with any TEC. The vegetation within the riparian zone and in-stream is a mix of exotic weed species and native species. The wider surrounds are predominantly managed pasture and large tracts of remnant native vegetation.

No vegetation is proposed to be removed by the development and no threatened flora species were identified in the Study Area.

Habitat and fauna surveys were undertaken, including aquatic surveys. No threatened species were observed.

Assessment under the 5-part test of significance of impacts determined that significant impacts upon Purvis' Turtle (*Myuchelys purvisi),* listed under the BC Act, are unlikely as the proposed bridge will allow movement and have minimal impact on available habitat. Similarly, assessment under section 220ZZ of the FM Act determined Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) is unlikely to be significantly impacted as the bridge has been designed to allow fish passage. Consideration of the EPBC Act revealed that impacts on Matters of National Environmental Significance are unlikely to occur, therefore, a referral to the Commonwealth is not required.

As no vegetation is to be impacted, a review of the State Environmental Planning Policy (Biodiversity and Conservation) 2021, specifically Chapter 4 Koala Habitat Protection 2021, does not apply.

Works will occur in the Manning River, and a Dredge and Reclamation Permit will be required under Part 7 of the FM Act. Consultation has been undertaken with the Department of Primary Industries and Regional Development – Fisheries (DPIRD Fisheries) to ensure the waterway crossing is designed in accordance with department guidelines and fish passage will not be blocked.

General recommendations and mitigation measures have been included in the report to minimise environmental impacts of the proposal during the construction phase. These measures should provide adequate protection during the construction phase for native flora and fauna in the locality.

Study Certification and Licensing

The fieldwork for this report was carried out by Brendon Young MEnvMgt (Water Resources) and Eamon McEntee BEnvSc (under study) of Anderson Environment & Planning. The report was written by Brendon Young and reviewed by Thomas Stephens BEnvSc and approved by Senior Environmental Manager, Natalie Black BSc (Hons), MPL & Cert IV TAE & MSc (BAAS no. 19076).

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Research Establishment Accreditation Number 53724.

Certification:

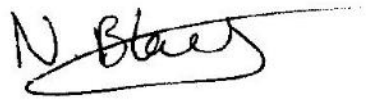
As the principal certifier, I, Natalie Black, make the following certification:

The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area.

Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons; and

All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the Animal Research Act 1995, National Parks and Wildlife Act 1974 and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Certifier:



Natalie Black

Senior Environmental Manager

BAAS: 19076

Anderson Environment & Planning

11 November 2024

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1.0 Introduction

The proposed development is for a bridge and associated civil works on the Manning River at 2414 Thunderbolts Way, Tibbuc, NSW (the Subject Site).

Anderson Environment & Planning was commissioned by Midcoast Planning on behalf of Rob Blain (the client) to undertake an Ecological Assessment Report (EAR) for the proposed development. The Study Area is currently zoned RU1 Primary Production and C3 Environmental Management. The proposed development encompasses the entirety of the Subject Site.

Anderson Environment & Planning (AEP) have undertaken necessary investigations for the production of an EAR. This assessment has been undertaken with reference to the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), the NSW *Biodiversity Conservation Act 2016* (BC Act), NSW *Fisheries Management Act 1994* (FM Act), NSW *Water Management Act 2000* (WM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report is specifically intended to indicate the likelihood of the proposal having a significant impact on threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the NSW *Environmental Planning & Assessment Act 1979*, the NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Fisheries Management Act 1994* (FM Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The purpose of this report is to:

- Describe the ecological values of the Subject Site;
- Explore the potential for threatened species to utilise the area; and
- Assess ecological impacts associated with the proposal against relevant legislation.

Potential ecological impacts on native species in general are also considered, as are recommendations for minimising any impacts within the scope of the development.

For the purposes of referencing, this document should be referred to as:

> Anderson Environment & Planning (2023) Ecol*ogical Assessment Report for Proposed Bridge at 2414 Thunderbolts Way, Tibbuc NSW.* Unpublished report for Mid Coast Planning.

2.0 Site Particulars

Table 1 – Site Particulars

Detail	Comments
Client	Rob Blain c/- Midcoast Planning
Address	2414 Thunderbolts Way, Tibbuc NSW
Title(s)	The proposed development is to provide access to Lot 64 DP 778073. The existing causeway and associated property access road occupy Crown Land.
Subject Site	The Subject Site encompasses the proposed bridge and areas impacted by associated civil works.
LGA	Mid Coast
Zoning	Under the *Gloucester Local Environmental Plan 2010* (the LEP), the Study Area is zoned RU1: Primary Production and C3: Environmental Management.
Current Land Use	Lot 64 DP 778073 is rural farmland and is utilised for primary production.
Surrounding Land Use	The Study Area occupies, and is surrounded by rural farmland. A portion of Lot 64 DP 778073 in the south is heavily forested and is zoned C3. The Manning River is a 6th order stream at the Subject Site, and flows downstream approximately 100km to the east, discharging into the Pacific Ocean at Harrington.

Figure 1 depicts the extent of the Subject Site overlaid on an aerial photograph of the locality.

3.0 Proposed Development

A bridge is proposed to replace a storm-damaged causeway crossing on the Manning River for property access at 2414 Thunderbolts Way, Tibbuc NSW.

Figure 2 depicts the Proposed Development Plan within the Subject Site.

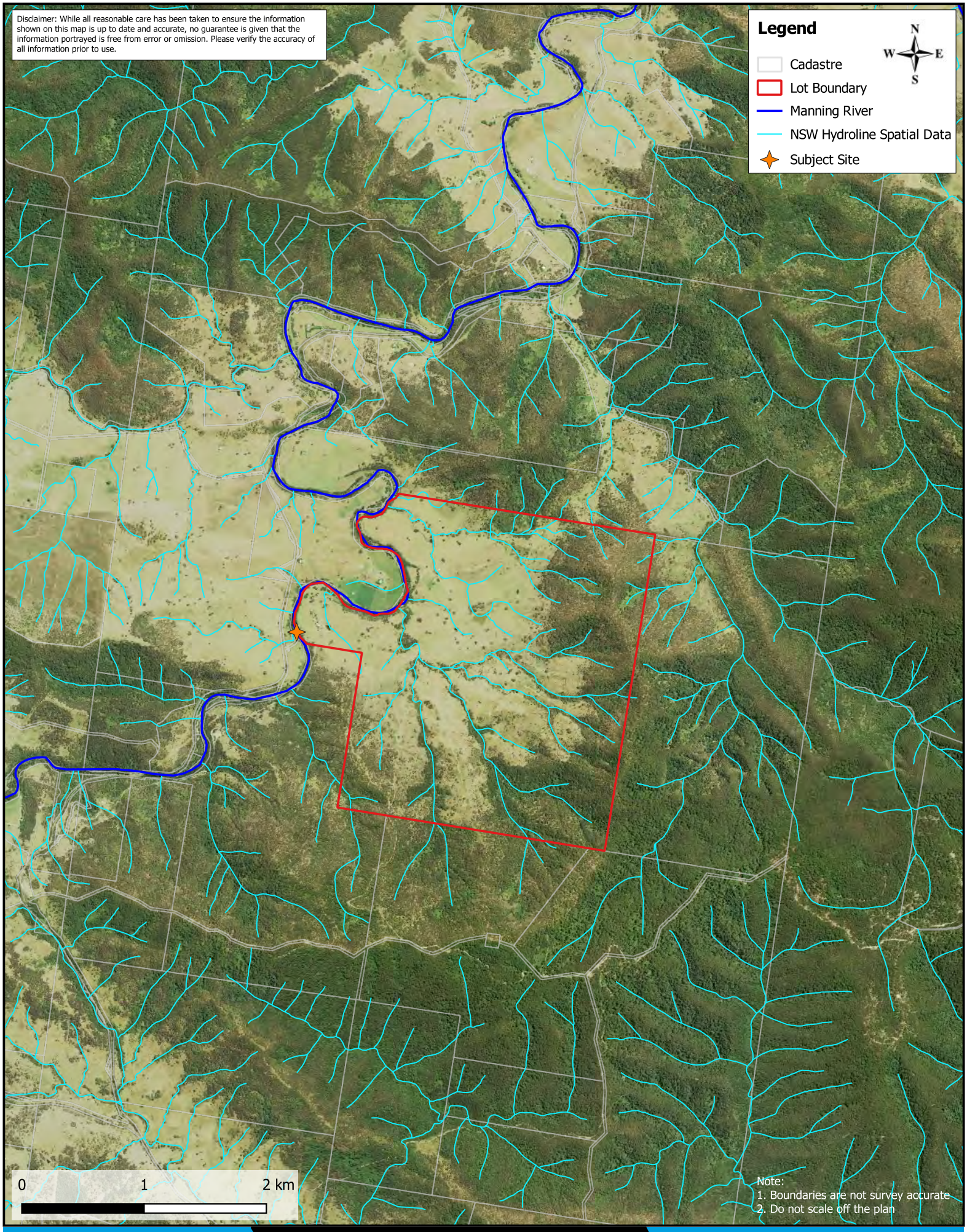

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Figure 1 - Site Location

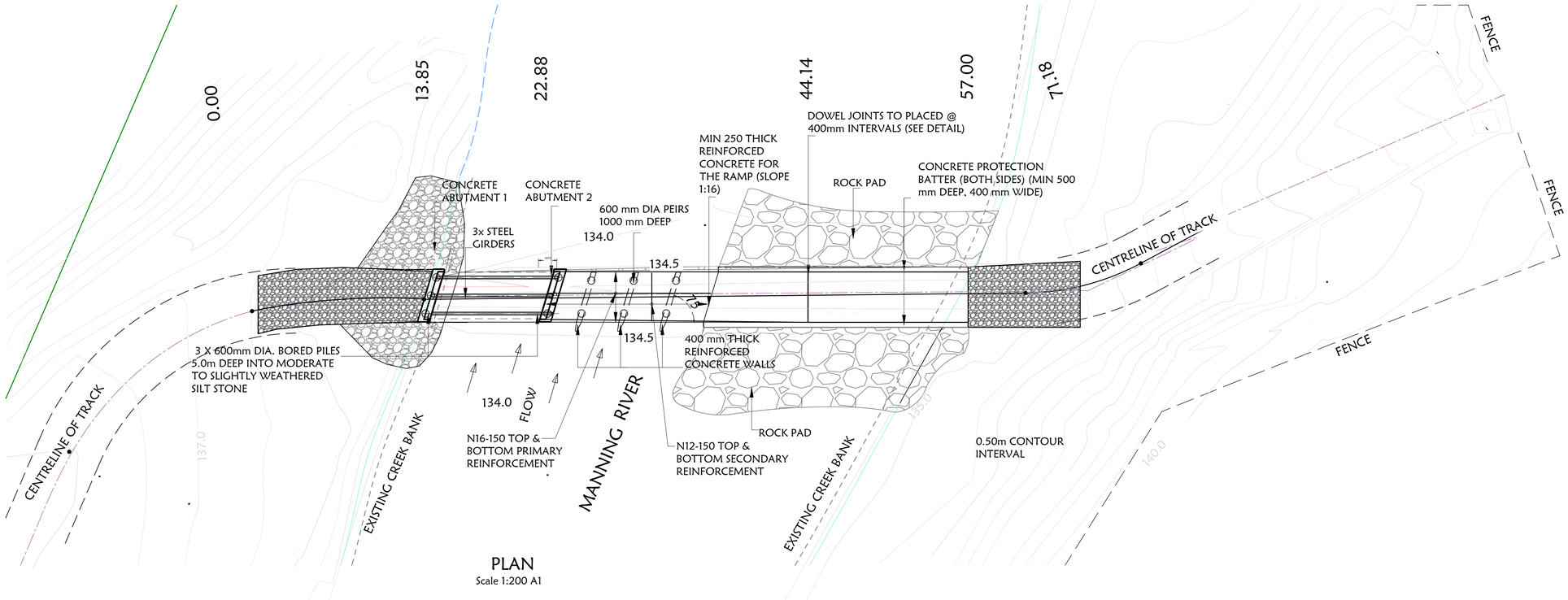
Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

Figure 2 - Proposed Development Plan



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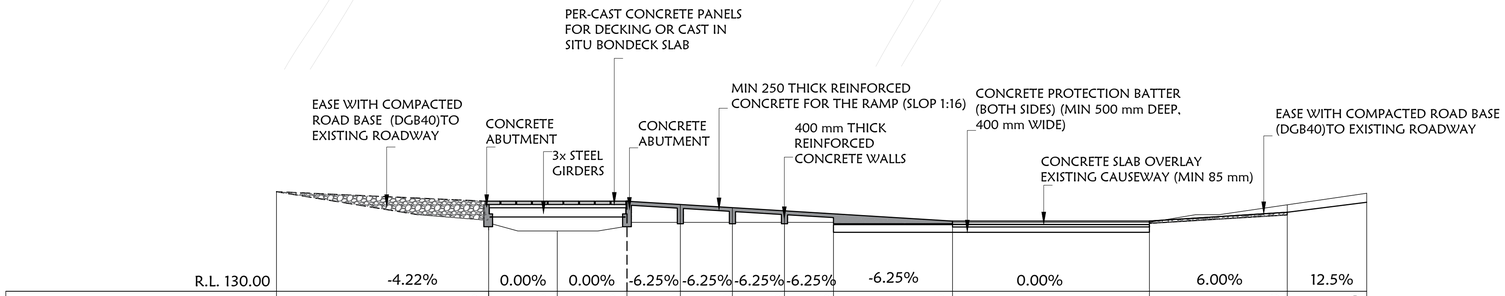

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DESIGN SURFACE	136.50	135.915		135.915	135.915	135.695	135.485	135.275	135.075	134.585	134.585	135.160	135.800
EXISTING SURFACE	136.50	134.400		134.000	134.500	134.500	134.500	134.500	134.500	134.500	135.000	135.650	136.400
CHAINAGE	0.00	13.850		18.335	22.885	26.370	29.770	33.170	36.370	44.140	57.000	66.000	71.189

CAUSEWAY LONGITUDINAL SECTION

Hz Scale 1:200 A1

Vt Scale 1:200 A1

MATRIX THORNTON

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REVISION	DESCRIPTION	DATE
C	PRELIMINARY	10-06-2024
B	PRELIMINARY	13-03-2024
A	DRAFT	28-02-2024

Client: Julianne Blain

Project: Causeway Replacement
Site Address: 2414 Thunderbolts Way, Tibbuc N.S.W

Drawing Title: Causeway Plan & Long Sect.

Design: M.A. | Checked: P.T. | Size: A1 | Scale: 1:200 (A1) | Project No.: M23014
Drawn: B.A. | Date: 13-03-2024 | Sheet No.: S4 | Rev: C

4.0 Scope and Purpose

Investigations were carried out within the Subject Site and via literature / database searches to gather information required to adequately address Section 7.3 of the BC Act (known as the “5-part test”).

Also afforded consideration were the EPBC Act, the FM Act, the WM Act and relevant State Environmental Planning Policies (SEPPs).

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development. This was achieved by background research and literature review, database searches, consultation, targeted ecological fieldwork and mapping, detailed habitat assessment, and ultimately impact assessment consideration against the type and form of development proposed.

Impact assessment was undertaken with due reference to the “Threatened Species Test of Significance Guidelines” (OEH 2018).

Specifically, the scope of this study is to:

- Identify vascular plant species occurring within the site, including any threatened species listed under the BC Act, FM Act or EPBC Act;
- Identify and map the extent of vegetation communities within the site, including any EECs listed under the BC Act, FM Act or EPBC Act;
- Identify any fauna species, including threatened and migratory species, and populations or their habitats, which occur within the site and are known to occur in the wider locality;
- Assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- Describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the site boundary and its immediate surrounds, consideration has been afforded to the wider locality, via database searches within 10km of the site and via consideration of habitat areas that may be linked ecologically to the site.

5.0 Methodology

The field surveys for the site have been prepared and performed with due recognition of the State Survey Guidelines (DEC 2004; DPI 2006; DECC 2009; DPIE 2020, OEH 2018).

The size of the site, the type of native vegetation and habitats remaining, the status of existing and proposed surrounding land use, and the level and type of habitat linkages to proximate bushland areas were considered in formulating the methodology employed and described below.

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development.

5.1 Information Sources

Information and spatial data provided within this EAR has been compiled from various sources including:

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- NSW Biodiversity Values Map (accessed October 2024);
- State Vegetation Type Mapping (SVTM) (2023);
- Key Fish Habitat Search (2024) https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal;
- State survey guidelines (DEC 2004; DPI 2006; DECC 2009; OEH 2018; DPIE 2020a; DPIE 2020b; DPE 2022a);
- DPE Threatened Species, Populations and Ecological Communities website (https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1) (accessed June 2023);
- DPI Threatened Species Lists website (https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current) (accessed October 2024);
- Collective knowledge gained from previous ecological survey and assessment in the greater NSW region over the past 25 years; and
- In addition, database searches were carried out, namely:
    - Review of flora and fauna records held by the BioNet Atlas of NSW Wildlife within a 100km^2 search area of the site (October 2024);
    - Review of flora and fauna records held by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search within a 5km radius of the Subject Site (October 2024).

5.2 Considerations of Biodiversity Offsets Scheme

There are three criteria that require assessment under the Biodiversity Offsets Scheme (BOS) to determine whether or not entry into the BOS is required. The three criteria include;

- Whether or not the site contains Biodiversity Values Mapped land;
- Whether or not it exceeds the Area Clearing Threshold applicable to the minimum lot size; and / or
- Whether or not a 5-part Test of Significance determines that a significant impact on threatened biodiversity is likely to occur.

5.2.1 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the Biodiversity Conservation Regulation 2017. The Biodiversity Offsets Scheme (BOS) applies to all local developments, major projects or the clearing of native vegetation where the SEPP (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the BOS if they occur on land mapped on the BV Map. Exempt and complying development or private native forestry are not subject to the Biodiversity Offsets Scheme.

The Manning River and associated riparian zone is mapped as BV land within the Subject Site, however no vegetation will be removed or impacted for the proposed development. Native vegetation will be identified by a suitably qualified ecologist and works excluded from this area prior to construction. An Arborist assessment will be undertaken to determine Tree Protection Zones (TPZ) of nearby trees and no works will occur within the TPZ of native trees. Therefore, the proposal does not trigger the BOS or the requirement for a Biodiversity Development Assessment Report (BDAR) under this criterion (refer **Appendix C**).

5.2.2 Area Clearing Threshold

“The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP). The area threshold applies to all proposed native vegetation clearing associated with a development proposal”.

Table 2 – Area Clearing Thresholds (BC Act)

Minimum lot size	Threshold for clearing, above which the BOS applies
< 1ha	**>0.25ha**
1ha to <40ha	>0.5ha
40ha to <1000ha	>1.0ha
>1000ha	>2.5ha

Native vegetation will be avoided during construction and the removal of vegetation is not proposed for the development of the bridge; therefore, the Area Clearing Threshold does not apply.

5.2.3 Test of Significance

Following the above assessments, it is a requirement to determine whether or not the development is likely to significantly affect threatened species, ecological communities or their habitats using a Test of Significance. The Test of Significance is used to undertake qualitative analysis of the likely impacts and determine whether further assessment is required in association with the development. As part of this Ecological Assessment Report, a 5-part Test of Significance has been undertaken in Section 8.0.

5.3 Survey Methods

All fieldwork was conducted within the Subject Site as shown in **Figure 3**.

5.3.1 Vegetation Communities

Vegetation was surveyed utilising a variety of methods, as outlined:

- Consideration of STVM;
- Aerial Photo interpretation (API) to identify any notable variations within the site;
- Consultation of 1:25,000 topographic map series for the area;
- Inspection of the site to ground-truth the unit(s) identified by SVTM; and
- Identification of the vegetation map unit occurred via identification of required dominant species in community structural layers.

The final derived vegetation map was based on dominant species present in the canopy, shrub and ground layers. The dominant species composition, structural and physical attributes were all considered when assigning the best fit ecological communities.

Consideration was given to the potential for the derived vegetation communities to constitute TECs as listed under the BC Act and/or EPBC Act. The floristic composition, geomorphological characteristics and geographical extent were important considerations in this process.

5.3.2 Flora

A flora survey was undertaken to produce a flora species list for the Subject Site, to search specifically for threatened flora species known from the wider locality, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Identification of all vascular plant species encountered during fieldwork;
- Survey involved systematic coverage of the Subject Site. Random Meander Technique (Cropper, 1993) was utilised to maximise species encountered. All vascular plant species encountered during fieldwork were recorded; and
- A systematic approach to target threatened plant species at the site as per DPIE guidelines (2020a and 2020b).

5.3.3 Habitat

An assessment of the relative habitat values present within the Subject Site was carried out. This assessment focused primarily on the identification of specific habitat types and resources within the site favoured by known threatened species from the region. The assessment also considered the potential value of the Subject Site (and surrounding areas) for all major guilds of native flora and fauna.

The assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light, hydrology and geomorphology for threatened flora and assemblages.

5.3.4 Fauna

Fauna survey was carried out utilising techniques as outlined below. Fauna survey work was undertaken with reference to relevant guidelines and to add additional information to the generated Expected Fauna Species List (**Appendix B**).

5.3.4.1 Avifauna Surveys

The presence of avifauna within the site was assessed via targeted diurnal surveys and incidental observations during all other phases of fieldwork.

For diurnal surveys, birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

5.3.4.2 Mammals

The occurrence of mammals within the site was assessed by utilising habitat assessment as an analogue for presence. Habitat assessment included survey for foraging resources (blossom, herbaceous, prey etc), hollows and roosting opportunity, connectivity and water.

5.3.4.3 Aquatic Fauna

Aquatic surveys were undertaken utilising dip nets and targeted habitat assessment including shaded areas, undercut banks, deep pools, aquatic vegetation and complex substrate such as large boulders and woody snags.

5.3.4.4 Incidental Observations & Secondary Indications

Incidental records of any fauna species observed during fieldwork were noted. This included opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of any resident or migratory species. Searches were also conducted for whitewash, regurgitation pellets and prey remains from Owls, chewed (Allo) Casuarina cones from Black-Cockatoos, chewed fruit remains from frugivorous birds etc.

5.3.5 Details of Field Surveys

A summary of the survey effort is below in **Table 3** and **Figure 3**.

Table 3 – Field Survey Periods

Date	Time	Field Activity	No. of Persons on Site
15/06/2023	10:00 – 13:00	Random Meander Dip Netting Bird Survey Riparian and Aquatic Vegetation Survey	2

The above survey methodology is considered to provide sufficient understanding of the biodiversity of the Subject Site.

In addition, by applying rigorous habitat assessment to more mobile species identified in BioNet Atlas records within the locality, it was ensured that all possible use of the Subject Site by notable species was considered, and accommodated within subsequent ecological assessment and management recommendations.

AEP has deemed the survey effort undertaken for the Subject Site sufficient given the disturbed and managed nature of the site, the limited amount of habitat features and resources therein, the very small area of low-quality vegetation proposed for removal and the large areas of high-quality vegetation present off site.

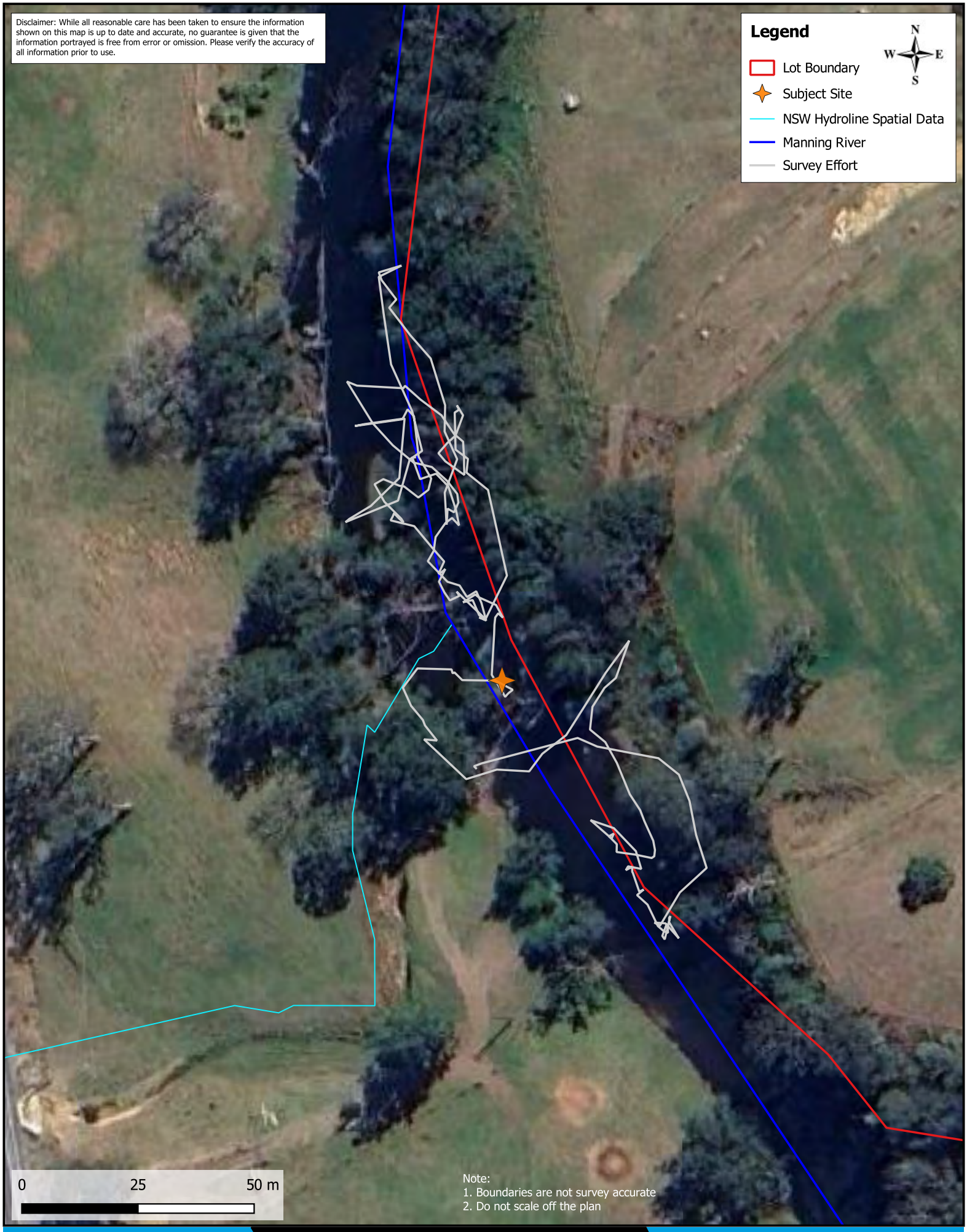

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Figure 3 - Survey Effort

Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

6.0 Results

6.1 State Vegetation Mapping

SVTM indicates the access road within the Subject Site is identified as 'Not Classified", while adjacent areas contain PCT 4079 – *Northern Hinterland Grassy River Oak Forest.*

Figure 4 shows the extent of STVM within and surrounding the Subject Site.

6.2 Ground-truthed Vegetation

Fieldwork was conducted to ground-truth SVTM. The existing causeway and connected access road have resulted in a small amount of historical clearing in the riparian zone of Manning River and is consistent with the area identified as 'Not Classified' within the SVTM. Native species identified during field surveys were consistent with PCT 4079, including high abundance of:

- *Casuarina cunninghamiana;*
- *Ficus coronata;* and
- *Juncus usitatus.*

The riparian zone was moderately weeding with *Lantana camara* (Lantana) and *Solanum mauritianum* (Wild Tobacco) present in abundance. Large amounts of *Myriophyllum aquaticum* (Parrot's Feather) occurs within the river upstream and downstream of the Subject Site.

This PCT is not associated with any TEC. The proposed development will not result in the removal of PCT 4079.

The extent of ground-truthed vegetation identified within the Subject Site is considered commensurate with STVM, as shown in **Figure 4**.

6.3 Habitat Assessment

The Subject Site occurs in the upper reaches of the Manning River and is fed by numerous tributaries originating in the Barrington Tops.

NSW Hydroline spatial data indicates the Subject Site is a 6th order stream. The channel bed is approximately 45m across and the existing causeway is 4m wide with a 0.70m height variation in the up- and down-stream beds. Immediately up-stream the bed consists of medium to large rocks and boulders, and relatively uniform depth varying from 10-40cm.

Immediately down-stream is a narrow channel approx. 1m deep on the western side of a slight, long meander that leads to a deeper (>1m) section expanding to the width of the stream.

An approximate 9m span of the existing causeway has been removed by storm damage, resulting in the convergence of the river and a significant increase in flow velocity. During the period of field surveys, water level height was below the causeway height.

Manning River is considered a Class 1 waterway under DPIRD Fisheries guidelines (**Table 4**). The existing causeway is currently acting as a barrier for upstream fish migration.

Table 4 - Classification of waterways for fish passage

Classification	Characteristics of waterway class
CLASS 1 **Major key fish habitat**	Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.
CLASS 2 Moderate key fish habitat	Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.
CLASS 3 Minimal key fish habitat	Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the

	waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other CLASS 1-3 fish habitats.
CLASS 4 Unlikely key fish habitat	Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).

6.4 Flora

Flora surveys have resulted in the identification of 22 species within the Subject Site, including one (1) aquatic weed species, *Myriophyllum aquaticum.*

A full list of flora species identified within the site is included in **Appendix A**.

6.5 Fauna

Fauna surveys identified 16 species within the Study Area and surrounds comprising 14 birds, one (1) mammal and one (1) fish.

No threatened fauna species were detected within the Subject Site.

A list of fauna species present onsite has been generated for the site and is included within the Expected Fauna List in **Appendix B**.

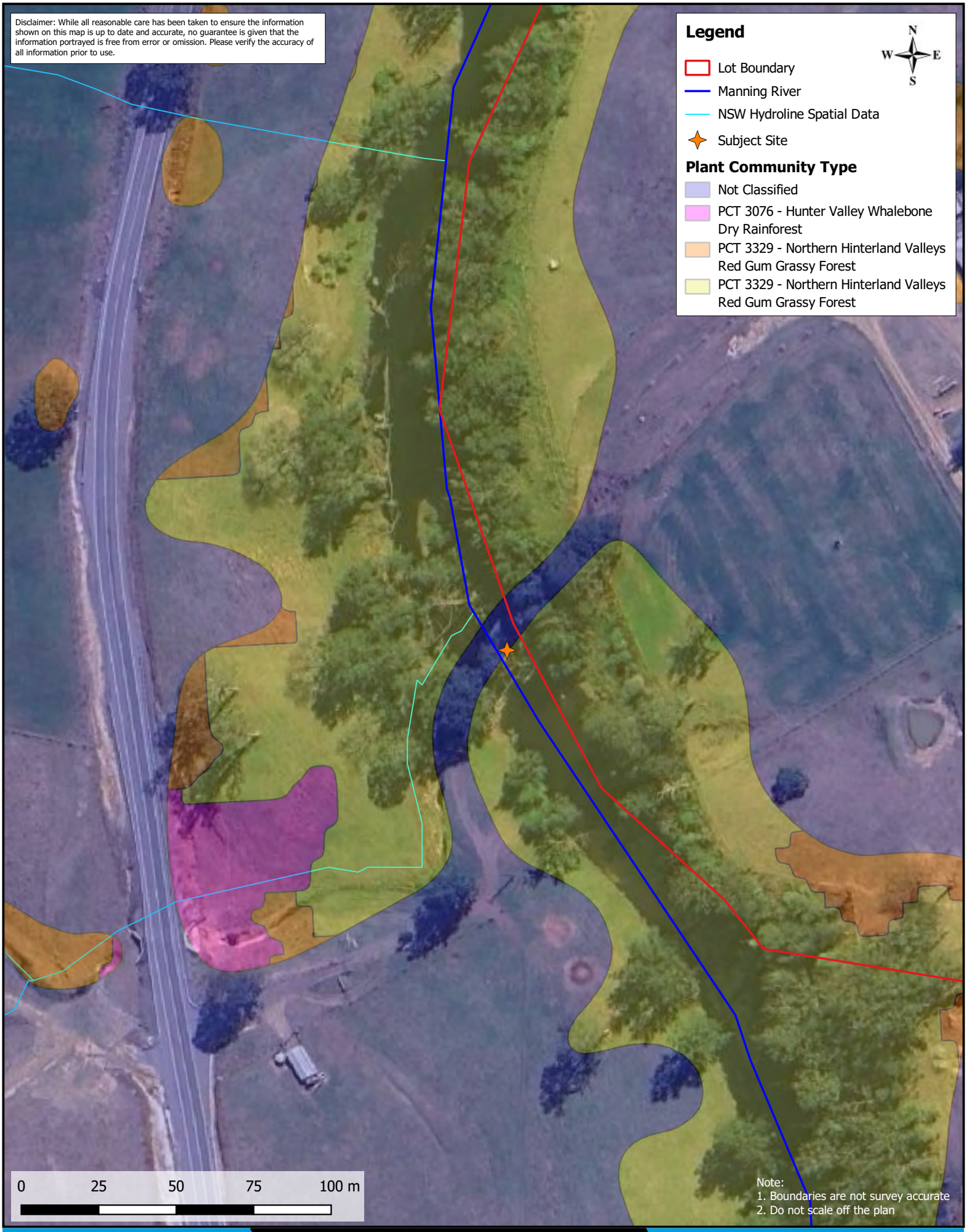

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Figure 4 - State Vegetation Type Mapping

Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

6.6 Database Searches

Searches were undertaken of databases within a 5km radius of the Subject Site for BC Act listings and EPBC Act listings. Note that any records considered erroneous, historic only, or obviously of no relevance to the site in regards to habitat (e.g., seabirds, marine species etc.) were omitted.

Additionally, relevant threatened species listed under the FM Act are considered.

The potential for listed threatened species to occur within the Subject Site is considered in **Table 4** and selection for subject species in **Table 5** below. Detailed ecological profiles of threatened species can be found at:

https://www.environment.nsw.gov.au/threatenedspeciesapp/ and;

https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current

Figure 5 shows the results of the BioNet records database search.

Table 5 – Threatened Species Appraisal

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Likelihood of Occurrence
Flora					
Rhodamnia rubescens	Scrub Turpentine	E	CE	1	Not observed on site and minimal vegetation to be impacted by the proposed development. Species unlikely to be impacted.
Eucalyptus largeana	Craven Grey Box	E	E	4	Not observed on site and minimal vegetation to be impacted by the proposed development. Species unlikely to be impacted.
Cynanchum elegans	White-flowered Wax Plant	E	E	1	Not observed on site and minimal vegetation to be impacted by the proposed development. Species unlikely to be impacted.
Reptiles					
Hoplocephalus stephensii	Stephens' Banded Snake	V		1	Prefers rainforest and eucalypt forests. No vegetation proposed to be removed by the development. No individuals were observed or heard during field surveys. This species is unlikely to be impacted by the proposed development.
Myuchelys purvisi	Manning River Helmeted Turtle, Purvis' Turtle	E		4	Endemic to the Manning River. Despite low number of BioNet records, Subject Site occurs in known habitat and the proposed development may impact species movement. **Subject Species**
Birds					
Daphoenositta chrysoptera	Varied Sittella	V		1	Inhabits eucalypt forests and woodlands. Forested habitat adjacent the subject site. A single BioNet record approx. 2.5km north east from 2022. No individuals or nests observed within the subject site. Given the lack of vegetation to be cleared it is unlikely the species will be impacted by the proposed development.
Ptilinopus magnificus	Wompoo Fruit-Dove	V		1	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. A single BioNet record approx. 2.5km north east from 2022. No individuals or nests observed within the subject site. Given the lack of vegetation to be cleared it is unlikely the species will be impacted by the proposed development.

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Likelihood of Occurrence
Mammals					
Dasyurus maculatus	Spotted-tailed Quoll	V	E	2	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Use hollow-bearing trees, fallen logs, other animal burrows as den sites. Two BioNet records approx. 4.5km north east, both from 2004. Preferred habitat will not be impacted and it is considered unlikely the proposed development will impact this species.
Phascolarctos cinereus	Koala	V	E	5	A total of three (5) BioNet records within the 10km assessment area, generally near roads. No preferred feed trees are to be removed by the proposed development. No individuals observed or heard during field surveys. It is considered unlikely the proposed development will impact this species.
Petaurus norfolcensis	Squirrel Glider	V		1	Preferred habitat contains abundant HBTs. No HBTs are to be removed and no individuals were observed during field surveys. This species is unlikely to be impacted by the proposed development.
Myotis macropus	Southern Myotis	V		1	The Study Area contains large amount of potentially utilised freshwater habitat. Given the high mobility of the species it is unlikely such a small development will impact this species.
Fish					
Mogurnda adspersa	Southern Purple Spotted Gudgeon	E		-	Refer to **Section 10.0 Fisheries Management Act 1994** for assessment.
Odonata					
Archaeophya adamsi	Adam's Emerald Dragonfly	E		-	List as Endangered under the FM Act. While there is suitable habitat within the Study Area, given the lack of records and the small, degraded area to be impacted, it is considered unlikely this species will be impacted by the proposed development.
Petalura gigantea	Giant Dragonfly	E		-	No BioNet records within the search radius. While there is suitable habitat within the Study Area, given the lack of records and the small,

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Likelihood of Occurrence
					degraded area to be impacted, it is considered unlikely this species will be impacted by the proposed development.

Table Key - Status (BC Act, FM Act & EPBC Act): CE: Critically Endangered, E: Endangered, EP: Endangered Populations V: Vulnerable. (#) – Indicates number of Atlas Records within 5km of the Subject Site.

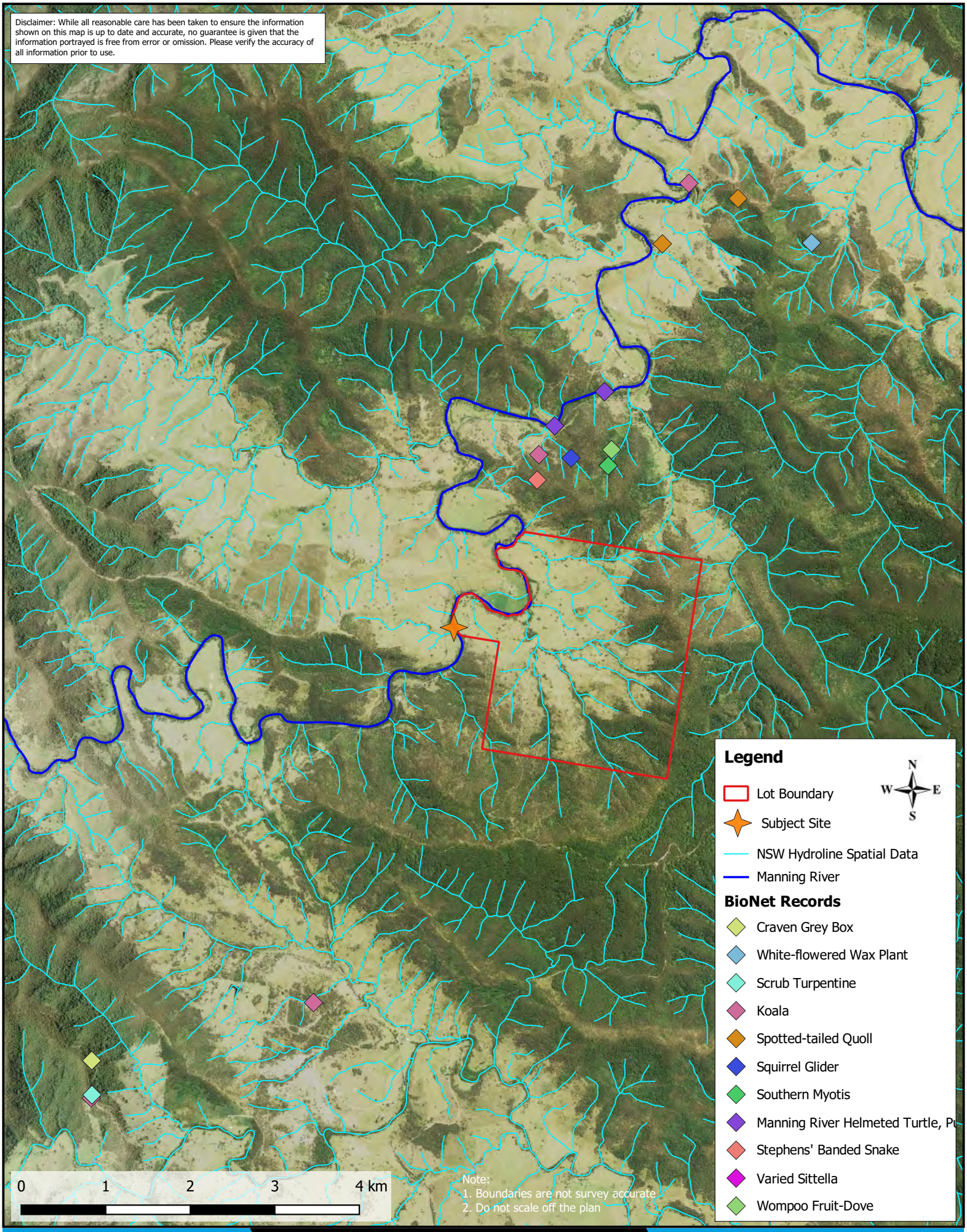

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Figure 5 - BioNet Records

Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

From **Table 5** above, the species listed in **Table 6** are considered key subject or indicator species for the Subject Site due to being recorded on site, potentially likely to forage and roost or nest on the site, the site potentially forms an important part of a local home range for resident specimens and some potential habitat may be impacted by the proposal.

Table 5 – Subject Species

Scientific Name	Common Name	BC Act	EPBC Act
Fauna			
Myuchelys purvisi	Manning River Helmeted Turtle, Purvis' Turtle	E	

CE: Critically Endangered, E: Endangered, V: Vulnerable.

7.0 Key Species Considerations

The species identified for further consideration have been analysed in **Table 6**. By considering these species and their lifecycle needs, many other species are also inadvertently considered. The analysis below considers key lifecycle features for each guild of species in more detail, and assists in informing the subsequent 5-part test assessment.

Table 6 – Key Species Analysis

Guild / Species	Reason for Inclusion	Comment
Myuchelys purvisi	Nearby records.	BioNet records nearby and within Manning River catchment, therefore occurs in habitat connected to the Subject Site. Endemic to Manning River.

8.0 Five-part Test Assessment

Section 7.3 of the BC Act lists five factors that must be taken into account in determining the significance of potential impacts of proposed activities on threatened species, populations, ecological communities and/or their habitats as listed within the BC Act.

The 5-part test is used to determine whether there is likely to be a significant impact, and thus whether the Biodiversity Offsets Scheme (BOS) is triggered.

Table 7 – Key Species Five-part Test

No.	Clause	Assessment
a)	In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	The proposed development is unlikely to have an adverse impact on the life cycle of Purvis' Turtle. Works will primarily occur in in the location of the existing causeway. The proposed bridge in the Manning River will not limit the available habitat accessible for breeding and foraging. The existing causeway will be removed, increasing access to available habitat and the bridge has been designed to allow fauna passage within Manning River. Erosion controls will be implemented in accordance with the Blue Book.
b)	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	The proposed development will not continue impacting the extent and composition of the ecological community. The existing causeway is impeding the movement of Purvis' Turtle up stream within the Manning River. The proposed development design would result in in a return natural instream flow velocity, reducing the impact on the ability of Purvis Turtle to traverse the Subject Site. While the species can move terrestrially around the existing barrier, this may result in increased risk of predation and mortality due to car strikes. The bridge design allows for greater in stream movement, reducing this risk. This is likely to *improve* the extent and composition of the surrounding ecological community.
c)	In relation to the habitat of a threatened species or ecological community: the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.	The existing causeway has significantly altered the habitat from natural conditions by changing the flow regime and providing a barrier for instream aquatic fauna. The proposed bridge will remove these impacts. The proposed bridge development will remove this barrier to passage and increase connectivity within Manning River. Availability of habitat is important for the species long-term survival as it increasing breeding and foraging resources.
d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No areas of outstanding biodiversity value occur within the Study Area.

No.	Clause	Assessment
e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process (KTP).	Due to the nature of the proposed development, the following KTPs require consideration: *Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.* The natural flow regime has been altered by the existing causeway. The proposed bridge design will reinstate a more natural flow regime by removing the existing causeway. *Removal of dead wood and dead trees* Fallen trees and logs provide instream woody structure for aquatic fauna. The existing causeway has created a blockage in the river where woody debris has accumulated. While the removal of the existing causeway may result in this debris washing downstream, it is considered likely instream structure will remain, and natural re-snagging will occur. It is recommended, where possible, instream woody debris should not be removed. *Anthropogenic Climate Change* While the proposed development will have minimal direct contribution towards anthropogenic climate change, cumulative impacts should be considered. It is recommended that all construction processes and designs adopt relevant guidelines for the reduction and minimisation of actions contributing to climate change.

9.0 EPBC Act Assessment

A search was conducted in October 2024 for Matters of National Environmental Significance (MNES) as relevant to the EPBC Act. The following MNES are considered in this assessment.

World Heritage Properties:

The site is not a World Heritage area and is not in close proximity to any such area.

National Heritage Places:

The site is not a National Heritage Place and does not contain any matters of national heritage.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not a declared RAMSAR wetland.

Great Barrier Reef Marine Park:

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

Commonwealth Marine Areas:

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

Threatened Ecological Communities (TECs):

There are three (3) listed TECs within a 5km radius of the Subject Site:

- Lowland Rainforest of Subtropical Australia
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions

PCT 4079 is not commensurate with any TEC, and no vegetation will be removed by the proposed development.

Threatened Species:

No listed species were observed during field surveys. While *Myuchelys purvisi* is endemic to the Manning River and has been recorded nearby historically, additional impacts to any population are considered unlikely. However, incorporating fish passage in to the design of the replacement bridge will increase available habitat and likely provide benefit to the species. It is considered this development is unlikely to significantly impact on EPBC listed threatened fauna species.

No vegetation is proposed to be removed by this development. Therefore, it is unlikely to significantly impact any EPBC listed flora.

Migratory Species:

A total of 9 migratory species may occur in, or may relate to areas within 5km of the Subject Site. It is not considered the development is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

Consideration of the EPBC Act revealed that it is unlikely that significant impacts on Matters of National Environmental Significance will occur as a result of the proposal. As such a referral is not considered likely to be necessary.

10.0 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) objectives are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The proposed bridge requires the following sections to be addressed under the FM Act:

- Section 201 – A permit is required for dredging or reclamations works on water lands; and
- Section 219 – The blocking of fish passage is prohibited.
- Section 220ZZ – Significant effects on threatened species or community must be assessed.

Additionally, the Subject Site is located within identified *Key Fish Habitat* (**Figure 6**). Therefore, the proposal will require a permit in accordance with the FM Act, and consultation and applications to the Department of Primary Industries (Fisheries).

The following assessment has been undertaken in accordance with the FM Act relevant policies.

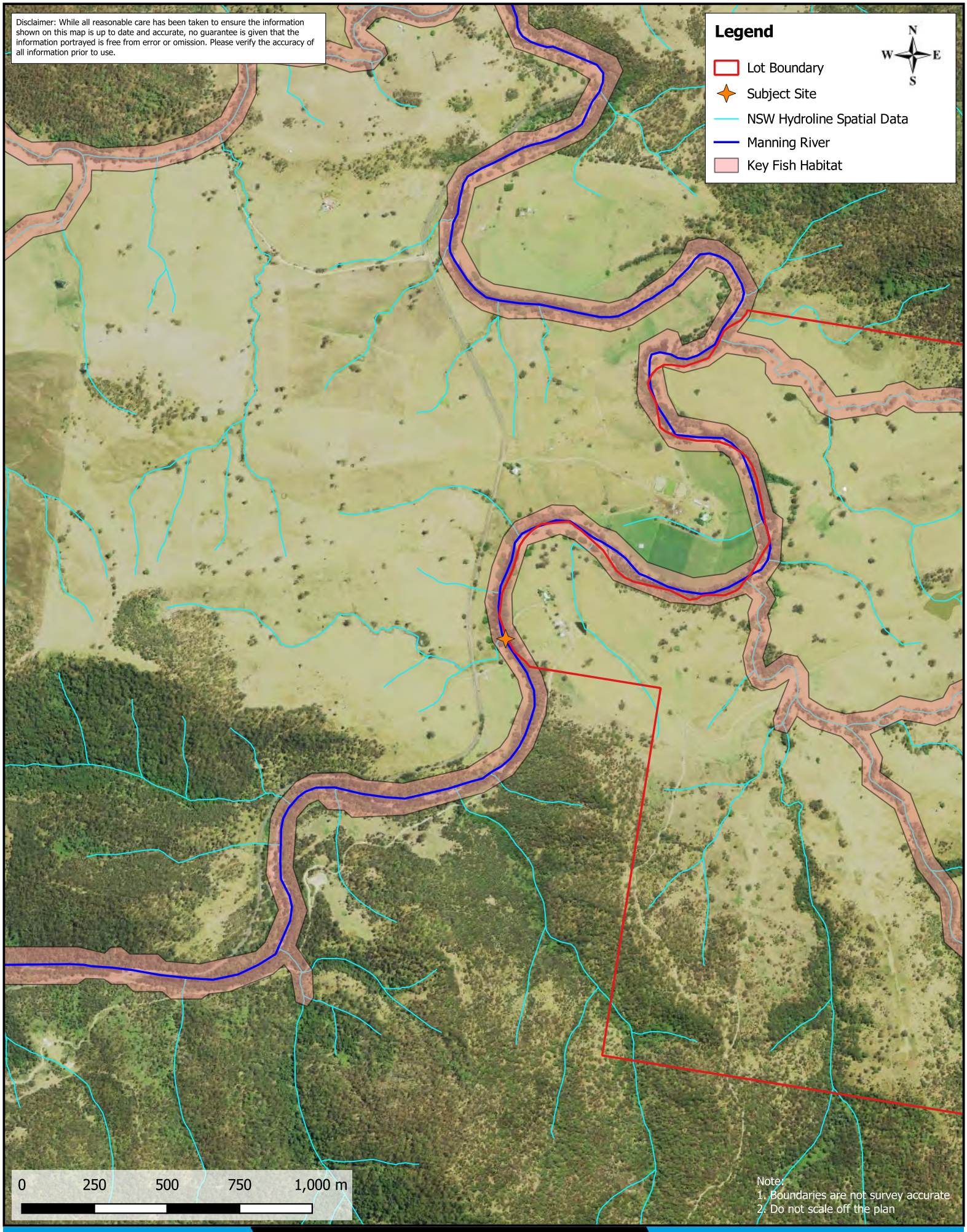

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Figure 6 - Key Fish Habitat

Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

10.1 Dredge and Reclamation Assessment

Under Section 201 of the FM Act a permit will be required to undertake dredging and reclamation activities in Manning River. To obtain approval, an evaluation of risk of environmental factors is required as per Section 171 of the *Environmental Planning and Assessment Regulation 2021.*

Table 8 – Environmental Risk Assessment for the proposed bridge

Environmental Factor	Risk Level (High, Moderate, Low, Nil)	Assessment
(a) the environmental impact on the community,	Low	The bridge will provide access to a farm property. Direct environmental impacts to the community are likely marginal and limited, the implementation of erosion controls during construction will minimise turbidity downstream during the construction phase.
(b) the transformation of the locality,	Low	Given the relatively small scale of the proposed works, it is expected that there will be no major transformation of the locality.
(c) the environmental impact on the ecosystems of the locality,	Low	The proposed bridge will not continue to fragment the Manning River, reducing isolation of aquatic species. Movement and migration are an important part of many aquatic species lifecycles. The proposed bridge is likely to improve the local ecosystem condition.
(d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality,	Low	Replacement of the existing causeway situated within the stream, with a bridge that predominantly sits above the channel, will likely increase the quality and value of the locality by removing an instream obstruction to fauna passage and reinstating a natural river bed.
(e) the effects on any locality, place or building that has— (i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or (ii) other special value for present or future generations,	Low	The Subject Site does not represent a place of special value to present or future generations.
(f) the impact on the habitat of protected animals, within the meaning of the Biodiversity Conservation Act 2016,	Low	The proposed bridge will not act as an impediment to the movement of the threatened Purvis' Turtle, or result in a reduction of habitat. Allow instream movement will reduce the risk of car strikes and predation.
(g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,	Low	Removal of the existing causeway and replacement with a bridge will reduce risk of car strikes and allow safe traversal through the Subject Site. The proposed bridge will allow a return to natural flow velocities and increase available habitat for *Mogurnda adspersa* by removing an impediment to fish movement and migration.

Environmental Factor	Risk Level (High, Moderate, Low, Nil)	Assessment
(h) long-term effects on the environment,	Low	The proposed bridge will not block fish movement and migration permanently. Vehicles will be able to cross Manning River without entering the channel, reducing the risk of contamination.
(i) degradation of the quality of the environment,	Low	The proposed bridge increase connectivity of Manning River aquatic habitat, and will not reduce available habitat or negatively impact biodiversity.
(j) risk to the safety of the environment,	Low	The proposal is unlikely to impact the safety of the environment.
(k) reduction in the range of beneficial uses of the environment,	Low	The small area to be impacted by the proposed bridge is unlikely to reduce the range of beneficial uses of the environment.
(l) pollution of the environment,	Low	The proposal is unlikely to cause pollution of the environment as sedimentation controls will be implemented during construction in accordance with the 'Blue Book'. Vehicles will be able to cross Manning River without entering the channel, reducing the risk of contamination.
(m) environmental problems associated with the disposal of waste,	Low	It is recommended approval is conditioned to require a Construction Environmental Management Plan (CEMP) that specifies the procedure for waste disposal during construction. Adherence to a suitable plan will result in minimal impact to the environment from waste disposal.
(n) increased demands on natural or other resources that are, or are likely to become, in short supply,	Low	It is unlikely the proposed bridge will significantly impact natural resource supplies.
(o) the cumulative environmental effect with other existing or likely future activities,	Low	The Manning River contains numerous barriers to fish movement and migration. The proposed bridge has been designed to not contribute to this impediment.
(p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions,	Nil	No impact to coastal processes or coastal hazards is predicted.
(q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,	Moderate	The proposed bridge will not block the passage of fish movement and migration. The 'avoid, minimise and offset' hierarchy proposed by the *Hunter Regional Plan 2041* (prepared under Division 3.1 of the EP&A Act 1979) is considered to be met. Through consultation with DPIRD Fisheries, the proposed design has gone through a number of iterations, and a design was chosen that will not be an impediment to fish passage and the existing blockage will be removed.

Environmental Factor	Risk Level (High, Moderate, Low, Nil)	Assessment
(r) other relevant environmental factors.	Nil	No other environmental factors are likely to be impacted by the proposed bridge.

10.2 Blockage of Fish Passage Assessment

Under Section 219 of the FM Act, fish passage is not to be blocked without a permit from NSW DPI Fisheries:

219 Passage of fish not to be blocked

The current proposed design of the bridge will not block upstream fish passage. The proposed bridge design has gone through multiple iteration in consultation with DPIRD Fisheries and meets the requirements of NSW DPIRD Fisheries guidelines (Fairfull, 2013; NSW DPI, n.d.).

10.3 Threatened Fish Species Assessment

Detailed analysis of NSW DPIRD Fisheries Threatened Species List and Spatial Data Portal were undertaken in October 2024. There are no listed Threatened fish species mapped as occurring within the Study Area. *Mogurnda adspersa* (Southern Purple Spotted Gudgeon) is mapped (**Figure 7**) as occurring in streams within a 10km radius of the Subject Site and further assessment is considered below for this species.

The following threatened species assessment has been undertaken in accordance with Department of Primary Industries (2006) *Threatened species assessment guidelines: The Assessment of Significance*:

No.	Clause	Assessment
a)	In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	The existing causeway is a barrier for fish migration and movement. The proposed bridge will remove this impediment to movement, providing access to additional habitat. *Mogurnda adspersa* females lay eggs which are then guarded by males until they hatch. Limited habitat can result in territorial conflict and limit potential population size. The proposal will likely benefit this species.
b)	in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	No endangered populations are currently mapped within the Study Area or surrounds. No species belonging to an endangered population was observed during field surveys. The proposal is considered unlikely to impact a listed endangered population.
c)	in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	The Study Area does not occur in a listed endangered or critically endangered ecological community.
d)	in relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	The existing causeway has significantly altered the habitat from natural conditions by changing the flow regime and providing a barrier for instream aquatic fauna. The proposed bridge will not continue these impacts, removing the existing barrier and increasing available habitat and connectivity.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	The proposed development will not result in fragmentation of the Manning River. Removal of the existing causeway will increase habitat connectivity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	*Mogurnda adspersa* is known to disperse slowly over its range. Any impediment to movement will prevent the species from colonising, or recolonising. Therefore, availability of habitat is important for the species long-term survival. Removal of the existing causeway will increase habitat

No.	Clause	Assessment
		connectivity, likely benefiting and improving the long-term survival of this species.
e)	whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	No critical habitat for *Mogurnda adspersa* is listed within the Study Area.
f)	whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	The following **High Priority** recovery action is listed for *Mogurnda adspersa*: Undertake priority rehabilitation, restoration and enhancement work (e.g. rehabilitating riparian vegetation, cold water pollution reduction measures, reinstating large woody debris, **removal of barriers to fish passage**, removal of willows from riverbanks, sediment and erosion control measures) at key sites known to support Southern Purple Spotted Gudgeon populations It is considered the proposed bridge is currently consistent with proposed recovery actions and will contribute to this high priority action.
g)	whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	*Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.* The proposed bridge will not increase instream velocity, thus not contributing to this Key Threatening Process. *Degradation of native riparian vegetation along New South Wales water courses* No native vegetation is proposed to be removed. The proposed bridge is to replace an existing causeway and will connect to existing roads. Native vegetation will be identified by a suitably qualified ecologist and works excluded from this area prior to construction. An Arborist assessment will be undertaken to determine Tree Protection Zones (TPZ) of nearby trees and no works will occur within the TPZ of native trees. It is considered unlikely the proposal with contribute significantly to this Key Threatening Process. *Removal of large woody debris from New South Wales rivers and streams* Fallen trees and logs provide instream woody structure for aquatic fauna. The existing causeway has created a blockage in the river where woody debris has accumulated. While the removal of the existing causeway may result in this debris washing downstream, it is considered likely instream structure will remain. It is recommended, where possible, instream woody debris should not be removed.

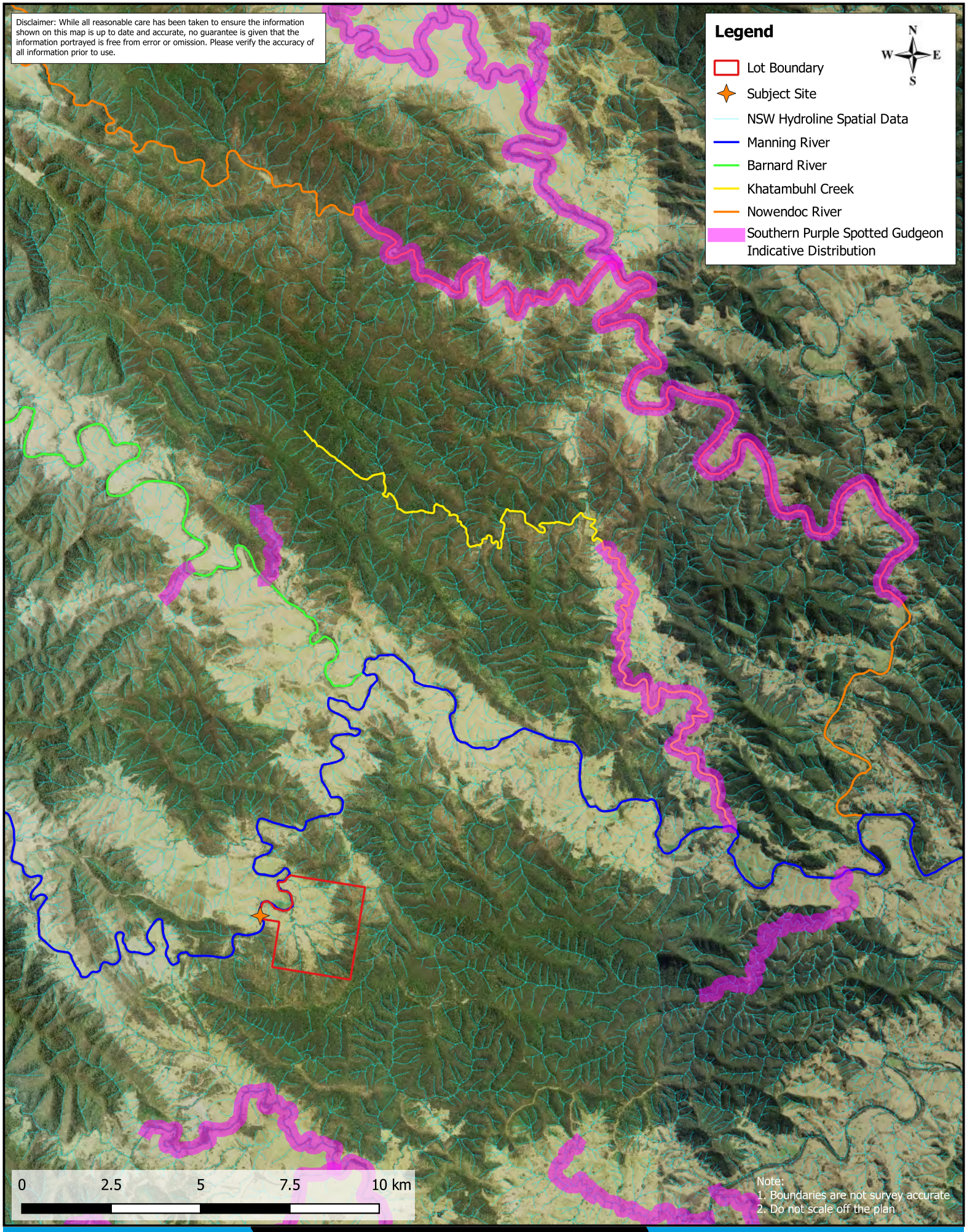

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Figure 7 - Southern Purple Spotted Gudgeon Indicative Distribution

Date: October 2024

Location: 2414 Thunderbolts Way, Tibbuc, 2422

Client: Rob Blain c/- Midcoast Planning

AEP ref: 3261

11.0 Water Management Act 2000

Manning River, a 6th order stream, runs through the Subject Site (refer **Figure 1**). Under the WM Act, development work within 40m of a mapped watercourse requires a Controlled Activity Approval (CAA).

Table 8 outlines DPE (2022) guidelines for works and activities that can occur on waterfront land and in riparian corridors under the WM Act (note approvals are still required under other legislation). The proposed bridge is permissible on a 6th order stream; however, approval is still required.

Table 9 – Riparian Corridor Matrix

Type	VRZ width (each side of WC)	Total RC width	Cycleways and pathways	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st order	10m	20m + channel width	Yes	Yes	Yes	Yes	Yes	Yes	-	-
2nd order	20m	40m + channel width	Yes	Yes	Yes	Yes	-	Yes	-	-
3rd order	30m	60m + channel width	Yes	Yes	-	Yes	-	-	Yes	Yes
4th order or greater	40m	80m + channel width	Yes	Yes	-	Yes	-	-	Yes	Yes

Note: Where a watercourse (WC) does not exhibit the features of a defined channel with bed and banks, the NRAR may determine that the watercourse is not waterfront land for the purpose of the WM Act.

In accordance with Section 91 of the WM Act, a CAA is required to undertake the proposed works.

12.0 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The Biodiversity and Conservation SEPP commenced on 1 March 2022. This SEPP consolidated 11 other SEPPs within this SEPP on 1 March 2022. The State Environment Planning Policy (Koala Habitat Protection) 2021 (BC SEPP) was one SEPP that was consolidated within the Biodiversity and Conservation SEPP 2021 under Chapter 4 – Koala Habitat Protection 2021. No policy changes were made as part of the consolidation nor did the legal effect of the existing SEPPs, with section 30A of the Interpretation Act 1987 applying to the transferred provisions. The consolidation was undertaken in accordance with section 3.22 of the *Environmental Planning and Assessment Act 1979*.

The Biodiversity and Conservation SEPP 2021 aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

No vegetation is proposed to be impacted by the proposed development; therefore, no further assessment is required.

13.0 Recommendations

The following general recommendations are made for consideration to minimise localised impacts on biodiversity in general as a result of development of the site:

- Prior to construction, a suitably experienced and qualified Project Ecologist should be appointed to oversee ecological works to mitigate construction impacts on native biota welfare;
- Prior to construction an Arborist Assessment be undertaken to determine the TPZs for retained vegetation adjoining earthworks to ensure suitable protection measures are in place;
- Prior to construction commencing, temporary construction fencing and signage will be installed to delineate construction zone from retained vegetation, including nearby native vegetation. No native vegetation is to be impacted during construction works;
- Prior to construction commencing, the Project Ecologist will inspect the exclusion flagging tape alignment to ensure it is adequate for protection of retained trees and vegetation;
- An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the proposal following guidelines from the “Blue Book” (Landcom, 2004);
- Prior to construction, installation of sediment and erosion controls to ensure sediment generated is retained at or near the worksite and not enter into the river where possible. Refuelling and hydrocarbon storage should occur offsite or within a bunded area 40m from the river channel;
- No machinery or material should be stored within retained vegetation or within the dripline of retained trees;
- Equipment should be cleaned thoroughly and disinfected before entering and exiting site to prevent weed and disease introduction such as *Phytophthora cinnamomi* (Root-rot fungus), *Puccinia psidii* (Myrtle Rust) and others;
- The removal of in-stream woody debris should be minimised where possible during construction;
- Construction should occur in stages to ensure continual flow of the river and fish passage is maintained throughout the construction process; and
- It is recommended approval is conditioned to provide a Construction Environmental Management Plan (CEMP) that specifies the procedure for waste disposal and appropriate sediment and erosion controls, during construction.

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Strahan, R (2004). The Mammals of Australia. New Holland Publishers.

Swan, G., Shea, G., and Sadlier, R. (2004). A Field Guide to the Reptiles of New South Wales. 2nd Edition. New Holland Publishing, Sydney.

Appendix A – Flora Species List

FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as thus:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.” and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

> Harden, G. (ed) (2000). Flora of New South Wales, Volume 1. Revised edition. UNSW, Kensington, NSW.
>
> Harden, G. (ed) (2002). Flora of New South Wales, Volume 2. Revised edition. UNSW, Kensington, NSW.
>
> Harden, G. (ed) (1992). Flora of New South Wales, Volume 3. UNSW, Kensington, NSW.
>
> Harden, G. (ed) (1993). Flora of New South Wales, Volume 4. UNSW, Kensington, NSW.

Names of families and higher taxa follow a modified Cronquist System (1981).

Exotic species are indicated by an asterisk “*****”.

Threatened species listed under the *Biodiversity Conservation Act 2016 (BC Act)* or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in **bold font**.

Family	Scientific Name	Common Name
Apiaceae	*Cyclospermum leptophyllum**	Slender Celery
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Asteraceae	*Euchiton sphaericus*	
Asteraceae	*Ageratina riparia**	Mist Flower
Asteraceae	*Senecio madagascariensis**	Fireweed
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Cyperaceae	*Cyperus spp.*	
Haloragaceae	*Myriophyllum aquaticum**	Brazilian Water Milfoil
Juncaceae	*Juncus usitatus*	Common Rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Meliaceae	*Melia azedarach*	White Cedar
Moraceae	*Ficus coronata*	Sandpaper Fig
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Rutaceae	*Citrus limon**	Lemon Tree
Solanaceae	*Solanum chenopodioides**	Whitetip Nightshade
Solanaceae	*Solanum mauritianum**	Wild Tobacco
Verbenaceae	*Verbena spp.*	

Appendix B – Expected Fauna Species List

EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on the Subject Site at some point, given site attributes and location.

Threatened species listed under the BC Act or the EPBC Act are indicated in bold font.

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Fish				
Anguillidae	*Anguilla reinhardtii*	Longfin eel		
Retropinnidae	*Retropinna semoni*	Australian Smelt	O	
Amphibians				
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet		
Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet		
Limnodynastidae	*Adelotus brevis*	Tusked Frog		
Limnodynastidae	*Limnodynastes peronii*	Brown-striped Frog		
Hylidae	*Litoria caerulea*	Green Tree Frog		
Hylidae	*Litoria chloris*	Red-eyed Tree Frog		
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog		
Hylidae	*Litoria lesueuri*	Lesueur's Frog		
Hylidae	*Litoria peronii*	Peron's Tree Frog		
Hylidae	*Litoria tyleri*	Tyler's Tree Frog		
Hylidae	*Litoria verreauxii*	Verreaux's Frog		
Reptilia				
Chelidae	*Chelodina longicollis*	Eastern Snake-necked Turtle		
Chelidae	*Emydura macquarii*	Macquarie Turtle		
Chelidae	***Myuchelys purvisi***	**Manning River Helmeted Turtle, Purvis' Turtle**		
Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink		
Agamidae	*Intellagama lesueurii*	Eastern Water Dragon		
Agamidae	*Pogona barbata*	Bearded Dragon		

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Pythonidae	*Morelia spilota*	Carpet & Diamond Pythons		
Elapidae	*Cryptophis nigrescens*	Eastern Small-eyed Snake		
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake		
Birds				
Megapodiidae	*Alectura lathami*	Australian Brush-turkey		
Phasianidae	*Synoicus ypsilophora*	Brown Quail		
Anatidae	*Anas superciliosa*	Pacific Black Duck		
Anatidae	*Aythya australis*	Hardhead		
Anatidae	*Chenonetta jubata*	Australian Wood Duck	O	
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe		
Columbidae	*Columba leucomela*	White-headed Pigeon		
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove		
Columbidae	*Leucosarcia melanoleuca*	Wonga Pigeon		
Columbidae	*Macropygia phasianella*	Brown Cuckoo-Dove		
Columbidae	*Ocyphaps lophotes*	Crested Pigeon		
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	O	
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant		
Ardeidae	*Bubulcus ibis*	Cattle Egret		
Ardeidae	*Egretta novaehollandiae*	White-faced Heron		
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis		
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk		
Accipitridae	*Aquila audax*	Wedge-tailed Eagle		
Accipitridae	*Circus approximans*	Swamp Harrier		
Accipitridae	*Elanus axillaris*	Black-shouldered Kite		
Accipitridae	***Haliaeetus leucogaster***	**White-bellied Sea-Eagle**		
Falconidae	*Falco berigora*	Brown Falcon		
Falconidae	*Falco cenchroides cenchroides*	Nankeen Kestrel		
Rallidae	*Fulica atra*	Eurasian Coot		
Rallidae	*Gallinula tenebrosa*	Dusky Moorhen		

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Rallidae	Hypotaenidia philippensis	Buff-banded Rail		
Rallidae	Porphyrio porphyrio	Purple Swamphen		
Cacatuidae	Cacatua sanguinea	Little Corella		
Cacatuidae	Eolophus roseicapilla	Galah	O	
Cacatuidae	Zanda funereus	Yellow-tailed Black-Cockatoo		
Psittacidae	Alisterus scapularis	Australian King-Parrot		
Psittacidae	Glossopsitta concinna	Musk Lorikeet		
Psittacidae	Platycercus elegans	Crimson Rosella	O	
Psittacidae	Platycercus eximius	Eastern Rosella		
Cuculidae	Cacomantis flabelliformis	Fan-tailed Cuckoo		
Cuculidae	Cacomantis variolosus	Brush Cuckoo		
Cuculidae	Centropus phasianinus	Pheasant Coucal		
Cuculidae	Chalcites lucidus	Shining Bronze-Cuckoo		
Cuculidae	Scythrops novaehollandiae	Channel-billed Cuckoo		
Strigidae	Ninox novaeseelandiae	Southern Boobook		
Strigidae	**Ninox strenua**	**Powerful Owl**		
Alcedinidae	Ceyx azureus	Azure Kingfisher	O	
Alcedinidae	Dacelo novaeguineae	Laughing Kookaburra		
Alcedinidae	Todiramphus sanctus	Sacred Kingfisher		
Meropidae	Merops ornatus	Rainbow Bee-eater		
Coraciidae	Eurystomus orientalis	Dollarbird		
Pittidae	Pitta versicolor	Noisy Pitta		
Climacteridae	Cormobates leucophaea	White-throated Treecreeper		
Ptilonorhynchidae	Ailuroedus crassirostris	Green Catbird		
Ptilonorhynchidae	Ptilonorhynchus violaceus	Satin Bowerbird		
Ptilonorhynchidae	Sericulus chrysocephalus	Regent Bowerbird		
Maluridae	Malurus cyaneus	Superb Fairy-wren	O	
Maluridae	Malurus lamberti	Variegated Fairy-wren		
Maluridae	Malurus melanocephalus	Red-backed Fairy-wren		
Acanthizidae	Acanthiza lineata	Striated Thornbill		
Acanthizidae	Acanthiza nana	Yellow Thornbill		

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Acanthizidae	Acanthiza pusilla	Brown Thornbill		
Acanthizidae	Gerygone mouki	Brown Gerygone		
Acanthizidae	Gerygone olivacea	White-throated Gerygone		
Acanthizidae	Neosericornis citreogularis	Yellow-throated Scrubwren		
Acanthizidae	Sericornis frontalis	White-browed Scrubwren		
Pardalotidae	Pardalotus punctatus	Spotted Pardalote		
Pardalotidae	Pardalotus striatus	Striated Pardalote		
Meliphagidae	Acanthorhynchus tenuirostris	Eastern Spinebill		
Meliphagidae	Anthochaera carunculata	Red Wattlebird		
Meliphagidae	Caligavis chrysops	Yellow-faced Honeyeater		
Meliphagidae	Manorina melanocephala	Noisy Miner	O	
Meliphagidae	Manorina melanophrys	Bell Miner		
Meliphagidae	Meliphaga lewinii	Lewin's Honeyeater	O	
Meliphagidae	Melithreptus brevirostris	Brown-headed Honeyeater		
Meliphagidae	Melithreptus lunatus	White-naped Honeyeater		
Meliphagidae	Nesoptilotis leucotis	White-eared Honeyeater		
Meliphagidae	Philemon corniculatus	Noisy Friarbird		
Psophodidae	Psophodes olivaceus	Eastern Whipbird		
Neosittidae	Daphoenositta chrysoptera	Varied Sittella		
Campephagidae	Coracina novaehollandiae	Black-faced Cuckoo-shrike		
Campephagidae	Coracina papuensis	White-bellied Cuckoo-shrike		
Campephagidae	Edolisoma tenuirostris	Cicadabird		
Campephagidae	Lalage leucomela	Varied Triller		
Pachycephalidae	Colluricincla harmonica	Grey Shrike-thrush		
Pachycephalidae	Pachycephala pectoralis	Golden Whistler		
Pachycephalidae	Pachycephala rufiventris	Rufous Whistler		

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Oriolidae	Oriolus sagittatus	Olive-backed Oriole	O	
Oriolidae	Sphecotheres vieilloti	Australasian Figbird		
Artamidae	Artamus cyanopterus cyanopterus	Dusky Woodswallow		
Artamidae	Cracticus nigrogularis	Pied Butcherbird	O	
Artamidae	Cracticus torquatus	Grey Butcherbird		
Artamidae	Gymnorhina tibicen	Australian Magpie	O	
Artamidae	Strepera graculina	Pied Currawong		
Rhipiduridae	Rhipidura albiscapa	Grey Fantail		
Rhipiduridae	Rhipidura leucophrys	Willie Wagtail	O	
Rhipiduridae	Rhipidura rufifrons	Rufous Fantail		
Corvidae	Corvus coronoides	Australian Raven		
Corvidae	Corvus mellori	Little Raven		
Corvidae	Corvus orru	Torresian Crow		
Monarchidae	Grallina cyanoleuca	Magpie-lark	O	
Monarchidae	Monarcha melanopsis	Black-faced Monarch		
Monarchidae	Myiagra rubecula	Leaden Flycatcher		
Monarchidae	Symposiachrus trivirgatus	Spectacled Monarch		
Corcoracidae	Corcorax melanorhamphos	White-winged Chough		
Petroicidae	Eopsaltria australis	Eastern Yellow Robin		
Petroicidae	Microeca fascinans	Jacky Winter		
Petroicidae	Petroica rosea	Rose Robin		
Hirundinidae	Hirundo neoxena	Welcome Swallow	O	
Hirundinidae	Petrochelidon ariel	Fairy Martin		
Hirundinidae	Petrochelidon nigricans	Tree Martin		
Turdidae	Zoothera heinei	Russet-tailed Thrush		
Turdidae	Zoothera lunulata	Bassian Thrush		
Zosteropidae	Zosterops lateralis	Silvereye		
Dicaeidae	Dicaeum hirundinaceum	Mistletoebird		
Estrildidae	Neochmia temporalis	Red-browed Finch		
Motacillidae	Anthus novaeseelandiae	Australian Pipit		
Mammals				

Family Name	Scientific Name	Common Name	Surveyed Observations	Survey Equipment
			Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)	Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)
Ornithorhynchidae	Ornithorhynchus anatinus	Platypus		
Dasyuridae	Antechinus stuartii	Brown Antechinus		
Dasyuridae	**Dasyurus maculatus**	**Spotted-tailed Quoll**		
Dasyuridae	**Phascogale tapoatafa**	**Brush-tailed Phascogale**		
Phascolarctidae	**Phascolarctos cinereus**	**Koala**		
Petauridae	Petaurus breviceps	Sugar Glider		
Petauridae	**Petaurus norfolcensis**	**Squirrel Glider**		
Acrobatidae	Acrobates pygmaeus	Feathertail Glider		
Phalangeridae	Trichosurus vulpecula	Common Brushtail Possum		
Macropodidae	Macropus giganteus	Eastern Grey Kangaroo		
Macropodidae	Notamacropus rufogriseus	Red-necked Wallaby		
Vespertilionidae	Myotis macropus	Southern Myotis		
Vespertilionidae	Vespadelus darlingtoni	Large Forest Bat		
Vespertilionidae	Vespadelus pumilus	Eastern Forest Bat		
Vespertilionidae	**Vespadelus troughtoni**	**Eastern Cave Bat**		
Muridae	Rattus fuscipes	Bush Rat		
Muridae	Rattus rattus	Black Rat		
Canidae	Canis lupus	Dingo, domestic dog		
Canidae	Vulpes vulpes	Fox		
Felidae	Felis catus	Cat		
Leporidae	Oryctolagus cuniculus	Rabbit		
Bovidae	Bos taurus	European cattle	O	

*Bats that are likely to be on site but could not be definitively identified (i.e., those that were classified as possible or within a species group)

**Species possibly recorded by Songmeter but could not be definitively identified.

Appendix C – BOSET Report

Department of Planning and Environment

Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to your local council to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under the Biodiversity Conservation Regulation 2017 (Cl. 7.2 & 7.3).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

Biodiversity Values Map and Threshold Report

Date of Report Generation		11/11/2024 10:40 AM
1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)		
1.1	**Does the development Footprint intersect with BV mapping?**	yes
1.2	Was ALL BV Mapping within the development footprinted added in the last 90 days? (dark purple mapping only, no light purple mapping present)	no
1.3	**Date of expiry of dark purple 90 day mapping**	N/A
1.4	**Is the Biodiversity Values Map threshold exceeded?**	yes
2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)		
2.1	**Size of the development or clearing footprint**	3,703.1 sqm
2.2	**Native Vegetation Area Clearing Estimate (NVACE)** (within development/clearing footprint)	3,595.3 sqm
2.3	**Method for determining Minimum Lot Size**	LEP
2.4	**Minimum Lot Size** (10,000sqm = 1ha)	1,000,000 sqm
2.5	**Area Clearing Threshold** (10,000sqm = 1ha)	10,000 sqm
2.6	**Does the estimate exceed the Area Clearing Threshold?** (NVACE results are an estimate and can be reviewed using the Guidance)	no

REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area? (Your local council will determine if a BDAR is required)	**yes**

What do I do with this report?

• If the result above indicates the BOS Threshold has been exceeded, your local council may require a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor.

• If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is '"likely to significantly affect threatened species" as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.

• If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.

• If all Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

For more detailed advice about actions required, refer to the Interpreting the evaluation report section of the Biodiversity Values Map Threshold Tool User Guide .

Review Options:

• If you believe the Biodiversity Values mapping is incorrect please refer to our BV Map Review webpage for further information.

• If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the Guide for reviewing area clearing threshold results from the BMAT Tool.

Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: _____ Date:_____

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

11/11/2024 10:40 AM

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the Biodiversity Values Map webpage.

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the Biodiversity Values Map Review webpage.

If you need help using this map tool see our Biodiversity Values Map and Threshold Tool User Guide or contact the Map Review Team at map.review@environment.nsw.gov.au or on 1800 001 490.

Biodiversity Values Map

245.9 0 122.96 245.9 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days
- Native Vegetation Area Clearing Estimate (NVACE)
- Development area selected by proponent

11/11/2024 10:40 AM

The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the Biodiversity Values Map viewer for mapping updates is recommended.

Appendix D – Site Photographs

Above: Existing, storm damaged causeway.

Below: High flow due to convergence of stream through damaged section.

Above: Downstream of the existing causeway.

Below: Upstream of the existing causeway.

Above: *Myriophyllum aquaticum* (Parrots Feather) aquatic weed abundant in stream.

Below: Downstream of the Subject Site

Above and Below: Australian Smelt (*Retropinna semoni*) caught up- and down-stream of the existing causeway.

Appendix E – Manning River Concrete Causeway Geomorphic Assessment

Manning River Concrete Causeway Geomorphic Assessment

Prepared for Julianne Blain

2414 Thunderbolts Way, Tibbuc
May 2020

NSW GOVERNMENT Local Land Services

www.scs.nsw.gov.au

Title
Manning River Concrete Causeway Geomorphic Assessment

Published by
Soil Conservation Service May 2021.

External distribution:

Version	Date	Prepared by	Approved by	Released to
1.1	28/05/2021	Mick Taylor 	Dan Brown	Julianne Blain

Disclaimer
The information contained in this publication is based on knowledge and understanding at the time of writing, May 2021. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Soil Conservation Service or the user's independent adviser.

1. Introduction

Julianne Blain, the owner of property address 2414 Thunderbolts Way, Tibbuc, NSW, engaged the Soil Conservation Service (SCS) to undertake a geomorphic condition assessment of an existing concrete causeway located on the Manning River at the above address.

The purpose of the assessment was to assess the current stability condition of the causeway and determine the likely geomorphic impacts of its retention and/or removal in the context of potential replacement by a proposed bridge.

SCS undertook a visual inspection of the site on 28th April, 2021 as well as a localised centreline long section survey to specifically determine impacts of causeway removal on the up and downstream river bed levels. Local geomorphic characteristics were noted during the field inspection and a desktop analysis undertaken to determine reach-based behaviour and condition.

The study reach is approximately 1.0 kilometres (km) long extending 100m downstream and 900 upstream of the causeway and flows south/south-west adjacent Thunderbolt's Way. The study reach is located within cleared agricultural land with good to moderate riparian vegetation.

Figure 1: Location of Manning River assessment reach on the Blain Property, Tibbuc.

2. Geomorphic Setting

The assessment site is located in a reach of the Manning River that can be classified into two RiverStyles ® impacting on river behaviour and condition. The first, where the causeway is located, is a **Partly Confined Valley Setting (PVCS)** bedrock controlled system. Here the river winds it's way through the floodplain, occasionally abuts the hillsides (valley margins) where it typically meets bedrock and is generally maintained in its position by the combined effects of the floodplain and native riparian vegetation. At water level the dominating features are gravel riffles, long pools, low sinuosity bends, occasional bedrock outcrops and moderate native vegetation coverage.

Approximately 500m upstream of the causeway, the river transitions to a **Confined Valley Setting (CVS)** where it encounters more bedrock and therefore has less potential to adjust across the smaller floodplain as it is 'locked' into place by bedrock outcrops occurring in the bed and valley margins.

3. River Behaviour

The geomorphic features present in the study reach provide evidence that this system reduces erosion potential through a combination of bedrock and riparian vegetation controls and floodwaters being able spill out onto the left floodplain where they dissipate energy rather than in the channel. This latter process is described as high floodplain connectivity. Additionally, the existing riparian vegetation within the site is in good to moderate condition allowing high natural recovery when erosion does occur. This refers to the ability of the river to re-stabilise following disturbance owing to the amount of native vegetation that can recolonise and provide stability to the channel.

Approximately one month prior to the site inspection, a large flood with an Average Return Interval of 30 years took place in the Manning Catchment. Total rainfall records for the month of March on the Manning River (Mt George) were 444mm. Reach scale expansion due to large scale erosion was not evident or likely given the natural controls described.

In summary the processes and controls that have provided stability to the river for thousands of years are still largely present.

4. Current Condition of Causeway and Channel

The causeway has been constructed on a point bar (eastern bank) riffle located at the downstream end of a straight pool on the inflexion point of two outside bends located approximately 300m apart. The pool downstream of the causeway is maintained by a gravel riffle located approximately 375m downstream of the causeway and the pool upstream is maintained by the causeway itself and extends upstream for approximately 530 metres before ending at a bedrock riffle.

The causeway is a typical river crossing construction consisting of a log bearer/joist frame with a 250mm thick capped concrete carriageway. The downstream edge of the causeway includes a 1.2m wide sloped apron to dissipate energy (Figure 3). Concrete ramps extending down to the level crossing exist on both banks.

The following table outlines the surveyed dimensions of the concrete causeway including failure points. Note CH 0.00 commences on the left/western bank.

Dimension	Metres/Chainage
Channel Spanning Length (Bed)	45
Channel Spanning Length Total (Bed and Sloped Ramps)	54
Carriageway Width	4
Total Width Including Downstream Apron	5.2
Partial-width carriageway failure	CH 4.50-9.00
Full-width carriageway failure	CH 9.00-17.00
Apron failure/loss	CH 17.00-20.50
Causeway concrete capping cavitation	CH 28.00-30.00

Table 1: Causeway dimensions

Figure 2: Looking lengthways along causeway towards western bank. Note upstream pool formed by causeway.

Figure 3: Concrete apron extending downstream of causeway and failure points towards western bank. Note drop of approximately 0.55m to downstream pool.

The current condition of the causeway is poor due to fluvial removal of the concrete capping in sections (See Table 1) rendering it unsafe and unable to function as river crossing point. The bearer and joist frame has been exposed in the failure points evident CH 4.50-17.00 (Figure 4).

Figure 4: Detail of causeway failure illustrating complete loss of concrete carriageway and exposed timber log frame.

The construction of the causeway historically raised the level of the bed in this location and instigated changes to local hydraulics and geomorphic units with the most noticeable impacts including:

- creation of an upstream weir pool which extends approximately 430m to the next riffle
- maintenance of a raised bed profile up and downstream
- a hydraulic grade differential (0.55m) up and downstream of causeway

Localised failure of the concrete capping, in addition to cavitation and apron loss, indicate poor structural integrity of causeway. Additionally, these failure points have resulted in exposed steel pins and concrete reinforcement making the site a potential safety hazard.

5. Long Section Survey

A longitudinal survey of the creek was undertaken of the up/downstream centreline bed level, causeway crossing and reach scale natural riffles to determine channel grade through the study reach and assess the impact of ongoing deterioration and/or removal. See Figure 5 below for location of key survey features described in Table 2.

Location	**Grade Differential (m)**
Bed level difference (grade offset) between up and downstream of causeway	0.70
Hydraulic grade differential between up and downstream of causeway	0.55
Hydraulic grade differential between causeway pool and upstream riffle	0.21
Average hydraulic grade differential between natural downstream riffles	1.16
Significant Geomorphic Features	
Average distance between natural riffles in reach	360m
Causeway is located mid-way along a raised bed profile that extends for 110m. Either side of this raised bed profile are deeper pools.	
All natural riffles surveyed are located on outside bends where the grade change has resulted in eroded banks in the last flood (March 2021)	
Causeway and associated raised bed profile is located on straight section of river.	

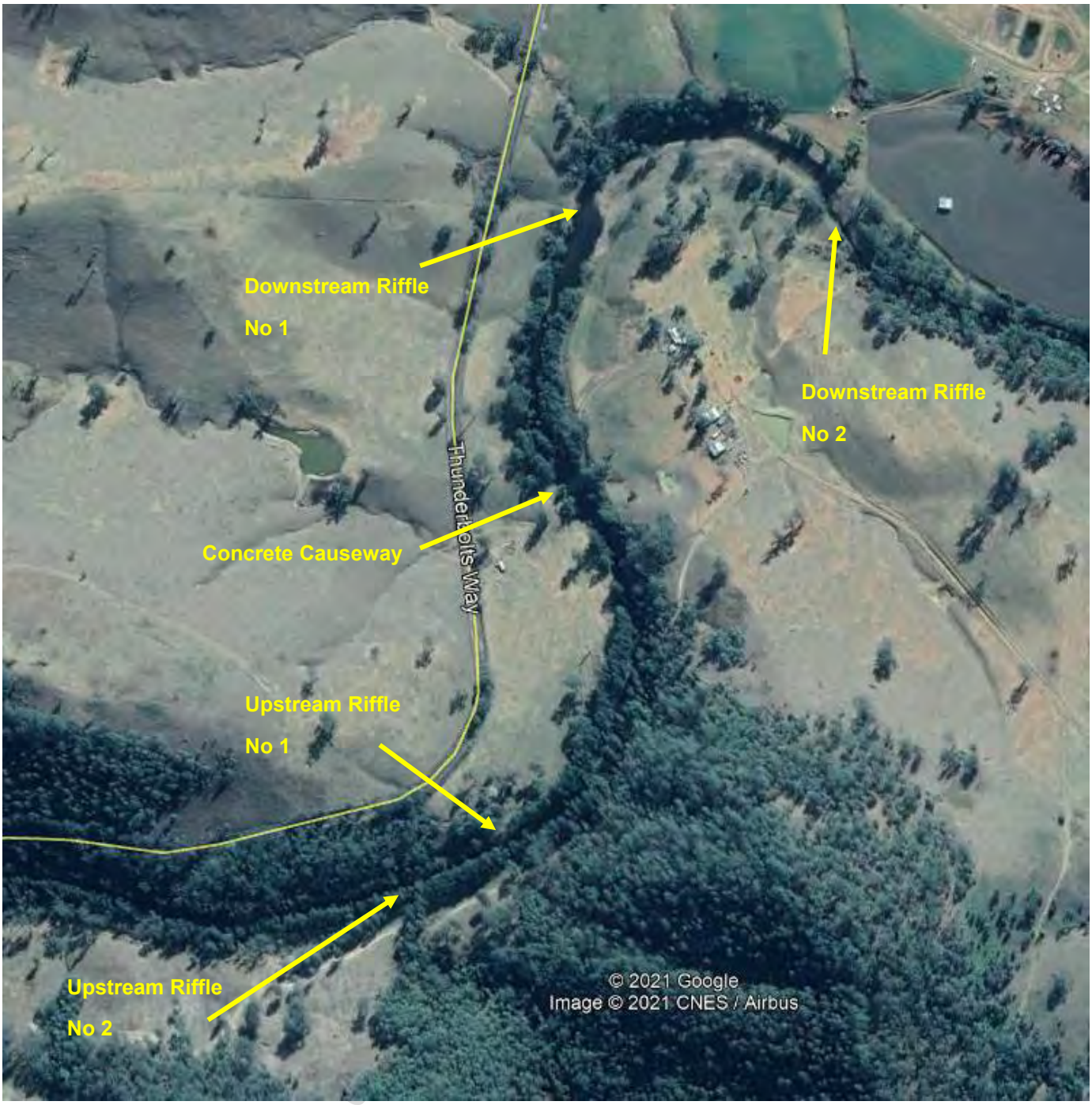

Figure 5: Key survey features along study reach

6. Geomorphic Impacts of Causeway Removal

The existing causeway provided the main thoroughfare in low-flow conditions to residential and other infrastructure on this property. The causeway has failed and an engineered bridge has been proposed as a crossing replacement. This geomorphic assessment was undertaken to assess the likely impacts of removing the causeway as part of the bridge proposal.

As detailed above, the hydraulic grade of 0.55m through the causeway is locked in place by the structure itself. The causeway therefore acts a grade control in this reach of the river and if removed so too is the means by which the bed levels have remained constant since it construction. The focus of this assessment is to determine the potential impacts of removing this control and the likelihood of them occurring.

One of the main concerns with potential removal of causeways is the impact to the channel, particularly upstream bed levels. Upstream bed levels are a concern if the grade offset is large enough to initiate bed incision often referred to as bed lowering. Bed lowering is the process whereby flows moving over a rapid change in grade can increase in velocity thereby causing erosion. The end result is the downstream bed level moves upstream. The negative impacts of this can be significant and are detailed below in Table along with the likelihood of them occurring if this causeway is removed:

Potential Impact of Removing Causeway	**Likelihood**	**Cause**
Significant, reach scale erosion/mobilisation of bed and bank material and downstream sedimentation.	**Unlikely**	Upstream reach is classified as a Confined Valley Setting dominated by bedrock in the channel which cannot be eroded/mobilised.
Localised adjustment of existing raised bed profile in vicinity of causeway.	**Likely**	Causeway removal will remove artificial grade control and river will potentially adjust.
Formation of a gravel riffle in the vicinity of removed causeway	**Likely**	Likely re-instatement of a riffle in this location given natural riffle spacings of 360m

Upstream modification of natural riffle	**Possible**	Exact height of potential riffle formation in causeway location (if removed) cannot be determined. If lower in height than causeway, the existing upstream pool will be lowered This will increase the existing hydraulic grade (0.12m) and flow over the upstream riffle. Note: The construction of a piered bridge will concentrate flows through this section of the river and it is likely the raised gravel bar beneath the causeway (if removed) will be mobilised and re-located immediately downstream.
Increased bank erosion	**Possible**	As above - if potential riffle formation resulting from causeway removal is lower than existing, the upstream pool will be lowered. This will result in exposed banks with increased erosion potential. Additionally, bank erosion is already occurring in vicinity of upstream riffle. If the grade of riffle increases (due to pool lowering downstream), erosion potential will increase adjacent existing gravel access road.

Table 2: Potential Impacts of Causeway Removal

Given the potential impacts of full removal of the causeway on bed and bank stability described in Table 2, additional causeway management options for replacing access with a proposed bridge in this location include:

1. Do Nothing Approach

This would involve constructing bridge over the top of the existing causeway leaving it to degrade over time. This introduces an element of risk to channel stability, and potentially the bridge, as the manner in which the causeway degrades cannot be determined. Initially the existing bed and bank would remain un-changed, however as the causeway degrades the bed level would adjust accordingly. Localised degradation (CH9.00-17.00) may continue causing concentrated flows or other weak points and failure may develop.

2. Partial Causeway Removal.

This would involve removing the entire concrete carriageway leaving the timber framework in-situ to act as a stabilising large woody debris structure in the bed of the stream. Additionally the partial lowering of the level of the causeway would reduce the potential of the likely impacts of full removal on channel grade detailed in Table 2. The potential deterioration of the timber framework will potentially mimic naturally occurring logs (large woody debris) found in rivers ie be re-distributed by floods over time and provide channel stability.

7. Recommendations

Based on surveys of the causeway and up and downstream channel, aerial photograph assessment and desktop investigations, it is recommended the dilapidated causeway can be partially removed as part of the proposed bridge construction without causing significant geomorphic impacts to the study reach. Partial removal would consist of removing the concrete carriageway and retaining the timber framework beneath.

Large scale upstream bed lowering is considered unlikely due to natural riffle formation if the causeway is partially removed. Downstream hydraulic grades on natural riffle formations are also similar (and sometimes greater) to the grade through the causeway as are riffle intervals, indicating a stable grade is likely to form following causeway removal.

The upstream riffle (No 1) and right bank immediately downstream should be monitored for stability post partial causeway removal.

Appendix F – Author CVs

BRENDON YOUNG
Project Manager

Profile Summary

Brendon works with AEP in the role of Project Manager and Ecologist/Aquatic Ecologist. He graduated with a Bachelor of Applied Science (Fisheries w/Honours), a Masters in Environmental Management and Graduate Certificate in Fish Conservation and Management. Brendon has previously worked in large retail operations in staff and budget/data management, reporting and quality assurance which adds to the experience that he currently contributes to the AEP team.

Academic Qualifications

Charles Sturt University

- Master of Environmental Management (Water Resources) 2022
- Graduate Certificate of Fish Conservation and Management

University of Tasmania

- Bachelor of Applied Science (Fisheries) with Honours

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)

Professional Experience

Project Manager/Aquatic Ecologist Anderson Environment & Planning Newcastle NSW	Jan 2024 – Present
Project Lead/Ecologist Anderson Environment & Planning Newcastle NSW	Oct 2023 – Jan 2024
Ecologist Anderson Environment & Planning Newcastle NSW	Sept 2022 – Oct 2023
Department Manager Woolworths Pty Ltd	2013 - 2022
Produce Quality Control Officer Woolworths Pty Ltd	Mar 2019 - Oct 2019

Relevant Project Experience

Ecological Surveys

- Watercourse Assessment with the NRAR Waterfront Land Tool in Huner Valley, Central Coast, Midcoast and Dubbo regions.
- Key Fish Habitat surveys at Karuah River Port Stephens, Hunter River Lochinvar and Chisholm, Manning River Tibbuc and Lachlan River Stubbo.
- Dip netting for *Mogurnda adspersa* in Lochinvar, Tibbuc, Chisholm and Stubbo.

- Seagrass and Mangrove surveys in Port Stephens.
- Targeted, systematic transects for threatened flora species.
- Deployment of Camera Traps, Songmeter and Anabats across central Coast and Hunter Valley regions for targeted survey.
- Spot Assessment Technique surveys: Halloran, Windella, Ourimbah, Chisholm.
- Weed mapping: Taree, Ourimbah, Hunter Valley.

University

- Training with aquatic sampling techniques such as seine nets, gill nets and fyke nets.
- Training in the use of mist netting, bat harp traps, Elliot traps, pitfall traps and camera traps.
- Identification of fish, reptiles, insects, and plants to species level through honours research and other projects while studying.

Ecological Assessment

- Riparian and watercourse assessment with the Waterfront Land Tool in the Hunter Valley, Central Coast, Sydney and Hastings regions.
- Preparation of Vegetation Management Plans in the Hunter Valley, Central Coast and Midcoast regions.
- Bushfire Threat Assessment in accordance with PBP 2019 at various sites across the Hunter Valley and Central Coast regions.
- Assist with Arborists assessments in Central Coast, Sydney, Mudgee and Hunter Valley Regions.

Ecological Monitoring

- Primary contributing author for Garden Suburbs Biodiversity Stewardship Site Assessment Report and associated Management Plan.

Publications

- Courtney, A.J., Schemel B.L., Wallace, R., Campbell, M.J., Mayer, D.G. and Young, B. (2005) *Reducing the impact of Queensland's trawl fisheries on protected sea snakes*. FRDC Project No. 2005/053. Queensland Government.

Jarrod Baxter
Ecologist

Profile Summary

Jarod works with AEP in the role of `Ecologist. He graduated with a Bachelor of Science (Marine Systems). Jarod has previously worked in football administration before coming to AEP. Jarod has experience in a variety of aquatic and marine work, both paid and unpaid. Jarod's special interest areas and expertise include the identification of aquatic flora and fauna species observed during Riparian Assessments and Aquatic Surveys.

Academic Qualifications

- Bachelor of Science (Marine Systems & Management) – Southern Cross University, 2023
- Higher School Certificate – Northholm, Grammar School, 2020

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Currently undertaking PADI Open Water dive course, Coffs Harbour

Professional Experience

Ecologist — 2024 – Present
Anderson Environment & Planning
Newcastle NSW

Referee Administration Assistant — 2023 - 2023
Norther NSW Football
Speers Point NSW

Football Referee — 2023 - Present
Northern NSW Football
Speers Point NSW

Events & Admin Coordinator — 2023 - Present
Northern NSW Football
Speers Point NSW

Work Placement Intern — 2022 - 2022
Marine Discoveries
Cains QLD

Ocean Youth Ambassador — 2019
Sea Life
Sydney NSW

Relevant Project Experience

Ecological Surveys

- Targeted Nocturnal Surveys searching for Squirrel Glider in Wyee (2024)
- Spot Analysis Techniques surveys in Austral (2024)

Ecological Assessment

- Riparian Assessments across NSW (2024)
- Aquatic Assessments searching for Key Fish Habitat and Purple Spotted Gudgeon in Stubbo and Lochinvar (2024)

Ecological Monitoring

- VMP Monitoring in the Northern Beaches (2024)

NATALIE BLACK

Senior Ecologist

Profile Summary

Natalie works with AEP in the role of Senior Environmental Manager. She has extensive knowledge in environmental management, environmental planning, fisheries, aquatic and riparian environments, and report writing and assessment. With a detail understanding of planning, catchment management, coastal management and rehabilitation. Natalie has had a successful career with both state and local government in conservation, planning and field investigation roles. Natalie has also gained extensive communication skills and project management through her previous career in lecturing in a range of course with a focus on environmental management and environmental legislation. Her background and experience in the ecological and planning fields is utilised in a diverse array of application in her current role.

Natalie Black is a conservation detection dog handler and is currently working with his purpose breed working English Springer Spaniel “Gus” who is currently trained to detect Koala scat, Forest Owl pellets and Cane Toads.

Academic Qualifications

- B.Sc (Hons) Sustainable Resource Management and Marine Science – University of Newcastle, 2001
- Master Planning – University of Technology Sydney, 2007
- Certificate IV Training and Assessment – TAFE, 2012
- BAM Assessor; accreditation number: BAAS19076

Training, Licences and Professional Memberships

- NSW Class C Driver’s Licence
- Provide First Aid HLTAID011
- Evidence Gathering and Legal Process, Australian Institute of Environmental Health
- Conflict Resolution Course (LGSA)
- Report Writing Course (LGSA).
- Powerful Presentation (LGSA)
- NSW Rural Fire Services Bush Fire Assessment
- Relocation of Threatened Species, Botanical Gardens Sydney
- Sustainable Home Assessment Reduction Revolution
- Flora and Fauna Survey Assessments Niche Environment and Heritage

Professional Experience

Senior Environmental Manager / Works Coordinator 2019 – Present

Anderson Environment & Planning

Newcastle NSW

Principal Environmental Planner 2010 - 2019

Black Earth

Newcastle NSW

Senior Lecture 2010 - 2019

Hunter TAFE

Range of Hunter Campuses

Natural Resource Manager and Development Assessment Officer 2003 - 2010

Lismore City Council

Lismore NSW

Fish Passage Expert 2002 - 2003

NSW Department of Primary Industries

Ballina NSW

Conservation Officer 2000 - 2002

NSW Department of Primary Industries

Crows Nest, NSW

Volunteer NSW Fisheries 1998 - 2000

Varied Roles

Port Stephens, NSW

Relevant Project Experience

Ecological Survey examples

- Target surveys for *Thelymitra adorata* Halloran; Wyee, Wadalba;
- Target surveys for *Melaleuca biconvexa* Mardi, , Halloran; Wyee, Wadalba
- Target surveys for *Tetratheca juncea* Hillsborough, Mardi, Thornton, Warners Bay;
- Target surveys for *Rhodamnia rubescens* Hillsborough, Mardi, Thornton, Stuarts Point, South West Rocks,
- Target Survesy for Cumberpalin Snail and Dural Snail, Rouse Hill
- Target Search for seagrass and threatened marine fauna, Stuarts Point, South West Rocks, Lake Macquarie, Peat Island,
- Powerful Owl nest locating and monitoring: Salamander Bay
- Spot Analysis Techniques surveys: Lismore, Wallsend, Salamander Bay, North Arm Cove, Warnervale, Hamlyn Terrace, Wyee, Charlestown, Chisholm, Gillieston Heights, Mount Vincent, Hillsborough;
- Surveys for Squirrel Glider (*Petaurus norfolcensis*) Wadalba, Rouse Hill, Claremount Meadows, Wyee, Hillsobourgh, South West Rocks, Stuart Point;
- Frog Surveys: Lismore, Wallsend, Salamander Bay, North Arm Cove, Warnervale, Hamlyn Terrace, Wyee, Charlestown, Chisholm, Hillsborough Rouse Hill, Kariong, Wadalba,

Ecological Assessment examples

- Accredited Assessor for approved Biodiversity Development Assessment Reports:
  - Teraglin Village, Chain Valley Bay;
  - Railway Road, Warnervale;
  - McFarlane's Road, Chisholm;

- Fairlands Road, Medowie;
- Raymond Terrace Road Chishlm,
- Annangrove Road, Rouse Hill
- Richmond Road, Marsden Park,
- Claremount Meadows,
- Newcastle Golf Course, Fern Bay,
- Newell Highway, Gilgandra
- Narromine Road, Dubbo

- Ecological Assessment Report for Proposed Modification to Approved Western Rail Coal Unloader At Pipers Flat;
- Infrastructure Ecology Reports;
  - Wyee Water Main;
  - Mardi Water Main;
  - Wyee Rising Main;
  - Mardi Rising Main;
- Summerhill Waste Facility Recycling Plant

Ecological Offsets and Monitoring

- Biodiversity Stewardship Agreements including:
  - Hillsborough
  - Blueys Beach,
  - Allandale,
  - South-West Rocks.
- Biodiversity Management Plans / Vegetation Management Plan / Wildlife Management Strategies
  - VMP for Proposed Modification to Approved Western Rail Coal Unloader At Pipers Flat;
  - VMP / WMS / Dewatering Plan for Wyee for 23ha Offset lands
  - VMP Rouse Hill Commercial Development.
  - BMP – Claremount Meadows Commercial Development.

Planning – Approved Review of Environmental Factors

- South West Rocks Installation of Seawall,
- Lake Macquarie upgrade of carpark, boat ramp and jetty,
- Demolition of two (2) jetties Peat Island,
- Stuart Point upgrades to caravan park including boat ramp.
- Wyee Rising Main
- Anambah Recycling Facility

Bushfire Threat Assessments

- Kempsey Correctional Facility for upgrade
- Stuarts Point Caravan Park for upgrades
- Claremount Meadows for a Commercial development included Daycare, and service station
- Batlow for a Service Station
- Lovedale for a change of use to Brewery