



BELLINGEN
SHIRE COUNCIL

REVIEW OF ENVIRONMENTAL FACTORS ASSESSMENT REPORT

PART 5 ENVIRONMENTAL PLANNING & ASSESSMENT
ACT 1979

PROJECT:	KALANG RIVERBANK STABILIZATION WORKS
LOCATION:	32 & 88 HAINS LANE ROAD, BRIERFIELD, NSW 2454
JOB NO:	J200036
DOCUMENT NO:	J200036-REF02
VERSION:	2.0



1 Document Control

1.1 Control Version

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1.2 Document Status

Revision	Date	Description	By	Checked	Approved
2.0	16 June 2025	First draft version of REF.	CL	ST	ST
2.0	12 June 2025	Final draft version of REF	CL		

1.3 Change History

Revision	Date	Elements of Change	Amended by
2.0	16 June 2025	First version issued.	Celeste Lymn
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1.4 Document Overview

Business Unit	Bellingen Shire Council – Environment, Sustainability and Waste				
Client	Ozfish/ Tallowood Environmental Engineering				
Project Title	Kalang riverbank stabilization works				
Project Number	J200036				
Location:	32 & 88 Hains lane Road, Brierfield, NSW 2454				
Document Title	Review of Environmental Factors Assessment Report - Kalang riverbank stabilization works				
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Document Manager	Celeste Lymn (River and Biodiversity Officer)				

1.5 Authorising Systems Officer

Name:	Celeste Lymn	Position:	River and Biodiversity Officer	Date	16 June 2025
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2 Introduction

2.1 Proponent Details

The environmental assessment and determination of the proposal has been undertaken in accordance with Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979). For this proposal, Bellingen Shire Council (BSC) is both a public authority proponent (EP&A Act 1979, Section 5.3) and the determining authority (EP&A Act 1979, Section 5.1). The works will be undertaken by Ozfish and Tallwood Environmental Engineering on behalf of BSC. This REF has been prepared in accordance with Clause 171 of Environmental Planning and Assessment Regulation 2021 (EP&A Regulations 2021). Table 2-1 below outlines the proponent contact details.

Table 2-1. Proponent details.

Project Name	Kalang riverbank stabilization works
Proponent (Council) Name	Bellingen Shire Council
Project Manager	Celeste Lymn
Position	Project Manager (River and Biodiversity Officer)
Contact Details	clymn@bellingen.nsw.gov.au

2.2 Objectives of Investigation

The objectives of the investigation are to assess the potential environmental impact of the proposed development, specify mitigation measures required both during construction and ongoing after completion of the development and determine whether the proposed development should proceed. Specifically, this investigation will address the following:

- Determine whether the proposed development is likely to cause significant impacts to environmental factors specified under Section 171 of the EP&A Regulations 2021 and specify any controls that are required during development work to mitigate these impacts.
- Determine whether a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is required by assessing whether the proposed development is likely to cause significant impacts to biodiversity.
- Determine whether an Environmental Impact Statement (EIS) is required by assessing whether the proposed development is likely to cause significant impacts other than or in addition to biodiversity.
- Determine whether the proposed development is likely to cause significant impact to an item listed under the Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 and if so, whether the Minister for the Environment and/or Department of Environment and Heritage is required to be notified or is required for approval of the project.



- Determine whether the Minister for Planning and/or the Department of Planning is required to be notified or is required for approval of the project.
- Assess alternatives or alterations to the proposed development that may mitigate potential environmental impacts.
- Identify regulatory requirements to obtain licenses or permits from other agencies or regulatory bodies.
- Determine whether there is sufficient information to decide on whether the proposed development should proceed.
- Determine whether the proposed development can proceed subject to any mitigation measures and/or conditions.

2.3 Description of Activity

Remediation works to stabilize and revegetate the riverbank along a 270m section of the Kalang River, which runs through two private properties at 32 & 88 Hains Lane, in Brierfield, NSW. The location of the site is shown on Figure 1. in Appendix A. This reach has experienced significant riverbank erosion, which has worsened over several years with substantial and frequent flooding events. This project is proposing to improve terrestrial and aquatic habitat, minimize the loss of land on private property and improve water quality.

The erosion remediation design by Tallowood Engineering, is broken into six sections along the reach, as per Appendix I.

The project involves reshaping the mid to upper bank in certain areas, stabilising the bank's toe, constructing a stable drop structure at the re-entry point, and ensuring a smooth connection between the upstream and downstream banks. To assist with stabilization, riparian vegetation will be planted on the upper slopes on the bank. Landholders will also install fencing to exclude stock and allow the revegetation plantings to regenerate post project.

This Review of Environmental Factors (REF) will also evaluate the temporary structural modifications along Hains Lane, which serves as the machinery access route to the site and adjacent riverbank where construction activities will occur. Two existing structures are located along the lane: a timber bridge and a cattle grid with surface grating. Both structures require temporary reinforcement to accommodate increased load-bearing demands associated with construction vehicle traffic.

For the timber bridge, temporary reinforcement will be implemented using steel supports and load bearing base plates installed within the creek bed to disperse bearing loads. Installation of temporary timber bearers are to be fastened directly under existing bridge beams to enhance structural capacity and secure the supports. Further engineering assessment is required to determine the current load capacity of the bridge and to identify appropriate supporting members and installation measures necessary to safely accommodate construction vehicle traffic. The structures will be installed for a period of 1-2 weeks.



In the case of the cattle grid, a load-distributing steel plate is to be deployed over the grating to facilitate the safe passage of heavy equipment.

If engineering advice determines that alternative works are required to maintain the structural integrity of both the bridge and the cattle grid during the works, the potential impacts of these works are considered to be greater than those currently outlined, an addendum to this REF may be required to ensure that potential impacts are adequately assessed.

A figure showing the locations of the proposed works is provided as Appendix A, Figure 1.

2.3.1 Timing And Duration of Works

Core bank stabilization works (Phase 1 & 2) are expected to commence in September 2025 and are expected to be completed within 2 weeks (weather permitting). Fencing instalment and revegetation works are proposed to be completed by October 2026. The proposed works will be undertaken during standard working hours according to NSW Environmental Protection Authority (Formerly) DECCW (2009) as follows:

- 7:00 am – 6:00 pm Monday to Friday
- 8:00 am – 1:00 pm Saturday
- No work on Sundays or Public Holidays



2.3.2 Summary of Construction Methodology

The works will be separated into two phases:

Phase 1 – Preliminary Works

1. Engineering assessment of access bridge and cattle grid to determine appropriate temporary support methodology and load capacity requirements.
2. Installation of temporary support structures at the bridge and cattle grid to accommodate for construction equipment and vehicles.

Phase 2 – Bank stabilisation works

(design as seen in Appendix I)

1. Earthworks

Earthworks will include stripping and excavating the topsoil of the bank, battering and laying organic materials which will aid revegetation.

2. Rock placement

Rock will be installed below the water at a ratio of 1.5:1 slope (angle of repose) and above water at a batter ratio of 2:1. Where required, rocks will be positioned to widen the toe of the river. Large trees with the root ball may also be laid in place to improve the flow rate.

Phase 3- Revegetation and stock exclusion

1. Native riparian plants will be planted along the bank to stabilize the soil

2.3.3 Summary Of Activities That Pose a Potential Risk to The Environment

Proposed activities that pose a potential risk to the environment and community include:

- Excavation and removal of vegetation and soil exposure for 1-2 weeks
- Stockpiling of construction materials, including soils which may be stored for extended periods.
- Construction works in the riparian area of the Kalang River
- Installation of temporary bridge supports into an ephemeral creek bed
- Spills associated with machinery, including petroleum products, oils and lubricants, hydraulic fluids, etc.
- Construction works in an area of high flood risk.
- Earthworks which may cause a potential disturbance of Acid Sulfate Soils
- Potential disturbance of waterway.
- Importing of organic materials (i.e. logs)



2.3.4 Estimated Value of the Development

Total combined funding of the Kalang riverbank stabilization works project is approximately \$300,000 ex GST.

2.4 Reason for Activity

Bellinghen Shire Council is working collaboratively with Ozfish and Tallowood engineering to conduct bank stabilization works to benefit the environment through enhancing water quality and restoring aquatic and riparian habitat within the project area. The erosion is also detrimental to the landowners, with the loss of land on several grazing paddocks, particularly on the left side of the bank. These stabilization works are also expected to significantly increase the flood resilience of the area while reducing erosional risks within the riparian area of this section of the Kalang.

2.5 Alternatives to the Activity

Alternative design options have been assessed based on their impact on the environment and community, economic cost and suitability for meeting the requirements. Alternative options include:

2.5.1 Not Proceeding with The Project

Not proceeding with the project would result in continued erosion of banks within the riparian area over time and further loss of private land. Once an area is destabilised and erosion begins, erosion will accelerate and continue to transport large amounts of sediment to the Kalang River approximately 100 m downstream. This will continue to impact aquatic and riparian habitat along the watercourse.

2.5.2 Existing Proposal

The proposed stabilization works will increase flood resilience of the area; minimise the risk of debris and silt build up along the water course and reduce erosion within the riparian area of the Kalang. The long-term benefits of the project for the environment and local community outweigh the costs and temporary construction works in the riparian area.



3 Legislative Framework

3.1 Environmental Planning and Assessment Act 1979 (EP&A Act 1979)

The *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) and the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulations 2021) provide the framework for development and environmental assessment in NSW.

As BSC is the proponent, the works have been assessed as 'development permissible without consent' under Part 5 of the EP&A Act. Accordingly, council must satisfy Sections 5.5, 5.6 and 5.7 of that Act by examining, and considering to the fullest extent possible, all matters which are likely to affect the environment. This REF is intended to address council's compliance with the EP&A Act including Sections 5.5, 5.6 and 5.7 and the requirements of clause 171 of the EP&A Regulations 2021. Environmental Planning Instruments made under the EP&A Act 1979 may also be relevant and are addressed below.

3.1.1 State Environmental Planning Policy (Transport & Infrastructure) 2021

The State Environmental Planning Policy (Transport & Infrastructure) 2021 (T&I SEPP 2021) consolidates and repeals the provisions of the following 4 SEPPs:

- SEPP (Infrastructure) 2007 (Infrastructure SEPP)
- SEPP (Educational Establishments and Childcare Facilities) 2017 (Education and Childcare SEPP)
- SEPP (Major Infrastructure Corridors) 2020 (Corridor SEPP)
- SEPP (Three Ports) 2013 (Three Ports SEPP).

The T&I SEPP 2021 aims to facilitate the delivery of infrastructure across NSW by identifying whether certain types of infrastructure require consent, can be carried out without consent or are exempt development. The following sections are relevant to the proposed development:

- Bank stabilisation works- This activity meets the requirements to be considered permitted without consent under the Transport and Infrastructure SEPP (T&I SEPP) 2021, Chapter 2, Division 25, Section 2.165 (1). Which states:
"Development for the purpose of waterway or foreshore management activities may be carried out by or on behalf of a public authority without consent on any land."

"(3) In this section, a reference to development for the purpose of waterway or foreshore management activities includes a reference to development for any of the following purposes if the development is in connection with waterway or foreshore management activities—

- d) environmental management works."*



3.1.2 State Environmental Planning Policy (Resilience & Hazards) 2021

The State Environmental Planning Policy (Resilience & Hazards) 2021 (R&H SEPP 2021) consolidates and repeals the provisions of the following 3 SEPPs:

- SEPP (Coastal Management) 2018 (Coastal Management SEPP)
- SEPP 33 – Hazardous and Offensive Development (SEPP 33)
- SEPP 55 – Remediation of Land (SEPP 55)

The R&H SEPP 2021 aims to provide planning provisions for land use within the coastal zone consistent with the Coastal Management Act 2016, manage hazardous and offensive development, provide a statewide planning framework for the remediation of contaminated land and to minimise the risk of harm. In particular, the R&H SEPP provides additional provisions for development consent on the following types of land:

- Coastal wetlands and littoral rainforest (H&R SEPP 2021, Chapter 2, Part 2.2, Division 1 Section 2.7).
- Land in close proximity to Coastal wetlands and littoral rainforest (H&R SEPP 2021, Chapter 2, Part 2.2, Division 1 Section 2.8).
- Coastal Vulnerability Areas (H&R SEPP 2021, Chapter 2, Part 2.2, Division 2 Section 2.9).
- Coastal Environment Areas (H&R SEPP 2021, Chapter 2, Part 2.2, Division 3 Section 2.10).
- Coastal Use Area (H&R SEPP 2021, Chapter 2, Part 2.2, Division 4 Section 2.11).

The R&H SEPP 2021 also provides an exemption for development carried out by or on behalf of a public authority within the above land areas if the development is identified in any of the following:

- The relevant certified coastal management plan.
- A plan of management prepared and adopted under Chapter 6, Part 2, Division 2 of the Local Government Act 1993.
- A plan of management under Division 3.6 of the Crown Land Management Act 2016.

The following considerations must be made for proposed projects in the following land areas:

3.1.2.1 Coastal Wetlands and Littoral Rainforest:

- (4) *A consent authority must not grant consent unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.*

3.1.2.2 Land in close proximity to Coastal Wetlands and Littoral Rainforest:

- (1) *Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on—*
- a. the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or*



- b. the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.*

3.1.2.3 Coastal Vulnerability Areas:

The State Environmental Planning Policy (Resilience & Hazards) 2021 (R&H SEPP 2021) consolidates and repeals the provisions of the following 3 SEPPs:

- SEPP (Coastal Management) 2018 (Coastal Management SEPP)
- SEPP 33 – Hazardous and Offensive Development (SEPP 33)
- SEPP 55 – Remediation of Land (SEPP 55)

The R&H SEPP 2021 aims to provide planning provisions for land use within the coastal zone consistent with the Coastal Management Act 2016, manage hazardous and offensive development, provide a statewide planning framework for the remediation of contaminated land and to minimise the risk of harm. In particular, the R&H SEPP provides additional provisions for development consent on the following types of land:

- Coastal wetlands and littoral rainforest (H&R SEPP 2021, Chapter 2, Part 2.2, Division 1 Section 2.7).
- Land in close proximity to Coastal wetlands and littoral rainforest (H&R SEPP 2021, Chapter 2, Part 2.2, Division 1 Section 2.8).
- Coastal Vulnerability Areas (H&R SEPP 2021, Chapter 2, Part 2.2, Division 2 Section 2.9).
- Coastal Environment Areas (H&R SEPP 2021, Chapter 2, Part 2.2, Division 3 Section 2.10).
- Coastal Use Area (H&R SEPP 2021, Chapter 2, Part 2.2, Division 4 Section 2.11).

The R&H SEPP 2021 also provides an exemption for development carried out by or on behalf of a public authority within the above land areas if the development is identified in any of the following:

- The relevant certified coastal management plan.
- A plan of management prepared and adopted under Chapter 6, Part 2, Division 2 of the Local Government Act 1993.
- A plan of management under Division 3.6 of the Crown Land Management Act 2016.

The following considerations must be made for proposed projects in the following land areas:

3.1.2.4 Coastal Wetlands and Littoral Rainforest:

- (5) *A consent authority must not grant consent unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.*

3.1.2.5 Land in close proximity to Coastal Wetlands and Littoral Rainforest:

- (2) *Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the Coastal Wetlands and*



Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on—

- a. the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or*
- b. the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.*

3.1.2.6 Coastal Vulnerability Areas:

Development consent must not be granted to development on land that is within the area identified as “coastal vulnerability area” on the Coastal Vulnerability Area Map unless the consent authority is satisfied that—

- a. if the proposed development comprises the erection of a building or works—the building or works are engineered to withstand current and projected coastal hazards for the design life of the building or works, and*
- b. the proposed development—*
 - i. is not likely to alter coastal processes to the detriment of the natural environment or other land, and*
 - ii. is not likely to reduce the public amenity, access to and use of any beach, foreshore, rock platform or headland adjacent to the proposed development, and*
 - iii. incorporates appropriate measures to manage risk to life and public safety from coastal hazards, and*
- c. measures are in place to ensure that there are appropriate responses to, and management of, anticipated coastal processes and current and future coastal hazards.*

3.1.2.7 Coastal Environment Area:

(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—

- a. the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*
- b. coastal environmental values and natural coastal processes,*
- c. the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*
- d. marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*
- e. existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*
- f. Aboriginal cultural heritage, practices and places,*



- g. the use of the surf zone.*
- (2) *Development consent must not be granted to development on land to which this section applies unless the consent authority is satisfied that*
- a. the development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (1), or*
 - b. if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or*
 - c. if that impact cannot be minimised—the development will be managed to mitigate that impact.*

3.1.2.8 Coastal Use Area:

- (1) *Development consent must not be granted to development on land that is within the coastal use area unless the consent authority—*
- a. has considered whether the proposed development is likely to cause an adverse impact on the following—*
 - i. existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*
 - ii. overshadowing, wind funnelling and the loss of views from public places to foreshores,*
 - iii. the visual amenity and scenic qualities of the coast, including coastal headlands,*
 - iv. Aboriginal cultural heritage, practices and places,*
 - v. cultural and built environment heritage, and*
 - b. is satisfied that—*
 - i. the development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (a), or*
 - ii. if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or*
 - iii. if that impact cannot be minimised—the development will be managed to mitigate that impact.*
 - c. has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.*

3.1.3 State Environmental Planning Policy (Biodiversity & Conservation) 2021

The State Environmental Planning Policy (Biodiversity & Conservation) 2021 (B&C SEPP 2021) consolidates and repeals the provisions of the following 11 SEPPs:

- SEPP (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP)
- SEPP (Koala habitat Protection 2020 (Koala SEPP 2020)
- SEPP (Koala habitat Protection 2021 (Koala SEPP 2021)
- Murray Regional Environmental Plan No. 2 – Riverine Land (Murray REP)



- SEPP 19 – Bushland in Urban Areas (SEPP 19)
- SEPP 50 – Canal Estate Development (SEPP 50)
- SEPP (Sydney Drinking Water Catchment) 2011 (Sydney Drinking Water SEPP)
- Sydney Regional Environmental Plan No. 20 – Hawkesbury – Nepean River (No. 2 – 1997) (Hawkesbury-Nepean River SREP)
- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (Sydney Harbour Catchment SREP)
- Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment (Georges River REP)
- Willandra Lakes Regional Environmental Plan No. 1 – World Heritage Property (Willandra Lakes REP)

The B&C SEPP 2021 aims to provide:

- Planning rules and controls for the clearing of native vegetation in NSW.
- Planning and assessment framework for koala habitat.
- Provisions to protect and preserve bushland within public open space zones and reservations.
- Provisions to prohibit canal estate development.
- Provisions to manage, support, protect and conserve environmental aspects of specific major rivers and lakes in NSW which are outside the Bellingen Local Government Area (LGA) including the Murray River, Sydney Harbour and the World Heritage listed Willandra Lakes.

Section 2.7 of the B&C SEPP 2021 states that a permit or approval to clear vegetation on non-rural land (Defined in Section 2.3 of the B&C SEPP 2021) under this policy is not required if it is a clearing authorised under s60(O) of the Local Land Services Act 2013 (LLS Act). Section 60(O) of the LLS Act provides an exemption for clearing under Part 5 of the EP&A Act and therefore consent is not required under the B&C SEPP 2021.

Chapter 4 of the B&C SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for *Phascolarctos cinereus* (Koala) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline for specific LGA's listed in Schedule 2 of the SEPP which includes the Bellingen LGA. Chapter 4 of the B&C SEPP specifies when a council can provide development consent under part 4 of the EP&A Act 1979. As the proposed development is permissible without consent, Chapter 4 of the B&C SEPP 2021 does not apply. Despite this, Consideration of impacts to koala and koala habitat may still be relevant under the BC Act 2016.

3.1.4 Bellingen Local Environment Plan 2010

The Bellingen Local Environment Plan 2010 (Bellingen LEP 2010) specifies local environmental planning provisions for land in Bellingen. The plan is subject to the provisions of any State Environmental Planning Policy that prevails over this plan, including the T&I SEPP. The aims of the LEP are to:



- Protect and promote the use and development of land for arts and cultural activity.
- Facilitate implementation of Council's adopted strategic planning documents.
- Identify land that is suitable for development or environmental protection purposes and to encourage or restrict development accordingly.
- Respond to changes in the natural, social and economic environment in a manner that is consistent with the principles of ecologically sustainable development.

Section 7.1 of the LEP specifies when development consent is required for developments that may impact Acid Sulfate Soils. This is addressed within the environmental investigation section of the REF.

Section 5.21 of the LEP specifies the requirements for development to be granted consent in flood planning areas, which include:

- Development being compatible with the flood function and behaviour on the land.
- Development not adversely affecting flood behaviour in any way that results in a detrimental increase in the potential flood affectation of other development of properties.
- Development not adversely affecting the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.
- Development includes appropriate measures to manage risk to life in the event of a flood.
- Development will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.

In deciding whether to grant development consent on land within flood planning areas the consent authority must consider the following:

- a) the impact of the development on projected changes to flood behaviour as a result of climate change,
- b) the intended design and scale of buildings resulting from the development,
- c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,
- d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.

3.2 Environmental Planning and Assessment Regulations 2021 (EP&A Regulations 2021)

The EP&A Regulations provide further detail on the provisions of the EP&A Act and prescribe how they are enforced and penalties for non-compliance. Importantly, Part 8, Division 1, Section 171 of the EP&A Regulations prescribes the factors that must be assessed as part of a REF. In addition, Section 171 also prescribes additional requirements that define when a REF must be published, as follows:

(4) The review of environmental factors must be published on the determining authority's website or the NSW planning portal if—



- a. the activity has an estimated development cost of more than \$5 million, or*
 - b. the activity requires an approval or permits as referred to in any of the following provisions before it may be carried out—*
 - i. Fisheries Management Act 1994, sections 144, 200, 205 or 219,*
 - ii. Heritage Act 1977, section 57,*
 - iii. National Parks and Wildlife Act 1974, section 90,*
 - iv. Protection of the Environment Operations Act 1997, sections 47–49 or 122, or*
 - c. the determining authority considers that it is in the public interest to publish the review.*
- (5) The review must be published under subsection (4)—**
- a. before the activity commences, or*
 - b. if publishing the review before the activity commences is not practicable—as soon as practicable, and no later than 1 month, after the activity commences.*

Section 171, (4, b) requires publication of the REF if an approval or permit is required for any of the following:

- FM Act 1994 (Sections 144, 200, 205 or 219) – relate to aquaculture permits, dredging or reclamation permits for local authorities, permits to harm marine vegetation and permits to block fish passage respectively.
- Heritage Act 1977 (Section 57) – relates to approvals granted by the minister for planning (state heritage items) or the local council (local heritage items) that allow work to be undertaken on an item listed on the State Heritage Register.
- National Parks and Wildlife Act 1974 (Section 90) – relates to aboriginal heritage impact permits.
- Protection of the Environment Operations Act 1997 (Sections 47-49 and 122) – relate to licenses for scheduled activities and forestry approvals respectively.

3.3 Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)

The EPBC Act protects matters of National Environmental Significance (NES), which includes:

- World Heritage Items (listed under the United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage List).
- National Heritage Items (listed under the National Heritage List).
- Commonwealth Heritage Items (listed under Commonwealth Heritage List).
- Wetlands of international importance (listed under the Ramsar convention)
- Listed threatened species and communities (listed under the EPBC Act List of Threatened Ecological Communities, EPBC Act List of Threatened Fauna and EPBC Act List of Threatened Flora).
- Listed migratory species (listed under the EPBC Act Migratory Species List).
- Protection of the environment from nuclear actions.



- Marine environment which protects Commonwealth Marine Areas, listed marine species (listed under Section 248 of the EPBC Act) and whales (cetaceans) and their important habitats.
- Great Barrier Reef Marine Park.
- Protection of water resources from unconventional gas development and large coal mining development.
- Additional matters of NES listed under the EPBC regulations 2000 Division 2.2.

If matters of NES are identified on and near the site, an assessment of the activity must be undertaken in accordance with Significant Impact Criteria in the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013). If a significant impact is found to be likely, a referral to the Commonwealth Department of Environment is required. Impacts to matters of NES have been considered within this REF.

3.4 Biodiversity Conservation Act 2016 (BC Act 2016)

Part 7 of the BC Act provides the environmental assessment requirements for activities being assessed under Part 5 of the EP&A Act 1979. If a significant impact is likely, a Species Impact Statement is required. A biodiversity development assessment report may also be required if the proponent elects for this. Section 7.2(1)(a) and 7.3 describe the assessment requirements and thresholds for what is considered a significant impact. Schedule 4 of the Act specifies key threatening activities which are considered likely to adversely affect threatened species or ecological communities or could cause species or ecological communities to become threatened (e.g. removal of hollow bearing trees). Impacts to threatened species and communities listed under this Act have been assessed as part of this REF.

3.5 Local Land Services Act 2013 (LLS Act 2013)

The objects of the LLS Act include 'to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistently with the principles of ecologically sustainable development. The Act regulates the clearing of native vegetation; however, section 60(O)(b)(ii) excludes the need for consent under the LLS Act where the clearing is an activity carried out by a determining authority within the meaning of Part 5 of the EP&A Act 1979.

3.6 Fisheries Management Act 1994 (FM Act 1994)

FM Act provides for the protection, conservation, and recovery of threatened species, populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fishery resources in NSW. Part 7 of the FM Act requires that a permit is



issued by the minister for works that involve dredging, reclamation, harming of marine vegetation, blocking of fish passage, use of explosives or electrical devices within a waterway.

3.7 National Parks and Wildlife Act 1974 (NPW Act 1974)

The NPW Act regulates the control and management of all national parks, historic sites, nature reserves, and Aboriginal areas. The main aim of the Act is to conserve the natural and cultural heritage of NSW. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required. Where works are to be undertaken on land or may result in impacts to land managed by NPWS, written permission from the land managers must be obtained. Impacts to aboriginal heritage and NPWS managed land have been assessed as part of this REF.

3.8 Heritage Act 1977

The objectives of the heritage act are to identify, protect and conserve items of the State's heritage. The heritage act covers the following items:

- Local heritage items (listed under schedule 5 of the Bellingen LEP 2010).
- State heritage items (listed under the State Heritage Register).
- Interim heritage orders under Part 3 of the Heritage Act (including items of both state and local heritage significance).
- Section 170 Heritage Items (Heritage and Conservation Register).

If heritage items or interim heritage orders or listings are identified that may be impacted by the works, the works are considered a controlled activity and approval is required under Part 4 of the Heritage Act.

3.9 Protection of the Environment Operations Act 1997 (POEO Act 1997)

The POEO Act is the key environmental protection and pollution statute. The POEO Act is administered by the EPA and establishes a licensing regime for waste, air, water and pollution. Relevant sections of the Act are listed below:

- Part 5.3 Water Pollution
- Part 5.4 Air Pollution
- Part 5.5 Noise Pollution
- Part 5.6 Land Pollution and Waste

The POEO Act specifies scheduled activities under schedule 1. A license is required to carry out any activity which is considered a scheduled activity. Relevant activities that may be considered scheduled activities include:



- Waste Disposal (application to land) which includes the application of waste received from off-site to land by spreading, mixing, filling, raising, reclaiming, contouring, etc, of land.
- Waste storage which includes the receiving of waste material from off-site and storing (including storing for transfer).

Section 143 of the POEO act prohibits the transport of waste materials to a place that cannot lawfully be used as a waste facility for that waste. This includes intentional transport (e.g. by a vehicle) and unintentional transport (e.g. by erosion and sediment transport). An environmental protection licence (EPL) is generally required for materials to be lawfully accepted at a receiving site.

NSW EPA have developed orders and exemptions for specific types of waste which exempt waste producers and receivers from some license requirements provided they are used/stored in an approved way. If waste or excess material are generated and intended to be transported to an unlicensed receiver, an assessment of the material must be undertaken, and a statement of compliance prepared to confirm the material meets the requirements of an order and associated exemption.

3.10 Water Management Act 2000 (WM Act 2000)

The WM Act's main objective is to manage NSW water in a sustainable and integrated manner that will benefit today's generations without compromising future generations' ability to meet their needs. Section 60A of the WM Act specifies that a water access licence is required to allow the taking of water from a water source. Section 91 of the Act requires approval for controlled activities undertaken within waterfront land (land within the waterway and within 40 m of the bank, high water mark or shore depending on the type of waterway) and activities that may interfere with an aquifer. Controlled activities include:

- The erection of a building or carrying out of a work within the meaning of the EP&A Act 1979.
- The removal of material or vegetation from land.
- The deposition of material on land.
- The carrying out of any activity that affects the quantity or flow of water in a water source.

Clause 41 of the Water Management (General) Regulation 2018 provides an exemption for public authorities in relation to all controlled activities on waterfront land. Although formal approval under the WM Act 2000 is not required, if the proposed activity is within 40m of a waterway, the requirements of controlled activities should be implemented as far as reasonably practicable to reduce risks to waterways.

Schedule 4, Part 1 of the Water Management (General) Regulation 2018 provides a number of exemptions for water access licences that apply to council works including:

- **(2) Road's authorities:** a roads authority (within the meaning of the Roads Act 1993) in relation to water required for road construction and road maintenance.



- **(5) Dust suppression:** any public authority lawfully engaged in the use of water for dust suppression.
- **(7) Water taken in the course of certain aquifer interference activities:** any person lawfully undertaking an aquifer interference activity which required the extraction of less than 3 ML of groundwater within a year, where the purpose of the groundwater is not consumption or supply. Activities included under this exemption include:
 - (d) excavation required for the construction of a building, road or infrastructure.
 - (e) remediation of groundwater.
 - (f) investigation of groundwater resources or geotechnical investigations.
 - (g) testing of water quality from monitoring bores.

3.11 Roads Act 1993

The roads act defines roads authorities, their responsibilities and provides some exemptions to allow roads authorities to meet their responsibilities. For all unclassified roads and many classified roads, Council is the roads authority. For some, classified roads, Transport for NSW (TfNSW) is the road authority. If TfNSW is the road authority for the road in which the proposed activity is intended to be undertaken, concurrence from TfNSW is required for the activity.

Section 88 of the Roads Act states that a roads authority may, despite any other Act or law to the contrary, remove or lop any tree or other vegetation that is on or overhanging a public road if, in its opinion it is necessary to do so for the purposes of carrying out road work or removing a traffic hazard. However, the environmental safeguards outlined in this REF still apply.

Section 138 of the Roads Act restricts the types of developments that can occur on public roads (within the road corridor). This section requires that works must not be carried out or structures erected on public roads without consent from the applicable road's authority. This is TfNSW for all classified roads and the local council for all unclassified roads.

3.12 Biosecurity Act 2015

The *Biosecurity Act 2015* and regulations provide requirements for state level priority weeds. The Act regulates all plants, with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. This REF considers the likelihood of encountering weeds and appropriate mitigation measures to reduce the risk of spreading.

If biosecurity or prohibited matter is encountered during the works, it triggers a duty under the act for the person to ensure that the biosecurity risk is prevented, eliminated or minimised as far as reasonably practicable. In the case of prohibited matter, the person who becomes aware of or suspects that a prohibited matter event has occurred also has a duty to notify the department of primary industries of the incident.



3.13 Crown Land Management Act 2016

The crown land management act aims to provide management of crown land, facilitate the use of crown land by aboriginal people for spiritual, cultural and economic purposes and to require social, cultural heritage and economic considerations to be taken into account in decision making about crown land.

In most cases, council will be designated the crown land manager in which case, the council is authorised to classify and manage the land as if it were public land within the meaning of the Local Government Act 1993. A plan of management may be prepared for the land which is binding under Division 3.6 of the Crown Land Management Act. The crown land manager must ensure that that the development achieves or works towards the objectives of any plan of management that applies to the land.

The Crown Land Management Act also has implications on native title. Section 8.7 of the Crown Land Management Act states:

“(1) A responsible person for relevant land cannot do any of the following unless the person has first obtained the written advice of at least one of the person’s native title managers that it complies with any applicable provisions of the native title legislation:

- a) grant leases, licences, permits, forestry rights, easements or rights of way over the land,*
- b) mortgage the land or allow it to be mortgaged,*
- c) impose, require or agree to covenants, conditions or other restrictions on use (or remove or release, or agree to remove or release, covenants, conditions or other restrictions on use) in connection with dealings involving the land,*
- d) approve (or submit for approval) a plan of management for the land that authorises or permits any of the kinds of dealings referred to in paragraph (a), (b) or (c).”*

Where any of these activities are intended to be undertaken, Council’s Native Title Manager must be consulted.

3.14 Local Government Act 1993 (LG Act 1993)

The local government act largely specifies how the local government system should operate and how local governments are accountable to the community. Of particular importance, Chapter 6, Division 2 describes the preparation and adoption of a plan of management (POM) for community land. Chapter 6, Division 2, Section 35 of the LG Act 1993 specifies that Community land is required to be used and managed in accordance with a POM applying to the land. This ref will assess whether any POMs exist for community land impacted by the development and whether the development meets the objectives of the relevant POMs.



3.15 Marine Estate Management Act 2014 (MEM Act 2014)

The objectives of the MEM Act 2014 are to provide for the management of the marine estate of New South Wales consistent with the principles of ecologically sustainable development. The marine estate includes:

- The coastal waters of the State within the meaning of Part 10 of the Interpretation Act 1987,
- Estuaries (being any part of a river whose level is periodically or intermittently affected by coastal tides) up to the highest astronomical tide,
- Lakes, lagoons and other partially enclosed bodies of water that are permanently, periodically or intermittently open to the sea,
- Coastal wetlands (including saltmarsh, mangroves and seagrass),
- Lands immediately adjacent to, or in the immediate proximity of, the coastal waters of the State that are subject to oceanic processes (including beaches, dunes, headlands and rock platforms),
- Any other place or thing declared by the regulations to be the marine estate.

Under the Act, the marine estate management authority must prepare a Marine Estate Management Strategy (MEMS), and public authorities are required to consider this document where relevant to the exercise of their functions.

The current MEMS is the NSW MEMS 2018-2028. This strategy has identified and prioritised 25 activities/threats. The threats most relevant to council activities include:

- (1) Urban stormwater discharge.
- (2) Estuary entrance modifications.
- (3) Agricultural diffuse source runoff.
- (4) Clearing riparian & adjacent habitat including wetland drainage.
- (6) Modified freshwater flows.
- (7) Foreshore development.
- (8) Recreation & tourism boating & boating infrastructure.
- (10) Sewage effluent & septic runoff.
- (12) Four-wheel driving.
- (13) Recreational fishing - boat-based line & trap fishing.
- (14) Passive recreational use – swimming surfing and dog walking.
- (15) Recreational fishing - shore-based line & trap fishing.
- (20) Deliberate introduction of pests and weeds.
- (24) Recreational fishing – hand gathering.

To manage these identified risks, the MEMS has proposed 9 management initiatives which include:

1. Improve water quality and reduce litter.
2. Deliver healthy coastal habits with sustainable use and development.
3. Planning for climate change.



4. Protecting the Aboriginal cultural values of the marine estate.
5. Reducing impacts on threatened and protected species.
6. Ensuring sustainable fishing and aquaculture.
7. Enabling safe and sustainable boating.
8. Enhancing social cultural and economic benefits.
9. Delivering effective governance.

The impact of the development on the identified threats/activities and opportunities to deliver outcomes that meet the proposed management initiatives must be considered within the REF.

The MEM Act also allows for the creation of Marine Parks and Aquatic Reserves which restrict the allowable activities that can be undertaken in these areas. Under Section 55 of the MEM Act the determining authority must not grant approval to undertake an activity under Part 5 of the EP&A Act 1979 unless they have taken into consideration the following:

- i. if there are management rules for the marine park or aquatic reserve, the purposes of the zone within which the area concerned is situated as specified in those management rules, and
- ii. the permissible uses of the area concerned under the regulations or the management rules, and
- iii. if a management plan for the marine park or aquatic reserve has been made, the objectives of the marine park or aquatic reserve, and
- iv. any relevant marine park or aquatic reserve notifications, and

3.16 Native Title Act 1993 (NT Act 1993)

The Native Title Act legislates the recognition of native title, establishes how native title applications can be submitted and how they are determined, establishes procedures for navigating dealings that may impact native title and establishes a mechanism by which compensation may be received due to acts that may extinguish native title.

Native title may be granted over crown and public lands which provide additional rights to aboriginal people in those areas. These rights commonly include:

- The right to hunt, fish and gather the traditional natural resources for non-commercial, personal, domestic and communal use.
- The right to take and use waters.
- The right to access and camp.
- The right to conduct ceremonies.
- The right to teach the physical, cultural and spiritual attributes of places and areas of importance on or in the land and waters.
- The right to have access to, maintain and protect from physical harm, sites in the Consent Determination Area which are of significance under the group's traditional laws and customs.



Council's, being crown land managers, must ensure that their activities do not impact on the rights of a community granted by native title. Where a potential impact on the rights granted under native title is identified on native title land, consultation must be undertaken with the Council's Native Title Manager and or the managers of the native title land.

3.17 Pesticides Act 1999

This act aims to control the use of pesticides to protect human health, the environment, property and trade. The definition of pesticides includes any substance used for the following purposes:

- Destroying, stupefying, repelling, etc any pest in relation to a plant, place or thing.
- Destroying plant.
- Modifying the physiology of a plant or pest to alter its natural development, productivity, quality or reproductive capacity.
- Modifying an effect of another agricultural product.
- Attracting a pest for the purpose of destroying it.
- Some veterinary products.

Section 5A of the Pesticides act defines the carrying out by a public authority of any of the following as prescribed pesticide work:

- Supply or use of pesticides without a fee or reward.
- the piloting or use of aircraft in connection with the supply or use of pesticides.
- The employment or engagement of persons to carry out the activities for the public authority.

Section 45 of the Pesticides Act 1999 specifies that prescribed pesticide work cannot be carried out without a licence granted by the NSW EPA for the proposed activity.

3.18 Work Health and Safety Regulations 2017 (WHS Regulations 2017)

The work health and safety act and regulations, specify the requirements of employers and duty of care that employers owe to employees to ensure a safe work environment. As council is an employer, it must follow all parts of this legislation relevant to its activities. This includes provision of personal protective equipment (PPE) required for workers to undertake their roles safely and provision of adequate training.

Chapter 8 of the WHS Regulations specifies the requirements for working with asbestos. Section 458 of the WHS Regulations 2017 requires that a PCBU (including Council) must ensure that asbestos removal works are undertaken by a licenced asbestos removal contractor where removal works comprise more than 10 m² of bonded (non-friable) asbestos containing material or any amount of friable asbestos containing material. Section 466 of the WHS Regulations 2017 requires that the regulator (SafeWork NSW) is notified at least 5 days prior to the commencement of licenced asbestos



removal works. Chapter 8, Part 8.7 also describes how the asbestos removal works must be carried out, including requirements for PPE, site controls, access restrictions, waste management, air monitoring and clearance/validation at the completion of the asbestos removal works.

Chapter 8, Part 8.6 specifies requirements for the demolition and refurbishment of structures or plant. Section 451 requires that demolition or refurbishment works must not be carried out until the structure or plant has been inspected for asbestos containing materials by a competent person. Section 452 requires all asbestos containing materials are identified and removed as far as reasonably practicable before the demolition is commenced.

3.19 Forestry Act 2012

The Forestry Act 2012 establishes the Forestry Corporation, sets its responsibilities, defines the lands that it manages and controls its operations. Division 2 of the Forestry Act 2012 prescribes when and how forestry can permit other parties (including Council) to occupy and/or undertake activities on Forestry Corporation owned or managed land through the use of forest permits and leases. If the activity is required to be undertaken on Forestry Corporation owned or managed land, the forestry land manager must be consulted to obtain a permit or lease, if necessary.

3.20 Coastal Management Act 2016 (CM Act)

The objectives of the Coastal Management Act 2016 are to protect and enhance coastal processes, environmental values, social and cultural values, acknowledge aboriginal peoples use of the coastal zone, support coastal economies, mitigate effects of climate change of coastal areas, etc. The act includes provision that may require or support councils to develop Coastal Management Programs (CMP) which set the long-term strategy for the co-ordinated management of land within the coastal zone to achieve the objectives of the act. Once a local council adopts a CMP, the minister may certify the CMP and require the council to publish it in a gazette making it legally enforceable. A council must consider whether the proposed activity is likely to impact on any items specified within the CMP and ensure that the activity is designed/undertaken to meet the objectives of the CMP.



4 Consultation

4.1 Community Consultation

Bellinghen Shire council, Tallowood engineering and Ozfish undertook consultation with Landholders at 32 & 88 Hains Lane through the preliminary erosion assessment phase, as well as through the project scoping phase pre on ground works. All respondents expressed support for the proposed works and landholders will be informed during all stages of construction and revegetation

4.2 T&I SEPP Consultation Requirements

Part 2.2, Division 1 of the T&I SEPP specifies consultation requirements for exempt developments under the SEPP. Table 4-1 Below summaries these consultation requirements and whether they are applicable to the proposed development.

Table 4-1. T&I SEPP Consultation Requirements.

Item	Applicable to Development	Action
Will the development have a substantial impact on stormwater management services provided by council?	No	None
Is the development likely to generate traffic to an extent that will strain the capacity for the road system in the local government area?	No – Truck movements for the earthworks will occur within a short time frame (when transporting rock, truck movements will be up to eight times per day over one day, and a Digger/ excavator will do 1 trip in (commencing works) and 1 trip out (concluding works).	Alert signage will be installed at Hains Lane during the construction phase, and alert will also go out to neighbouring properties by letter notification pre construction works. A notification of works will also be put on the Bellinghen Shire Council website alongside the published REF.
Will the development involve connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council?	No	None
Will the development involve connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council?	No	None



Item	Applicable to Development	Action
Will the development involve the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential?	No – There will be works to raise the existing bridge on the private property, but this will only affect the landowner.	None
Will the development involve excavation that is not minor or inconsequential of the surface of a road, or a footpath adjacent to a road, for which the council is not responsible for the maintenance of?	No	None
Is the development likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a state heritage item, in a way that is more than minor or inconsequential?	No	None
Is the development to be carried out on flood liable land and, if so, will it change flood patterns other than to a minor extent?	Yes - The land is situated within a flood prone area, however the works have been designed by an environmental consultant to flow with the natural of the river and to improve flood impacts to the two private properties and further downstream. This change is not considered likely to change flood patterns beyond a minor extent. Consultation with SES not required.	A flood action plan will be in place during the construction phase
Will the development be undertaken on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land?	No	None
Is the development adjacent to land reserved under the National Parks and Wildlife Act 1974 or to land acquired under Part 11 of that Act—the Office of Environment and Heritage?	No - OEH notification not required	None
Is the development on land in Zone C1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone, other than land reserved under the National Parks and Wildlife Act 1974—the Office of Environment and Heritage?	No - OEH notification not required	None



Item	Applicable to Development	Action
Is the development comprising a fixed or floating structure in or over navigable waters?	No – Transport for NSW (TfNSW) notification not required	None
Will the development increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map?	No – Director of the Observatory notification not required	None
Is the development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument?	No – Secretary of the Commonwealth Department of Defence notification not required	None
Is the development on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961?	No – Mine Subsidence Board notification not required.	None
Is the development on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property?	No - World Heritage Advisory Committee and Heritage NSW notification not required.	None
Is the development within a Western City operational area specified in the Western Parkland City Authority Act 2018, Schedule 2 with an estimated development cost of \$30 million or more?	No - Western Parkland City Authority constituted under that Act notification not required.	None
Is the development for the purpose of health services facilities, correctional centres or residential accommodation in an area that is bush fire prone land?	No	None

4.3 Aboriginal Community

The proposed development is being undertaken on assumed crown land (Kalang River) and therefore a crown lands application for a license will be submitted. The site is not located within an area under Native Title determination or in an area identified as an aboriginal site or place. As such consultation with the Council's Native Title Manager and aboriginal community stakeholders has not been undertaken.



5 Environmental Assessment

5.1 Location

5.1.1 Location Details

Location details of the site are provided in Table 5-1 below. A figure showing the location of the proposed development has been provided as Appendix A – Figure 1.

Table 5-1. Location Details.

Legal Description	LOT 10/DP801045 & LOT 12/ DP801045
Address	32 & 88 Hains lane Road, Brierfield, NSW 2454
Coordinates	-30.505802, 152.897932
Landowner	Bellingen Shire Council
Land Zone	RU1- Primary Production RU4- Primary Production small lots W2- Recreational Waterways
Site Context	Description: The site comprises of the southern bank of the Kalang River which meanders through two bordering rural properties in Brierfield. Surrounding land uses area as follows North – Farmland and increasing vegetation with connectivity into Tarkeeth State forest approximately 800m away and the Kalang River East – Farmland with increasing levels of forested land South – Farmland and the Kalang River West – Kalang Road and farmland and increasing vegetation with connectivity into Gladstone State forest approximately 1km away

5.1.2 Proximity of Site to Sensitive and Protected Environments

Details on the proximity of the site to sensitive and protected environments are provided in Table 5-2 below.

Table 5-2. Proximity of Sensitive and Protected Environments to the Site.

Type of Environment	Distance From Site
National Parks and Wildlife Services (NPWS)	1.8 km South
Marine Parks and Aquatic Reserves	38 km Northeast
Flood Prone Land	On-Site (Assumed)
Bushfire Prone Land	On-Site
Crown Land	On-site
Native Title Land	12.7 km East



State Forest	1km West, 800 m North
SEPP (Hazards and Resilience) 2021 – Coastal Management	The site is mapped within the Coastal environment area map

A figure showing the Bushfire Prone Land is provided as Appendix A – Figure 3 and flood prone land in Appendix A-Figure 5 the site is considered to be flood prone (1 % AEP event).

5.1.3 Site Inspection

Harry Chapman (Environmental Officer) attended site to conduct a pre-construction site inspection on the 11th of July 2024 from 9:00am to 2:00 pm and a secondary field assessment was undertaken by Celeste Lymn (River and Biodiversity Officer) on the 20th of March from 10:00 am to 1 pm. The inspections were undertaken to visually assess the physical and ecological environment at the site and in the immediately surrounding areas. Photographs collected during the inspections have been Provided as Appendix B – Photolog. The weather at the time of the inspections is presented in Table 5-3 below.

Table 5-3. Weather during site inspection.

Inspection	Primary Inspection	Secondary Inspection
Conditions	Fine	Fine
Cloud Cover	Partial Cloudy	Scattered clouds cover
Precipitation	None	None
Rain Since 9am	0 mL	0 mL
Temperature	11 °C	28 °C
Wind Speed and Direction	17 km/h NNW (Moderate)	9.7 km/h NNE (Light)

During the inspections, a flora and fauna assessment was undertaken to identify species present within the proposed development area and within adjacent areas that may be impacted by the proposed works. The flora and fauna identified during the inspection are presented in Table 5-4 below.

Table 5-4. Flora and fauna identified during inspection.

Scientific Name	Common Name	Native/Introduced	Conservation Status
Flora			
<i>Ficus coronata</i> ^{1, 2}	Sandpaper Fig	Native	Not listed as threatened
<i>Solanum mauritianum</i>	Wild Tobacco	Introduced	Weed
<i>Ligustrum sinense</i>	Narrow Leaf Privet	Introduced	Weed
<i>Ageratum conyzoides</i>	Billy Goat Weed	Introduced	Weed
<i>Ligustrum lucidum</i>	Broad Leaf Privet	Introduced	Weed
<i>Senna occidentalis</i>	Coffee Weed	Introduced	Weed
<i>Cinnamomum camphora</i>	Camphor laurel	Introduced	Weed
<i>Rubus rosifolius</i> ²	Native Raspberry	Native	Not listed as threatened
<i>Christella dentata</i>	Soft Fern	Native	Not listed as threatened



Scientific Name	Common Name	Native/Introduced	Conservation Status
<i>Eucalyptus grandis</i> ²	Flooded Gum	Native	Not listed as threatened
<i>Ceratopetalum apetalum</i> ¹	Coachwood	Native	Not listed as threatened
<i>Waterhousea floribunda</i> ¹	Weeping Lilly Pilly	Native	Not listed as threatened
<i>Glochidion ferdinandi</i>	Cheese Tree	Native	Not listed as threatened
<i>Psidium guajava</i>	Pink Guava	Introduced	Weed
<i>Eucalyptus microcorys</i> ⁴	Tallowood	Native	Not listed as threatened
<i>Allocasurina torulosa</i>	Forest/ River Oak	Native	Not listed as threatened
<i>Eucalyptus siderophloia</i>	Northern Grey Ironbark	Native	Not listed as threatened
<i>Colocasia esculenta</i> var. <i>esculenta</i>	Taro/Elephant Ear	Native	Not listed as threatened
<i>Cyperus</i> spp.		Native	Not listed as threatened
<i>Pittosporum undulatum</i>	Australian Cheesewood	Native	Not listed as threatened
<i>Melaleuca salicina</i>	Willow bottlebrush	Native	Not listed as threatened
<i>Platynerium bifurcatum</i>	Staghorn fern	Native	Not listed as threatened
<i>Lomandra longifolia</i>	Spiny-head Matt rush	Native	Not listed as threatened
<i>Lophostemon confertus</i> ^{1,2,4}	Vinegar tree		
	Basket grass	Native	Not listed as threatened
<i>Callistemon salignus</i> ²	White Bottlebrush	Native	Not listed as threatened
<i>Paspalum urvillei</i>	Vasey grass/ Giant Paspalum	Introduced	Not listed as threatened
<i>Diploglottis australis</i> ¹	Native Tamarind	Native	Not listed as threatened
<i>Melaleuca quinquenervia</i> ^{2,3,4}	Broad-leaved Paperpark	Native	Not listed as threatened
<i>Casuarina Glauca</i> ^{2,3,4}	Swamp she-oak	Native	Not listed as threatened
<i>Eucalyptus saligna</i>	Sydney Blue Gum	Native	Not listed as threatened
<i>Eucalyptus pilularis</i>	Blackbutt	Native	Not listed as threatened
Fauna			
<i>Rhipidura leucophrys</i>	Willie Wagtail	Native	Not listed as threatened
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Native	Not listed as threatened
<i>Meliphaga lewinii</i>	Lewin's honeyeater	Native	Not listed as threatened
<i>Cracticus torquatus</i>	Grey Butcherbird	Native	Not listed as threatened
<i>Gymnorhina tibicen</i>	Magpie	Native	Not listed as threatened
<i>Eopsaltria australis</i>	Eastern Yellow Robin	Native	Not listed as threatened
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	Native	Not listed as threatened
<i>Pachycephala pectoralis</i>	Golden Whistler	Native	Not listed as threatened
<i>Colluricincla harmonica</i>	Grey Shrike Thrush	Native	Not listed as threatened
<i>Columba leucomela</i>	White-headed pigeon	Native	Not listed as threatened
<i>Geopelia humeralis</i>	Bar shouldered dove	Native	Not listed as threatened
<i>Corvus orru</i>	Torresian crow	Native	Not listed as threatened
<i>Lopholaimus antarcticus</i>	Topknot pigeon	Native	Not listed as threatened
<i>Cormobates leucophaea</i>	White-throated tree creeper	Native	Not listed as threatened



Scientific Name	Common Name	Native/Introduced	Conservation Status
<i>Ceyx azureus</i>	Azure Kingfisher	Native	Not listed as threatened

¹ Species associated with Lowland rainforest of subtropical Australia EPBC Act TEC

² Species associated with Coastal swamp sclerophyll forest of NSW and south east QLD EPBC Act TEC

³ Species associated with Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community EPBC Act TEC

⁴ Species associated with Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions – EEC under the EPBC Act 1999.

Bank stabilization works

The proposed works includes the stabilization of 270m of riverbank on the south-east of the Kalang as per the design attached in Appendix I and revegetation works in the riparian areas and discussed in section 2.3.2.

The riverbank is considered highly disturbed showing visible erosion impacts, with mainly bare soil and sparse vegetation. Plant species included scattered; *Acacias*, *Callistemon* and *Iomandra* species and weed species along the riparian edge. The paddocks are a mixture of exotic pasture species and weeds and are highly degraded due to grazing and agricultural practices.

The sparse individual plants that are retained on the riverbank are likely to be impacted by the earthworks and may potentially be removed. These species were of low habitat value and replacement vegetation will be supported through the revegetation process.

The western edge of the bank contains a moderate riparian vegetation with native wet-sclerophyll and rainforest species. This adjacent bank was not surveyed for flora species due to accessibility constraints and no hollows, stick nests or suitable fauna habitat were sighted from a distance. This area will also not be subject to any construction work and was only assessed for any indirect impacts.

Hains Lane access works

As discussed above, the vegetation is cleared and highly degraded surrounding the direct worksite. However, due to the necessity of temporary amending of the bridge and cattle grid areas for access works, the surrounding vegetation along Hains Lane was also considered in the survey. Hains Lane was noted to have healthy wet sclerophyll vegetation. A rapid data point was taken in this area, however, due to minimal works in this area and no vegetation clearing being conducted, a full assessment was not completed. The plant community was identified to align with current vegetation mapping matching closely with the following:

- PCT 1071: Tallowwood - Small-fruited Grey Gum - Forest Oak dry open forest,
- PCT 1500: Brush Box - Tallowwood - Sydney Blue Gum shrubby wet open forest of coastal hills and escarpment ranges
- PCT 529: Weeping Lilly Pilly dry riparian rainforest

Canopy height was approximately 15m. Weed species were noted within the canopy, mid and understorey.



Within this patch of forest- six species were observed that match the Lowland Rainforest of Subtropical Australia, four species associated with Subtropical eucalypt floodplain forest and woodland, three species associated with the Coastal swamp sclerophyll forest and two species associated with the Coastal Swamp Oak (*Casuarina glauca*) Forest. In general species that formed part of these TECs were not considered dominant in terms of population. Dominant species in the area were camphor laurel (*Cinnamomum camphora*) Blackbutt (*Eucalyptus pilularis*) and Narrow Leaf Privet (*Ligustrum sinense*). The vegetation was noted to be in moderate condition, with healthy canopy, but disturbed edges and weed infestation through-out the understorey. PCT 529, is associated with the EEC Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion EEC (floodplain only), however, this EEC was not returned in the PMST and Bionet search for the location.

Under the wooden road bridge, the third order, unnamed stream was seen to be stagnant, with low levels of water (under 0.25m). This ephemeral stream flows into a remnant billabong which did not open into the Kalang at the time of the site inspection. This stream could provide potential habitat for frog species, however suitable aquatic habitat for fish species was unlikely at the time of inspection.

Due to the anticipated small impact of the proposed stabilization works and the location of the project within largely disturbed areas with little habitat value, a detailed assessment of fauna, including sampling of fauna, was not undertaken as part of this investigation. No threatened fauna species were sighted during this field assessment. Two hollow bearing trees were observed within the road corridor and several Koala feed trees were also noted within this area. Fauna identified during the site inspection was limited to bird life which largely appeared to preference the vegetation around the riparian area on the adjacent riverbank.

It is noted that the cattle grid and wooden bridge could be potential habitat for microbats such as, the Southern myotis (*Myotis macropus*). During the site visits both structures were inspected. No visual or olfactory signs of microbat habitation were observed. The wooden corbels were relatively continuous under the bridge and were noted to be within 0.5m of the water.

Aquatic habitat is present within the Kalang River and the adjoining streams and billabong. This could be suitable habitat for threatened frog and fish species.

5.1.4 Impact of Development on Land Use of Site and Surrounds

The proposed development is likely to have a minimal impact during works to the aquatic area of the site; however, the project seeks to improve the environmental values of the area and will assist in creating healthy habitat along the damaged riparian edge. It will also assist with healthy river flows and will reduce sediment loads further downstream. These works will also contribute to the flood resilience and will limit the loss of paddocks on the private land.

Key risks identified during the site visit that must be controlled include:

- Erosion and sediment transport due to excavations within the riparian area of the Kalang
- Disturbance of man-made structures that could be potential habitat for threatened bat species
- Possible fuel or hydraulic oil spills from construction plant and equipment



- Disturbance during works of potential aquatic habitat for frogs and fishes
- Possible disturbance of potential acid sulphate soils or actual acid sulphate soils.
- Potential spread of weed seeds that could spread down stream
- Need for flood control plans during all stages of development to limit supplies, waste or chemicals running into stormwater runoff
- Potential disturbance to microbat and amphibian habitat
- Alerts for community members who may be impacted by the transportation of machinery and materials along the lane

These issues are addressed in more detail in subsequent sections of this report. Controls required to mitigate these risks are summarised in Table 8-1. All risks identified during the site visit are considered practical to control. As such, no reason to preclude the development was identified at this stage in the investigation.

5.2 Landscape, Soils and Geology

5.2.1 Topography

The site is situated at a low point, in a wide floodplain of the upper Kalang Estuary. The area is influenced by tidal movements with elevation ranging from 5m to 8m. The lowest point exists at the edge of the bank, with the water mark sitting at 2m, where it then raises to 4m along the steep eroded edges. Most of the agricultural paddock also remains at a low elevation of 4m, with two rises of 6m closer to the isolated dam and increases in elevation towards the house, which is built at 22m. High points also exist near Hains Lane, with some elevation increases up to 16m.

During times of heavy rainfall and flooding, rainwater will be running towards the work site and materials and equipment are recommended to be stored away from the riverbank, billabong and grazing paddocks and towards the high points. Due to the site being susceptible to frequent flooding, a flood management plan must be prepared and implemented for the site which will cover any controls that will be installed in the work area to minimise the impact of a flood event at each stage of the works. Weather forecasts are to be included within the daily toolbox meeting to ensure risks of flooding are identified in advance.

5.2.2 Soil Classification

Soils in the area are classified as Dermosols (DE) under the Australian Soil Classification (ASC) system and Alluvial soils- (medium to heavy textured) in the Greater Soil Group Classification. A summary of the soil types identified on-site is provided below:

- **Dermosols** – are soils with structured sub-soil (B horizon) and lacking a strong texture contrast between topsoil (A horizon) and subsoil.
- **Alluvial soils**- medium to heavy textured



5.2.3 Acid Sulphate Soils

The site is mapped as three different classes of Acid Sulphate Soils (ASS) under the Bellingen LEP 2010:

- Class 4
- Class 3
- Class 1

Due to the Desktop assessment showing potential Class 4 Acid sulphate soils, a preliminary assessment was taken by Harry Chapman on the 11th of July 2024. This assessment included; two samples: 1. ASS01 from the river bed 0.5 mBGL, and 2. ASS02 0.5m into an existing cutting midway between the top of the bank and the water. The soil at ASS01 was a grey mottled black sandy clay just below the quartz gravel layer. The soil at ASS02 was a brown silty sand layer that appeared homogenous throughout the inspected profile. No odours were identified during sampling at either location. The laboratory testing determined ASS01 to have a CRS (wt% S) 0.45 and Net acidity of 320 (mol H⁺/t). ASS02 had a non-detect for CRS and a Net acidity of 39 (mol H⁺/t). The results of ASS01 triggered the need for a more detailed assessment.

Due to the results, secondary sampling was undertaken by Tallowood Environment & Engineering on the 4th of February 2025. This included eight (8) boreholes (BH1 to BH8) which targeted all Sections of the remediation and were sampled at various depths according to the proposed works. One sample was collected from each of the boreholes, at strategically selected layers to ensure all horizons were tested. No composite samples were taken.

Field screening and Laboratory testing results showed that the floodplain soils are not PASS although they are naturally acidic and did not detect the same levels of reactive sulphur. Full results can be found in Appendix J. Due to the Net Acidity levels just exceeding the adopted action criteria, an Acid Sulphate Soils Management Plan (ASSMP) has been prepared to minimise any environmental impacts from disturbing the soil during earthworks on-site. While this management plan may not be required to be activated during works it has been included as an attachment to this report and should be prepared to be activated in the event of evidence of reactivity of soil on site during soil disturbance. The plan is attached in Appendix J.

Activation of the plan should take place in the event of sulphatic odour (rotten eggs), or signs of reactivity taking place within soils or water as outlined below.

Water Indicators

- Yellow mottling or crusts
- Presence of jarosite, a yellow mineral that forms from acid reaction.
- Often seen in soil profiles or exposed surfaces.
- Low soil pH (acidic)
- pH values often below 4, indicating active acid generation.
- Acidic conditions can damage vegetation and corrode infrastructure.



- Strong sulphurous or rotten egg smell
- From hydrogen sulphide (H₂S) gas in undisturbed, waterlogged PASS areas (prior to oxidation).
- Vegetation stress or dieback
- Especially in low-lying areas or after drainage works.
- Caused by root damage from acidity or toxic metals (e.g. aluminium).

Water Indicators

- Very low pH (acidic water)
- Water pH can drop to <4, sometimes as low as 2–3 in extreme cases.
- Orange-red staining in waterways
- From iron precipitates (ferric iron) caused by oxidation and acid leaching.
- Often coats streambeds and drainage channels.
- Increased turbidity or cloudiness
- Caused by mobilised metals and iron flocculants.
- Presence of toxic metals (aluminium, iron, manganese)
- Acid conditions release these from the soil.
- Toxic to aquatic life and can exceed water quality guidelines.
- Fish kills or absence of aquatic life
- Due to acid shock or metal toxicity.

5.2.4 Impact of Development

In the short-term during earthworks, potential vegetation removal and shallow soil disturbance will be required. It is noted that vegetation removal will be undertaken within the riparian area of the Kalang. Once vegetation is removed and soil disturbed, there will be a high risk of erosion which is heightened due to the site comprising a water course known to flood. Embankments will be stabilised as soon as practical with rock revetment following disturbance to minimise erosion risk. An erosion and sediment control plan must also be prepared to manage the erosion risk during the works.

Over the longer term, reduced impact on the natural flow of the river, reduced risk of debris and silt build up and reduced occurrence of flood water retreating the banks will occur, which is expected to reduce the erosional risk at the site. This is expected to result in a positive impact on the environment through improved water quality and reduction of silting of aquatic habitat in the Kalang River, alongside restored riparian vegetation and habitat through native planting works.



5.3 Contaminated Land

5.3.1 Existing Environment

A search of the NSW Environmental Protection Authority's (EPA) public registers and the NSW Department of Primary Industries (DPI) cattle dip site locator was undertaken on 26th March 2025. The search results found within 1km of the site are presented in Table 5-5 below.

Table 5-5. NSW EPA Public Register Search Results.

Register	Number of Results	Description of Results
Licences	0	
Notices	0	
Enforceable Undertakings	0	
Contaminated Land	0	
Cattle Dip Sites	0	The nearest dip site exists at Newry 17km away

5.3.2 Impact of Development

No items were identified during the EPA Public Register and DPI cattle dip site locator search within 1km of the site. Therefore, no contaminated land controls are necessary for this project. It is noted however, that BSC previously held an EPA license (surrendered in 2011) to apply herbicides within/near waterways within the LGA. As the spoil from the excavation works is predicted to be used on the landholder's property, it is recommended that this is tested for chemicals prior to use.

5.4 Hydrology

5.4.1 Existing Environment

The project will be working along a 270m reach, in the bank of the Kalang River (Class 7 waterway). Temporary structures will also be installed under the access bridge in the unnamed 3rd order ephemeral waterway, this creek flows into the billabong, which was a historical meander cut of the Kalang River and still overflows in times of heavy rainfall.

The site is prone to flooding and is mapped as being within the 1:100-year flood zone, which includes the floodplain within the project area. Flood prone land mapping can be sighted in Appendix A- Figure 5. Due to the proposed vegetation removal and excavation within the riparian area of the waterway, there is a high erosional risk during any rainfall event. An erosion and flood control plan must be devised for Phase 1 & 2 of the project, to minimise sediment transport into the waterway.

Concrete gutters and stormwater systems are not present surrounding the site. There is therefore no permanent clean water diversion around the site. A clean water diversion control should be included within the erosion and sediment control plan, to prevent overland water flows from entering the work area.



Four groundwater bores licensed for residential water supply were identified within a 1km radius of the site, located between 660 m north (up-gradient) of the site and 900m south-east (down-gradient) of the site.

No data on standing groundwater level was available for the registered well. Given the works are occurring in close proximity to a water course, groundwater is expected to be present at near the surface water level of the Kalang River within the work area. Despite this, excavation is only required into the embankments in more elevated areas which is not anticipated to encounter groundwater.

The proposed works are therefore considered unlikely to impact groundwater and it is therefore unlikely that the works will result in any impact to the down gradient bores.

5.4.2 Impact of Development

Due to the proposed vegetation removal and excavation within the riparian area of the waterway, there is a high erosional risk during any rainfall event. Embankments must be stabilised as soon as practical following disturbance to minimise erosion risk. During vegetation removal, roots within the riparian area should be retained as far as reasonably practicable. An erosion and sediment control plan must also be prepared to manage the erosion risk during the development.

During the project, stormwater flows may flow through the work area before entering the Kalang River, as such, clean water diversion controls must be included in the erosion and sediment control plan.

At the completion of the earthworks, the site will be stabilised and rehabilitated which will reduce the risk of erosion.

Given the distance the groundwater bores are from the site and the nature of the works which are not expected to impact groundwater, no impact to groundwater or users of groundwater bores is anticipated.

5.5 Biodiversity

Species and communities included in the assessment were determined using a DPIE Bionet Atlas database search of areas within 10km of the site on 5th of May 2025 and an EPBC Act Protected Matters Search Tool within 10 km of the Site on the 19th of March 2025. Several threatened species have been noted within a 1km radius of the site from the bionet records including Grey-headed Flying-fox, Koala, Brush-tailed Phascogale, Giant Barred Frog, Wompoo Fruit Dove, Scrub Turpentine and Spider Orchid. A copy of the EPBC Act Protected Matters Search Tool summary report has been provided as Appendix C. The Threatened Species and Communities, and Migratory Species Potential Occurrence Assessment has been provided as Appendix D and Appendix E respectively. Habitat potentially suitable for threatened species and communities was identified on-site and as such, tests of significance in accordance with the BC Act 2016 and assessments of significance in accordance with EPBC Act 1999 have been prepared for these species and are provided as Appendix F and Appendix G respectively.



Given the small scope of the development within a highly disturbed riverbank, a detailed assessment of fauna, including sampling of fauna, was not undertaken as part of this investigation.

5.5.1 Threatened Ecological Communities (TECs)

During the Threatened Species and Communities Potential Occurrence Assessment (Appendix D) which reviewed the PMST and Bionet, the site was assessed to be marginally suitable for 2 TECs, and suitable for 2 TECs including:

- Lowland Rainforest of Subtropical Australia Critically Endangered (CE) under the EPBC Act 1999
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community – Endangered under the EBPC Act
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland- Endangered under the EBPC Act
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South-East Queensland bioregions – EEC under the EPBC Act 1999.

Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion EEC (floodplain only) was also shown to be associated with the vegetation communities on site, so it was also assessed below.

During the Site inspection, 5 flora species were observed that match the Lowland rainforest of subtropical Australia, 6 flora species were associated with Coastal swamp sclerophyll forest, 2 flora species were associated with Coastal Swamp Oak (*Casuarina glauca*) Forest and 4 species were associated with Subtropical eucalypt floodplain forest.

- **Coastal swamp sclerophyll forest**

The site was not considered suitable habitat for this EEC; this is due to its preference for floodplains that adjoin lithic (rocky) substrates or coastal sand plains. While there were some canopy species associated with this EEC, there were limited matches in the shrub and groundcover layer.

- **Coastal Swamp Oak (*Casuarina glauca*) Forest**

The site was not considered suitable habitat for this EEC; this is due to its preference for floodplains that adjoin lithic (rocky) substrates or coastal sand plains. While there were some canopy species associated with this EEC, there were limited matches in the shrub and groundcover layer.

- **Subtropical eucalypt floodplain forest**

The vegetation found on site matches several characteristics of this EEC, it occurs below 50m ASL in a riparian area on alluvial soils, however the patch size is below 0.5ha, so it is unable to be appropriately identified.

- **Lowland Rainforest on Floodplain**



The site was not considered suitable habitat for this EEC, as the vegetation found on site, was not matching the typical species including, Figs (*Ficus macrophylla*, *obliqua* and *watkinsiana*), Palms (*Archontophoenix cunninghamiana* and *Livistona australis*), Silky Oak (*Grevillea robusta*), Black Bean (*Castanospermum australe*) and Brush Cherry (*Syzygium australe*)

- **Lowland rainforest of subtropical Australia**

The key diagnostic characteristics of Lowland rainforest of subtropical Australia TEC as provided within the Threatened Species Scientific Committee TEC Advice (2011) are divided into 3 categories based on the condition of the environment. These categories are:

- A – Natural remnant TEC vegetation evident by the persistence of mature residual trees that match the TEC species list.
- B – Some residual trees that match the TEC species list are present plus evidence of natural regeneration and/or regeneration with active management.
- C – A non-remnant patch that has recovered through natural regeneration and/or supplementary planting that has a stature and quality that is reflective of the description.

Some residual trees that match the species list were identified at the site including some moderately sized Coachwood (*Ceratopetalum apetalum*), Weeping Lilly Pilly (*Waterhousea floribunda*), Several Vinegar trees (*Lophostemon confertus*) and a Native Tamarind. As such, the vegetation is most similar to category B vegetation. The diagnostic criteria for category B Lowland rainforest of subtropical Australia are assessed in Table 5-6 below.

Table 5-6. Assessment of diagnostic criteria for the Lowland rainforest of subtropical Australia TEC.

Criteria	Category B Requirement	Estimated Site Vegetation Patch Characteristic
Patch Size	≥ 1 ha	0.96 ha
Canopy Cover	≥ 70%	50%
Species Richness	≥ 30 species from TEC	6 species
Percent Native Vegetation Cover	≥ 50%	40%

The vegetation at the site is therefore not considered to meet the diagnostic criteria to be considered a TEC. It is possible that the area once comprised vegetation that matched this TEC however it has since been heavily disturbed due to the installation of a road through the area and clearing for the surrounding agricultural properties.

Despite the vegetation not meeting the diagnostic criteria to be considered a TEC, Tests of Significance were undertaken for TECs listed under the BC Act 2016 (Appendix F) and Assessments of Significance were undertaken for TECs listed under the EPBC Act 1999 (Appendix G). Based on the test and assessment of significance, the development is considered unlikely to have a significant impact on threatened ecological communities. This is largely due to the environment in the area being highly disturbed and weed impacted in its current state and the development aiming to increase habitat



value. The works will not involve any vegetation trimming or removal in the areas of suitable habitat for any of these TEC's.

5.5.2 Threatened Flora and Fauna Species

During the Threatened Species and Communities Potential Occurrence Assessment (Appendix D), the site was assessed to be suitable for 14 threatened fauna species and four threatened flora species and marginally suitable for 28 threatened fauna species and 14 threatened flora species, including:

Fauna:

Likely:

- Spotted-tailed Quoll (*Dasyurus maculatus*) – Vulnerable under the BC Act 2016 and endangered (E) under the EPBC Act 1999.
- Grey Falcon (*Falco hypoleucos*) – Vulnerable under the BC Act 2016 and EPBC Act 1999.
- Little Lorikeet (*Glossopsitta pusilla*) – Vulnerable under the BC Act 2016.
- Painted Honeyeater (*Grantiella picta*) – Vulnerable under the BC Act 2016 and EPBC Act 1999.
- White-bellied Sea Eagle (*Ichthyophaga leucogaster*) – Vulnerable under the BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) – Vulnerable under the BC Act 2016.
- Giant Barred Frog (*Mixophyes iteratus*) – Vulnerable under the BC Act 2016 and EPBC Act 1999.
- Southern Myotis, Microbat (*Myotis macropus*) – Vulnerable under the BC Act 2016.
- White-throated Needletail (*Hirundapus caudacutus*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Green and Golden Bell Frog (*Litoria aurea*) Endangered under the BC Act 2016 and Vulnerable under the EPBC Act 1999
- Square-tailed Kite (*Lophoictinia isura*) Vulnerable under the BC Act 2016.
- Golden-tipped Bat (*Phoniscus papuensis*) Vulnerable under the BC Act 2016
- Common Planigale (*Planigale maculata*) Vulnerable under the BC Act 2016
- Grey-headed Flying-fox (*Pteropus poliocephalus*) Vulnerable under the BC Act 2016 and EPBC Act 1999

Potential:

- Australian Fritillary (*Argynnis hyperbius inconstans*) Critically Endangered under the EPBC Act 1999
- Australian Bittern (*Botaurus poiciloptilus*) Endangered under the BC and EPBC Act 1999
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Large-eared Pied Bat, Large Pied Bat (*Chalinolobus dwyeri*) Vulnerable under the BC Act 2016 and Endangered under the EPBC Act 1999
- Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) Vulnerable under the BC Act 2016 and EPBC Act 1999



- Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*) Endangered under the BC Act and Critically Endangered under the EPBC Act 1999
- Black-necked Stork (*Ephippiorhynchus asiaticus*) Endangered under the BC Act
- Red Goshawk (*Erythroriorchis radiatus*) Endangered under the BC Act 2016 and EPBC Act 1999.
- Stephens' Banded Snake (*Hoplocephalus stephensii*) V under the BC Act 2016.
- Swift Parrot (*Lathamus discolor*) Endangered under the BC Act 2016 and Critically Endangered under the EPBC Act 1999.
- Little Bent-winged Bat (*Miniopterus australis*) Vulnerable under the BC Act 2016
- Stuttering Frog (*Mixophyes balbus*) Endangered under the BC Act 2016 and V under the EPBC Act 1999
- Blue-winged Parrot (*Neophema chrysostoma*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Powerful Owl (*Ninox strenua*) Vulnerable under the BC Act 2016
- Eastern Long-eared Bat (*Nyctophilus bifax*) Vulnerable under the BC Act 2016
- Eastern Osprey (*Pandion cristatus*) Vulnerable under the BC Act 2016
- Brush-tailed Phascogale (*Phascogale tapoatafa*) Vulnerable under the BC Act 2016
- Koala (*Phascolarctos cinereus*) Endangered under the BC Act and the EPBC Act 1999
- Sphagnum Frog (*Philoria sphagnicola*) Vulnerable under the BC Act 2016
- Long-nosed Potoroo (*Potorous tridactylus*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Hastings River Mouse, Koontoo (*Pseudomys oralis*) Endangered under the BC Act and the EPBC Act 1999
- Wompoo Fruit-Dove (*Ptilinopus magnificus*) Vulnerable under the BC Act 2016
- Rose-crowned Fruit-Dove (*Ptilinopus regina*) Vulnerable under the BC Act 2016
- Australian Painted Snipe (*Rostratula australis*) Endangered under the BC Act 2016 and EPBC Act 1999
- Diamond Firetail (*Stagonopleura guttata*) Vulnerable under the BC Act 2016 and EPBC Act 1999.
- Masked Owl (*Tyto novaehollandiae*) Vulnerable under the BC Act 2016
- Sooty Owl (*Tyto tenebricosa*) Vulnerable under the BC Act 2016

Flora:

Likely:

- *Euphrasia arguta* – CE under the BC Act 2016 and EPBC Act 1999.
- Tall Velvet Sea-berry (*Haloragis exalata subsp. Velutina*) Vulnerable under the BC Act 2016 and EPBC Act 1999



- Tall Knotweed (*Persicaria elatior*) – V under the BC Act 2016 and EPBC Act 1999.
- Native Guava (*Rhodomyrtus psidioides*) – CE under the BC Act 2016 and EPBC Act 1999.

Potential:

- Newry Golden Wattle (*Acacia chrysotricha*) Endangered under the BC Act
- Trailing Woodruff (*Asperula asthenes*) Vulnerable under the BC Act
- Leafless Tongue-orchid (*Cryptostylis hunteriana*) – V under the BC Act 2016 and EPBC Act 1999.
- Red Boppel Nut (*Hicksbeachia pinnatifolia*) Vulnerable under the BC Act 2016 and EPBC Act 1999
- Clear Milkvine (*Leichhardtia longiloba*) – E under the BC Act 2016 and V under the EPBC Act 1999.
- Macadamia Nut (*Macadamia integrifolia*) V under the EPBC Act 1999
- Slender Marsdenia (*Marsdenia longiloba*) E under the BC Act 2016 and V under the EPBC Act 1999.
- Rusty Plum, Plum Boxwood (*Niemeyera whitei*) Vulnerable under the BC Act 2016
- Milky Silkpod (*Parsonsia dorrigoensis*) Vulnerable under the BC Act 2016 and E under the EPBC Act 1999.
- Lesser Swamp-orchid (*Phaius australis*) E under the BC Act 2016 and the EPBC Act 1999.
- Scrub Turpentine (*Rhodamnia rubescens*) E under the BC Act 2016 and CE under the EPBC Act 1999
- Smooth-bark Rose Apple, Red Lilly Pilly (*Syzygium hodgkinsoniae*) Vulnerable under the BC Act 2016 the EPBC Act 1999
- Austral Toadflax, Toadflax (*Thesium australe*) V under the BC Act 2016 and EPBC Act 1999
- *Vincetoxicum woollsii* E under the BC Act 2016 and the EPBC Act 1999

Habitat suitable for these flora and fauna species is limited to the riparian of the waterway and the access track. Given the potential for these species to occur at the site, Tests of Significance were undertaken for threatened species listed under the BC Act 2016 (Appendix F) and Assessments of Significance were undertaken for threatened species listed under the EPBC Act 1999 (Appendix G).

Based on the test and assessment of significance, the development is considered unlikely to have a significant impact on threatened flora and fauna species. This is largely due to the environment in the area being highly disturbed within the work area. The project works also aim to greatly improve the habitat value of the site with revegetation works within the riparian area and increased flood and erosion resilience along this reach of the Kalang River.

The assessment/ test of significance did identify the requirement of pre-clearance surveys by an experience ecologist targeting the following species:

- Giant Barred Frog (*Mixophyes iteratus*)



- Green and Golden Bell Frog (*Litoria aurea*)
- Stuttering Frog (*Mixophyes balbus*)
- Sphagnum Frog (*Philoria sphagnicola*) Vulnerable under the BC Act 2016
- Southern Myotis Microbat (*Myotis macropus*)

If any of these species are reported within the works area, a stop work order will be issued, species will be relocated by an experience spotter catcher and exclusion fencing and materials will be installed surrounding the aquatic environment and the wooden bridge.

It is also recommended that site workers be inducted for the potential of wildlife crossing the roads, speed limits will be enforced, and any sightings will require notification to the River and Biodiversity Officer to be included in Bionet. In the unlikely event of an injury of fauna, wires will be called and appropriate agency informed.

The assessment/test of significance process identified a risk of introducing disease that may cause threatened species, identified to potentially occur at the site, to decline. The following threatened species have been identified to occur at the site and are susceptible to diseases that pose a threat to their survival.

Table 5-7. Threatened species with potential to occur at the site that are susceptible to disease

Species	Threatened Status	Disease Threat
Swift Parrot (<i>Lathamus discolor</i>)	E (NSW) / CE (National)	Psittacine Beak and Feather Disease (PBFD)
Native Guava (<i>Rhodomyrtus psidioides</i>)	CE (NSW & National)	Infection by <i>Austropuccinia psidii</i> (Myrtle Rust)
Red Goshawk (<i>Erythrotriorchis radiatus</i>)	E (NSW & National)	PBFD
Giant Barred Frog (<i>Mixophyes iteratus</i>)	V (NSW & National)	Infection by chytrid fungus (Chytridiomycosis)

The diseases presented above may occur within the Bellinghen LGA. As such, a hygiene procedure must be implemented which addresses the above diseases to mitigate the risk of introducing diseases to the area. Provided the controls within the hygiene procedure are implemented, the development is unlikely to introduce disease that may cause the species to decline.

5.5.3 Listed Migratory Species

During the Listed Migratory Species Potential Occurrence Assessment (Appendix E), the site was assessed to be suitable for six migratory species including:

Likely:

- White-throated Needletail (*Hirundapus caudacutus*) - listed as Vulnerable under the BC Act 2016 and EPBC Act 1999



- Yellow Wagtail (*Motacilla flava*) -not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Satin Flycatcher (*Myiagra cyanoleuca*)- not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Osprey (*Pandion haliaetus*)- not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Rufous Fantail (*Rhipidura rufifrons*) not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Common Greenshank (*Tringa nebularia*) - listed as Endangered under the EPBC Act 1999

Potential:

- Common Sandpiper (*Actitis hypoleucos*) -not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Fork-tailed Swift (*Apus pacificus*) not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Oriental Cuckoo, Horsfield's Cuckoo (*Cuculus optatus*) not listed as threatened under the BC Act 2016 and EPBC Act 1999
- Latham's Snipe, Japanese Snipe (*Gallinago hardwickii*) listed as Vulnerable under the EPBC Act 1999

Given the potential for these species to occur at the site, an Assessment of Significance was undertaken for migratory species listed under the EPBC Act 1999 (Appendix G). Based on the assessment of significance, the development is considered unlikely to have a significant impact on listed migratory species. This is largely due to the environment in the area being highly disturbed and weed impacted in its current state and the development aiming to improve the riparian and aquatic habitat of the site.

5.5.4 Key Fish Habitat and Threatened Fish Species

The site is mapped within Key fish habitat; this is inclusive of the works that will occur along the banks of the Kalang (class 7) and within the bed of the unnamed ephemeral watercourse (class 3).

As the works require excavation, filling (dredging and reclamation) and potential removal of vegetation within the riparian area of the key fish habitat, there is potential for an impact to key fish habitat and a permit for the works must be obtained from NSW DPI. To minimise the risk to key fish habitat, embankments must be stabilised as soon as practical following disturbance to minimise erosion risk. During vegetation removal, roots within the riparian area should be retained as far as reasonably practicable. An erosion and sediment control plan must also be prepared to manage the erosion risk during the development.

The NSW DPI Threatened Species (Fish) Indicative Distribution across NSW rivers and waterways derived survey records, predicted occurrence and expert opinion dataset was analysed to assess potential occurrence of threatened fish species listed under the FM Act 1994. Upstream approx. 200m to the north of the works site, Spicketts Creek (class 6 watercourse) is mapped as Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) habitat.



A seven-part test (as per the FM Act) to assess the likelihood of a significant impact upon threatened species was applied. The results of the seven-part test are presented in Appendix G. The test concluded that there is not likely to be any significant impact arising from the proposed activity on Southern Purple-spotted Gudgeon, this is due to the temporary nature of the works within the waterway and the works not blocking fish passage. While there is potential for individuals to occur within the site boundary, the works will not encompass the whole riverbed and allows for migration outside of the zone of impact. Any potential short-term impacts to the species will be mitigated by the improvement of aquatic habitat and water quality within the Kalang.

5.5.5 Koala Habitat

During the site inspection, the area was observed to be located within a cleared areas of farmland and no suitable Koala habitat was noted within the direct work site. Several Koala sightings have been reported within 1km of the site based on NSW Bionet Atlas data. These sightings are limited to the vegetated areas to the north-east and west of the site. No Koalas scats or scratches were sighted during the site inspection. However, several Koala feed trees were noted within the road reserve area along Hains Lane which will be used for machinery and vehicle access, this included, Tallowood (*Eucalyptus microcorys*) and Flooded Gums (*Eucalyptus grandis*)- The NSW DPE Restoring Koala Habitat - North Coast Koala Management Area Fact Sheet specifies these species are high use tree for Koalas. No vegetation clearing will occur in this area and therefore no direct impact will occur to Koala habitat. It is noted that a potential indirect impact could be road collision to Koala's crossing through the area, and so a control has been included for trucks and machinery to follow required speed limits and prepare and watch for crossing wildlife.

In the unlikely event that any Koalas are injured during works, WIRES are to be called for rescue. Sightings should also be reported to the River and Biodiversity Officer for submission to Bionet.

Key Threatening Processes

Assessment of whether the works involve key threatening processes listed under the BC Act 2016 is presented in Table 5-8 below.

Table 5-8. Assessment of whether the project involves key threatening processes.

Key Threatening Process	Within Scope of Work	
Aggressive exclusion of birds from woodland and forest habitat by abundant noisy miners (<i>Manorina melanoccephala</i>)	Yes ☐	No ☒
Alteration of habitat following subsidence due to longwall mining	Yes ☐	No ☒
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Yes ☐	No ☒
Anthropogenic climate change	Yes ☐	No ☒
Bush rock removal	Yes ☐	No ☒
Clearing of native vegetation	Yes ☒	No ☐



Key Threatening Process	Within Scope of Work	
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)	Yes ☐	No ☒
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)	Yes ☐	No ☒
Competition from feral honey bees (<i>Apis mellifera</i>)	Yes ☐	No ☒
Death or injury to marine species following capture in shark control programs on ocean beaches	Yes ☐	No ☒
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	Yes ☐	No ☒
Forest eucalypt dieback associated with over-abundant psyllids and bell miners	Yes ☐	No ☒
Herbivory and environmental degradation caused by feral deer	Yes ☐	No ☒
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Yes ☐	No ☒
Importation of red imported fire ants (<i>Solenopsis Invicta</i>)	Yes ☐	No ☒
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	Yes ☒	No ☐
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Yes ☒	No ☐
Infection of native plants by Phytophthora cinnamomi	Yes ☒	No ☐
Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	Yes ☒	No ☐
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>)	Yes ☐	No ☒
Invasion and establishment of exotic vines and scramblers	Yes ☐	No ☒
Invasion and establishment of scotch broom (<i>Cytisus scoparius</i>)	Yes ☐	No ☒
Invasion and establishment of the cane toad (<i>Bufo marinus</i>)	Yes ☐	No ☒
Invasion of native plant communities by African olive (<i>Olea europaea subsp. Cuspidate</i>)	Yes ☐	No ☒
Invasion of native plant communities by (<i>Chrysanthemoides monilifera</i>)	Yes ☐	No ☒
Invasion of native plant communities by exotic perennial grasses	Yes ☐	No ☒
Invasion of the yellow crazy ant (<i>Anoplolepis gracilipes</i>) into NSW	Yes ☐	No ☐
Invasion, establishment and spread of Lantana (<i>Lantana camara</i>)	Yes ☐	No ☒
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Yes ☒	No ☐
Loss of hollow-bearing trees	Yes ☐	No ☒



Key Threatening Process	Within Scope of Work	
Loss or degradation (or both) of sites used for hill-topping by butterflies	Yes ☐	No ☒
Predation and hybridisation by feral dogs (<i>Canis lupus familiaris</i>)	Yes ☐	No ☒
Predation by plague minnow or mosquito fish (<i>Gambusia holbrooki</i>)	Yes ☐	No ☒
Predation by the European red fox (<i>Vulpes vulpes</i>)	Yes ☐	No ☒
Predation by the feral cat (<i>Felis catus</i>)	Yes ☐	No ☒
Predation by the ship rat (<i>Rattus rattus</i>) on Lord Howe Island	Yes ☐	No ☒
Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>)	Yes ☐	No ☒
Removal of dead wood and dead trees	Yes ☐	No ☒

The project involves key threatening processes which may have the potential to impact threatened species. This has been assessed as part of the tests of significance in accordance with the BC Act 2016 and assessments of significance in accordance with EPBC Act 1999 provided as Appendix F and Appendix G respectively.

5.5.6 Impact of Development

All potential TECs and suitable habitat for threatened or migratory species is located within the riparian area around the unnamed ephemeral waterway. This proposed area of the development is highly disturbed and weed impacted. Vegetation removal or trimming will not be required in this section.

As discussed in Section 5.5.2, a potential temporary impact to the following species habitat may occur during the works, and individuals may be harmed during Phase 1 & 2 of the project:

- Giant Barred Frog (*Mixophyes iteratus*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Stuttering Frog (*Mixophyes balbus*)
- Sphagnum Frog (*Philoria sphagnicola*) Vulnerable under the BC Act 2016
- Southern Myotis Microbat (*Myotis macropus*)

Any direct impacts will be mitigated through a pre-clearance survey as specified in Appendix F & G. Habitat value will be greatly increased for these threatened species through the revegetation of riparian area.

Threatened species susceptible to disease have been identified on site. The diseases that pose a risk to these species may occur within the Bellingen LGA. As such, a hygiene procedure must be implemented which addresses these diseases to mitigate the risk of introducing diseases to the area. Provided the controls within the hygiene procedure are implemented, the development is unlikely to introduce disease that may cause the species to decline.



5.6 Heritage Items

5.6.1 Aboriginal Heritage

A search of the NSW Environment and Heritage Aboriginal Heritage Information Management System (AHIMS) was undertaken on 5th July 2024. No aboriginal sites or places were reported within approximately 1 km of the Site. A copy of the AHIMS report has been provided as Appendix H.

5.6.2 Non-Aboriginal Heritage

A search of the National Heritage List, State Heritage Register, Interim Heritage Order items and LEP Heritage Items was undertaken on 28th of March 2025. A summary of the items identified on and adjacent to the site is presented in Table 5-9 below.

Table 5-9. Identified non-aboriginal heritage items on and adjacent to the site.

Heritage Type	Number Identified On-Site	Number Identified Adjacent to Site
National Heritage List	0	0
State Heritage Register	0	0
Interim Heritage Order	0	0
Local Heritage Register	0	0

No non-aboriginal heritage items were identified on-site or within the surrounding areas.

5.6.3 Impact of Development

No aboriginal or non-aboriginal heritage items were identified on-site or within the surrounding areas. Given the distance of the site from heritage items, the development is considered unlikely to impact any heritage items.

5.7 Matters of National Environmental Significance

A search of the Department of Climate Change, Energy, the Environment and Water Protected Matters Search Tool was undertaken on 19th of March 2025 for areas within 10 km of the Site. A copy of the summary report has been provided as Appendix C. Identified TECs, threatened species and migratory species have been addressed in Section 5.5. A summary of the anticipated impact of the development on Matters of National Environmental Significance (MNES) is provided in Table 5-10 below. Assessments of significance used to determine the impact of the development are provided as Appendix G.

Table 5-10. Impact of development on MNES.



MNES	Items Potentially Occurring in Assessment Area	Impact
Extinct in the wild species.	0	No Significant Impact
Critically endangered and endangered species.	21	No Significant Impact
Vulnerable species.	22	No Significant Impact
Critically endangered and endangered ecological communities.	4	No Significant Impact
Listed migratory species.	10	No Significant Impact
Wetlands of international Importance.	0	No Significant Impact
The Commonwealth marine environment.	0	No Significant Impact
World Heritage properties.	0	No Significant Impact
National Heritage places	0	No Significant Impact
Nuclear actions	0	No Significant Impact
Great Barrier Reef Marine Park	0	No Significant Impact
Water resources in relation to unconventional gas development and large coal mining development.	0	No Significant Impact

The development is not anticipated to significantly impact any MNES.

5.8 Coastal Processes and Hazards

5.8.1 Existing Environment

As these works occur within the Kalang River, the site is mapped within the coastal use area. However, the coastline is 12.6km from the site.

5.8.2 Impact of Development

The project works were designed by an environmental engineer to follow the natural flow of the river and given the distance of the site from coastal land, the development is considered unlikely to impact any coastal processes or hazards.



5.9 Other Environmental Considerations

5.9.1 Noise and Vibration

The works will occur in a rural area, which has few nearby sensitive noise and vibration receptors. Six dwellings occupy the rural land within 500m of the works. Two of these landholders are involved in the project and the others will be notified of the works by mail. The works with plant equipment is only expected to be undertaken for a period of less than 2 weeks. Due to these factors, the receivers are considered unlikely to be significantly impacted by noise or vibration during the works. Regardless, works will be restricted to the recommended standard hours for construction work as specified within the NSW EPA (2020) Draft Construction Noise Guidelines and within working hours.

Fauna species which may be impacted by noise have been identified on bionet records within 1km of the works, these include Grey-headed Flying foxes, Brush tailed phascogale and Koala's. If any of these species are seen during the Phase 1 & 2 of the project, further noise and vibration controls for each species will be put in place.

5.9.2 Air Quality

The works have the potential to generate dust during Phase 1 & 2 of the project. This risk is increased during periods of high wind. Dust suppression controls must be implemented during the works to minimise the generation of airborne dust. Given the location of the site on private property in a rural area with few close neighbours, there is a low risk of dust complaints from the public. If complaints are received council will consider additional dust suppression controls.

The works will also involve the delivery and transport of off-site rocks, logs and native tube stock plantings. During transport, the materials have the potential to release dust. Vehicles must be equipped with covers or have covers applied. The load must be covered before the vehicle leaves the origin site.

Construction vehicles and equipment may reduce air quality by production of excessive or uncontrolled exhaust. Vehicles and equipment should not be left idling when not in use. Vehicles and equipment must be maintained in accordance with manufacturer's specifications to minimise exhaust pollution.

The work does not require the burning of any material. Waste materials must not be burnt at the site and must instead be disposed off-site to a facility lawfully licensed to accept the waste.

5.9.3 Waste and Chemical Management

Phase 1 & 2 of the project (access track amendment and bank stabilization works) will involve the use of the following machinery:

- 1 x 20-30 tonne digger
- 1 x 24t excavator w rotating grab
- 2 x truck and dogs for rock delivery/ log delivery



This machinery will require diesel, hydraulic fluid + grease. These will not be stored at the site and will be transported and applied as required. If chemicals are required to be stored at the site, they must be separated by their Globally Harmonised System (GHS) classification and be stored within bunds in a secure area. Chemicals must be used in accordance with their Safety Data Sheet (SDS) and manufacturers specifications. Diesel in the back of Utes must be stored in a proprietary diesel tank and are supplied with a spill caption system. Refuelling and maintenance of all vehicles and equipment will not be undertaken while on site.

Vehicles and equipment must be serviced before they arrive at site. In a breakdown situation, vehicles will be transported to a service facility where possible. Where a broken-down vehicle cannot be relocated, servicing may occur on-site with appropriate bunding, waste collection vessels and spill kits.

Waste including litter and food scraps may also be generated by workers during the project. All waste products will be removed each day.

Landholders will allow the use of their toilets and amenities during the project.

5.9.4 Traffic and Pedestrians

The works will involve the movement of light and heavy vehicle traffic on public roads, including Martell's Rd, Bowraville Rd and Hains Lane. This is within a short time period, with a truck transporting rock into the site ~ 8/ day over one day, from Valla (25km south of the site) and a digger/ excavator will be doing 1 trip into the site at the commencement of the project and 1 trip out after earthworks conclude. The digger/ excavator will be travelling from Macksville (50km south of the site). As the works are within a rural area, the impact to traffic is limited to residents that use Hains Lane for access to their property. However, these residents will be notified via mail of the project and traffic alert signage will be installed while bridge strengthening works are conducted.

No footpaths or pedestrian infrastructure are present on Hains Lane. Pedestrian traffic is uncommon but is likely to be on the roadway. Workers should be informed of the risk of pedestrians using Hains Lane for recreational walking, during the induction process.

5.9.5 Environmental Safety

Due to the isolated nature of the site with access through private property, environmental safety risks are minimal, however, no chemicals, including fuels should be kept at the site, and equipment and machinery should be locked if left on site overnight. Where possible, materials and tools should not be stored at the site outside construction hours.

5.9.6 Asbestos Contamination

No materials suspected to contain asbestos were identified at the site during the site inspection.



The Naturally Occurring Asbestos (NOA) in NSW dataset was reviewed to determine the risk of encountering NOA during construction. No geological units with a risk of containing asbestos were mapped as occurring at the site.

If suspected ACM is unexpectedly encountered during the project, works must cease, and the Council's Environmental officer be contacted to assess the material.

5.9.7 Services

Telstra phone line cabling is known to occur in the vicinity of the access road and bridge, while excavation works in this area are not required, a Dial Before You Dig search must be conducted before the project is commenced. If any services are identified on the search, these should be located on site by potholing to ensure they can be avoided.

Overhead communication and power lines with low clearance may be present on Hains Lane. Overhead power should be assessed prior to works and be indicated with high visibility markers and roadside warning signs.

Meetings with landowners should also be held to determine any water lines and irrigation infrastructure. Any relocation of these systems should occur with landowner consultation, and prior to work commencement.

5.9.8 Demand on Natural Resources

The works involve bank stabilization and revegetation and is not anticipated to impact on the demand on natural resources such as water and non-renewable power sources.

5.9.9 Visual Amenity and Landscape

Visual amenity of the road reserve and private property will be temporarily impacted during Phase 1 & 2 of the project. This is due to a combination of the removal of soil and stock piling of rocks and logs within the paddock area. This impact should be minimised by ensuring the work area is maintained in a clean condition during bridge strengthening and earthworks. At the completion of works, the development is anticipated to improve visual amenity through replanting of the eroded bank with native vegetation.

5.9.10 Beneficial Uses

The proposed development involves the rehabilitation of the natural area of the eroded embankment on private property, and it is not anticipated to impact beneficial uses of the site.

5.9.11 Socio-Economic Considerations

During construction, traffic impacts may cause a minor negative impact to socio-economic factors for residents that reside on Hains lane. Once complete, the provision of the bank stabilization work is expected to improve flood resilience of the area and improve land retention for the private landowners.



5.9.12 Marine Estates, Marine Parks, and Aquatic Reserves

Council have reviewed the NSW MEMS 2018-2028 and have considered whether the proposed activity is likely to impact on the identified threats/activities and opportunities to deliver outcomes that meet the proposed management initiatives.

The proposed activity is unlikely to impact any of the identified prioritised 25 activities/threats. This is largely due to the distance of the site from the coast and waters suitable for recreational activities.

The closest marine park or aquatic reserve is the Solitary Islands Marine Park located approximately 38km north-east of the site. Due to the distance of the park from the site and the lack of any nearby water courses that discharge into this park, the development is not anticipated to impact any marine parks or aquatic reserves.

5.9.13 Crown Land

The works include works in the riverbank of the Kalang, while this area has not been formally surveyed, it is under the assumption that the Kalang River is Crown Lands and that a Crown Lands license is required.

5.9.14 Native Title

The site is not located on land that is the subject of a native title claim. Consideration of the impact of the development on native title rights and consultation with the Council's Native Title Manager and or the managers of the native title land is therefore not required. The closest land subject to a native title claim is 12.52 km east of the site and is unlikely to be impacted by the development due to its distance from the site.

5.9.15 Climate Change

The development is located at approximately 4 mAHD - height above sea level and is unlikely to be impacted by sea level rise upstream from the coast. The development is not anticipated to produce ongoing greenhouse gas emissions that may contribute to climate change. The development does involve the potential removal of sparse shrubby vegetation on the riverbank however, these are largely weed species and will be replaced by replanting with natives, that will increase the vegetation of the area. The development is in an area that is known to flood and therefore may be impacted by more frequent flooding due to higher occurrences of extreme weather. However, one of the objectives of the development is to increase the flood resilience of the area. On this basis, the development is not expected to be significantly impacted by or produce a significant ongoing impact to climate change.

During construction, vehicles and equipment will produce greenhouse gas emissions. Controls presented in air quality considerations (Section 5.9.2) have been developed to minimise the production of greenhouse gas emissions as far as reasonably practicable.



5.9.16 Flooding Considerations

The development is located in an area that is known to flood. Flood prone land mapping can be seen in Appendix A- Figure 5. Due to this, works should be avoided during time periods of heavy rain fall. Weather forecasts should be frequently checked prior to the commencement of the project.

In the event of unexpected flooding, sediment controls should be put in place, plant and works equipment removed from the floodplain and the alternative stockpiling location utilized to remove rocks and logs. Stockpiles should also be covered and stabilised.

The design aims to improve flood resilience, especially for minor events, by ensuring the natural flow of the river is followed, without high erosion to the embankment.

During a major flooding event, it is likely that the grazing paddocks will still be inundated, however the loss of land is expected to lessen.

During construction, there is a heightened risk of flood damage caused by erosion to embankments where vegetation has been removed. The embankment must therefore be stabilised as soon as reasonably practicable. This may include the use geotextile covers as a temporary measure until permanent rock revetment and vegetation can be placed.

Flooding may have impacts on all phases of the development and as such a flood management plan must be prepared by the contractor that considers the likely flood impacts on the site and construction works at each stage of the development and procedures for preparing for flood events that will be undertaken to mitigate the impact of flooding on construction works.

Although consent is not required for the development, the requirements related to development consent within a flood planning area presented in section 5.21 of the Bellinggen LEP have been considered below.

(1) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development:

a. is compatible with the flood function and behaviour on the land

The development does not change the existing alignment of the watercourse. However, the development does ensure the banks are stabilized during times of heavy flooding and flow. As such, the development is considered to be more compatible with flood function in the long term.

b. will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties

There are no nearby developments that are likely to be impacted by changes in flood patterns in this area. The project has been designed by an environmental engineer to improve the natural flow of the Kalang River. The development is therefore unlikely to change flood patterns in a way that results in detrimental increases in the potential flood affectation of other development or properties.



- c. will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood*

The development is not designed for occupation or increased capacity of the area. As the works occur on private property, it is not an area that would be used as part of an evacuation route. The development is therefore unlikely to impact the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes.

- d. incorporates appropriate measures to manage risk to life in the event of a flood*

Given the site is part of a grazing paddock the development is unlikely to be occupied during a flood event.

- e. will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses*

The removal of vegetation and excavation within the riparian area poses an environmental risk due to potential erosion and siltation during a flood event, especially prior to the establishment of vegetation on the embankments. Controls have been recommended to address this risk including stabilisation as soon as reasonably practicable during construction. Once rock revetment and vegetation is established, erosion and siltation are unlikely.

(2) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters:

- a. the impact of the development on projected changes to flood behaviour as a result of climate change*

As per previous sections, increases in weather event severity may result in more severe and common flood impacts at the site. However, the works are improving flood resilience and is considered unlikely to significantly impact flood behaviour.

- b. the intended design and scale of buildings resulting from the development.*

The development not designed for occupation and is relatively minor in scale. It is therefore considered unlikely to cause a significant change in flood patterns or impact on evacuation of people during flood events.

- c. whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood.*

The development is not designed for occupation or increased capacity of the area. As the works occur on private property, it is not an area that would be used as part of an evacuation route.

- d. the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion*



The works will not modify, relocate or remove buildings and will not increase the surrounding area to negatively affect the surrounding area during flooding.

Flooding has therefore been considered and incorporated into the design as far as reasonably practicable, while balancing the interests of the community, environment and surrounding landowners. The design is considered unlikely to result in an outcome that would require consent to be denied under section 5.21 of the Bellingen LEP.

5.9.17 Bushfire Considerations

The site is located on bushfire prone land. Mapping can be viewed in Appendix A, figure 5. The development does involve the replanting of vegetation. However, the development does not change the location of vegetation, and it is exclusive to the riparian edge, it is therefore considered unlikely to impact the current risk or severity of bushfires at the site.

5.9.18 Cumulative Impacts with Other Development

This project works is limited to the bank stabilization on private property and minor works to the access track, and no known development works are expected to occur simultaneously within the vicinity of Brierfield. The development is therefore considered unlikely to result in significant cumulative impacts to the environment, economy or community.

5.9.19 Interaction With Other Planning Instruments

At the time of the assessment, the council had not adopted any plan of management applicable to the area.



6 Consideration of Impacts of the Activity

The following comprises an assessment of the impacts of the activity on the factors presented in section 171 of the EP&A Regulations 2021. The assessment has been completed based

The assessment has been undertaken in accordance with the NSW Government Department of Planning and Environment (2022), Guidelines for Division 5.1 Assessments which requires the following attributes of each potential impact throughout the lifecycle to be considered:

1. **Type of impact** – Certain environments may be more sensitive to specific impacts. The pathway of impacts to sensitive receiving environments must also be considered. For example, a potential impact to water quality is of higher significance in a river setting where a direct pathway exists between the development and the river, compared to an industrial setting with stormwater/wastewater systems to collect released water before it enters the environment.
2. **Extent** – Population affected by the impact (localised vs broad impact).
3. **Size** – The area, amount, quantity, volume, etc of the impact.
4. **Duration** – Timescale of the impact (short vs long term).
5. **Severity** – The likely degree of change which should include considerations of how resilient the environment is.
6. **Importance** – Impacts to heritage items, community health or wellbeing and whether the environment is rare/unique or readily replaceable.
7. **Local Significance** – local factors that may exacerbate an impact such as community significance, or cultural values.

For each environmental factor requiring assessment under the EP&A Regulations 2021, the above attributes will be assigned a significance rating based on the information presented in the environmental investigation provided as Section 5. A cumulative impact for each environmental factor will be calculated based on the sum of the significance of each attribute. Significance ratings will include:

- 1 – Negligible Impact
- 2 – Minor Impact
- 3 – Significant Impact

If any individual attribute receives a significance rating of 3 or if the cumulative significance rating is 12 or greater, the development is considered to have a significant impact on the assessed environmental factor. Where a development is deemed to have a significant impact a Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR) where the development is found to have a significant impact on threatened species, ecological communities or their habitats, or an Environmental Impact Statement (EIS) where the development is found to have a significant impact on any other environmental factor. Alternatively, the development can be redesigned to reduce the impacts to a level where they are no longer considered significant. Examples of the expected level of impact for each significance rating is provided in Table 6-1 below.



Table 6-1. Description of impact significance scoring.

1 – Negligible Impact	2 – Minor Impact	3 – Significant Impact
• Does not create a nuisance. • Impacts contained within work site. • No detectable/noticeable change. • Complies with industry guidelines. • Reasonable inconvenience/financial loss. • Change but similar to original land use. • No damage to heritage items or native flora or fauna. • No foreseen increase to risk from natural hazards. • Waste disposed/recycled of at licensed waste facility or reused immediately. • No remediation required following work to prevent/remove pollution.	• Creates a temporary nuisance. • Impact short term/localised, for life of project. • Measurable change/may be offensive. • Exceeds industry guidelines (minor). • Sustained/short term inconvenience/financial loss. • Slight or temporary change to land use. • Heritage items or native flora and fauna able to be repaired/rehabilitated. • Slight increase to risk from natural hazards. • Waste stockpiled with end use unknown, potential for temporary impact to air, soil, water. • Minor /short term site remediation required at completion of work to prevent/remove pollution.	• Creates a continuous or ongoing nuisance. • Impact ongoing/long term or widespread impact. • Obvious change/offensive. • Exceeds industry guidelines (major). • Unacceptable inconvenience/financial loss. • Transforms a locality permanently. • Permanent damage/loss of a heritage item/flora or fauna from an area. • Major increase to risk from natural hazards, • Long term contamination of air, soil or water due to waste disposal. • Extensive site remediation required over extended timeframe to prevent/remove pollution (e.g. soil or water contamination, severe soil erosion, large scale revegetation).



6.1 Impact Assessment

To address Section 171 Factors under the EP&A Regulation 2021, the anticipated impact of the development on each environmental factor has been assessed in Table 6-2 below.

Table 6-2. Assessment of development impact on Section 171 Factors.

Environmental Factor	Type of Impact	Extent	Size	Duration	Severity	Importance	Local Significance	Cumulative
a. The environmental impact on the community.	1	1	1	1	1	1	1	7
b. The transformation of the locality.	1	1	1	1	1	1	1	7
c. Any environmental impact on the ecosystems of the locality.	2	1	1	1	1	1	2	9
d. Reduction of the aesthetic, recreational, scientific or other environmental quality or values of the locality.	1	1	1	1	1	1	1	7
e. Impacts on heritage and culturally significant location, places or buildings.	1	1	1	1	1	1	1	7
f. The impact on the habitat of protected animals.	1	1	1	1	1	1	1	7
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? (Listed species, non-listed species and key threatening processes).	2	1	1	1	1	1	2	9
h. Long-term effects on the environment.	1	1	1	1	1	1	1	7



Environmental Factor	Type of Impact	Extent	Size	Duration	Severity	Importance	Local Significance	Cumulative
i. Degradation of the quality of the environment.	1	1	1	1	1	1	1	7
j. Risk to the safety of the environment.	1	1	1	1	1	1	1	7
k. Reduction in the range of beneficial uses of the environment.	1	1	1	1	1	1	1	7
l. Pollution of the environment.	2	1	1	1	1	1	1	9
m. Environmental problems associated with the disposal of waste.	1	1	1	1	1	1	1	7
n. Increased demands on natural or other resources	1	1	1	1	1	1	1	7
o. Cumulative environmental effects.	1	1	1	1	1	1	1	7
p. The impact on coastal processes and coastal hazards.	1	1	1	1	1	1	1	7
q. Applicable local strategic planning statements, regional strategic plans or district strategic plans.	1	1	1	1	1	1	1	7
r. Other relevant environmental factors.	1	1	1	1	1	1	1	7

No significant impact on the environmental factors presented under Section 171 of the EPA Regulation 2021 have been identified based on the environmental assessment detailed within this REF. As no significant impacts have been identified an SIS, BDAR and/or EIS is not required for the proposed development.



7 Other Required Permissions and Consultations

A summary of other legislative requirements and whether they apply to the proposed development is present in Table 7-1 below.

Table 7-1. Other Legislative Requirements.

Legislation	Controlled Activity	Applicable to Development	Action
EP&A Regulation 2021	Is the value of the development greater than \$5,000,000?	No – Publication of the REF is not required.	None
EPBC Act 1999	Does the activity have the potential to impact on any matters of NES?	No – referral to the Australian Government Department of the Environment and/or the environment minister not required.	None
BC Act 2016	Will the activity impact threatened species/populations and/or ecological communities?	No – SIS and/or BDAR not required.	None
	Does the activity require the relocation of protected or native species?	Potentially – A License from Office of Environment and Heritage (OEH) is required for relocation of native species (if required).	If relocation of native species is required, due to identification during pre-clearance surveys, a licensed fauna spotter catcher must be engaged to relocate the fauna.
FM Act 1994	Will the activity involve dredging, reclamation, harming of marine vegetation, blocking of fish passage, use of explosives or electrical devices within a waterway?	Yes – Permit from the Department of Primary Industries (DPI) not required. Publication of REF required.	Apply DPI for permit to undertake works. It is noted that no blocking of fish passage will occur during these works. Publish REF on council website prior to starting works.



Legislation	Controlled Activity	Applicable to Development	Action
	Does the activity have the potential to impact areas of key fish habitat?	Yes – development may impact key fish habitat. Permit from the Department of Primary Industries (DPI) required	Apply DPI for permit to undertake works.
NPWS Act 1974	Will the activity be undertaken on or have the potential to impact land managed by NPWS?	No – Notification to NPWS through the NSW Planning Portal not required.	None
	Are the works likely to impact items of aboriginal heritage?	No – A permit under the NP&W Act is not required. Publication of REF not required.	None
Heritage Act 1977	Will the activity involve working within the 'place' of a Heritage Item identified under the NSW Heritage Act?	No – Council Heritage Officer notification not required. Publication of REF not required.	None
POEO Act 1997	Does the activity require transport and receipt of material from another site that is not licensed to supply material and/or transport and supply of material from the site to a receiving site that is not licensed to accept the waste?	No	None
	Does the activity require the undertaking of any other scheduled activity?	No – A license or exemption from the NSW EPA is not required. Publication of REF not required.	None
	Does the activity require the transport of waste that must be tracked including tyres and asbestos waste?	No – Waste tracking using the NSW EPA's Integrated Waste Tracking Solution (IWTS) not required.	None



Legislation	Controlled Activity	Applicable to Development	Action
WM Act 2000	Is the proposed activity to be undertaken within 40m of a waterway?	Yes – However, Public authorities are exempt in relation to all controlled activities on waterfront land.	Although formal approval under the WM Act 2000 is not required, the requirements of controlled activities should be implemented as far as reasonably practicable to reduce risks to waterways. Recommended controls have been provided as conditions and must be implemented.
	Does the proposed activity require water to be extracted from an aquifer (includes dewatering activities)?	No – An exemption or water access license from Water NSW is not required.	None
Roads Act 1993	Will the development involve working on TfNSW managed Classified Roads?	No – Concurrence from TfNSW not required	None
Biosecurity Act 2015	Is biosecurity or prohibited matter likely to be encountered during the activity?	No – Unexpected finds protocol not required.	None
Crown Land Management Act 2016	Will the development involve working on vacant Crown Lands not under Council control and/or Council not Trustee?	Yes– It is assumed that the Kalang River is Crown. Permission from crown land manager will be required.	Crown Lands License application



Legislation	Controlled Activity	Applicable to Development	Action
	Will the activity: • Grant leases, licences, permits, forestry rights, easements or rights of way over the land, OR • mortgage the land or allow it to be mortgaged, OR • impose, require or agree to covenants, conditions or other restrictions on use (or remove or release, or agree to remove or release, covenants, conditions or other restrictions on use) in connection with dealings involving the land.	No – Written advice from the Council’s Native Title Manager that the development complies with any applicable provisions of the native title legislation is not required.	None
LG Act 1993	Does the proposed development conflict with a POM adopted for the area?	No – Redesign of proposed development to meet POM objectives is not required.	None
MEM Act 2014	Is the activity likely to exacerbate the priority activities/threats identified in the NSW MEMS 2018-2028	No– Redesign of proposed development to minimize exacerbation of priority activities/threats identified in the MEMS is not required.	None
	Will the activity be undertaken within or have the potential to impact Marine Parks and Aquatic Reserves?	No – Marine Park/aquatic reserve notification not required.	None



Legislation	Controlled Activity	Applicable to Development	Action
NT Act 1993	Will the activity have a potential impact on the rights granted under native title on native title land?	No – Consultation with the Council's Native Title Manager and or the managers of the native title land is not required.	None
Pesticides Act 1999	Will the activity involve application of chemicals including pesticides/ herbicide?	No- No NSW EPA prescribed pesticide work license will be required for field reinstatement works.	None
WHS Regulations 2017	Is the development likely to disturb naturally occurring asbestos (NOA) or asbestos containing materials?	No – SafeWork NSW notification required.	None
Forestry Act 2012	Will the development be undertaken in a state forest or area subject to a forest agreement?	No – Forest Corporation notification not required.	None
Coastal Management Act 2016	Does the development conflict with any objectives presented in a coastal management plan (CMP) adopted by council?	No – No CMP adopted by council at the time of the assessment.	None
Other Safety and Environmental Considerations	Will the development involve excavation below the ground surface with potential to impact services?	No- However, a Dial Before You Dig Australia (BYDA) search and notification to any service authorities listed is required.	Complete a Before You Dig Australia (BYDA) search and notify any required service authorities listed. If services are identified within 2 m of the works area, an accredited service locator should be engaged to undertake service location prior to commencement of works.



Legislation	Controlled Activity	Applicable to Development	Action
	Is the development on land that is not council owned or controlled?	Yes – Approval from the landowner/manager required	Site compound proposed on private property. Written permission to use the land must be sought prior to undertaking the works.
	Do the works require isolation and/or decommissioning of active services?	No	None



8 Summary of Potential Impacts and Required Controls

Table 8-1 presents a summary of the potential impacts associated with the development identified during the environmental assessment, and the required controls that must be implemented to mitigate the risk of these impacts.

Table 8-1. Summary of Potential Impacts and Required Controls.

Aspect	Potential Impact	Required Controls
Social, economic and cultural impacts	Minor inconvenience during Phase 1 & 2 due to traffic delays.	1. The REF must be published before works commence. 2. Notify residents and road users of the works at least 1 week prior to starting works. Signage and traffic controls will be installed during the bridge strengthening works.
Local human and non-human environment	Minor short-term impact. Once complete is expected to improve both human and non-human environment.	3. The Site stockpiling area is intended to be established on land owned by 88 Hains Lane, Brierfield. Written permission to utilise the land for stockpiling rock and logs must be obtained prior to utilizing the property.
Ecosystems of the locality	Not likely to be significantly impacted by development. Minor risk of disease introduction to the area, due to sensitive riparian ecosystem. See endangered species below for additional controls.	4. There is a risk of introduction of diseases to the area which may impact the ecosystem, including threatened species. These diseases include: PBFD, Myrtle Rust, and Chytridiomycosis. Hygiene protocols must be adopted for the works to minimise the risk of disease introduction.
Environment quality (Visual, recreational, scientific, etc.)	Bank stabilization works in the area is anticipated to have a minor effect on visual amenity in the short term but proposed replanting will compensate for this loss in the long term.	5. Although the vegetation on the bank is sparse and limited, A pre-clearance inspection must be completed to ensure no fauna are present within the area. If fauna are found a qualified spotter catcher will be required to relocate the animal. 6. The site will be maintained in a cleanly condition. Amenities including rubbish bins will be provided to workers at the site. 7. On completion of works, the area will be restored to an improved condition, only native species known to occur within the riparian area of the LGA will be planted.



Aspect	Potential Impact	Required Controls
		8. Any mulch to be used on the site should be pasteurised and follow the NSW EPA Mulch Order so as not to introduce any weed, disease or pest.
Heritage (aboriginal and non-aboriginal)	No aboriginal or non-aboriginal heritage items have been identified at the Site or surrounding areas.	None
Protected animal habitat	The area is a highly disturbed and weed impacted environment. Vegetation clearing is largely limited to a few sparse weeds, shrubs and grasses along the riverbank, and replanting will be undertaken which will greatly improve habitat quality (see endangered species). Minor impacts to habitat quality are anticipated during Phase 1 & 2 of the project, however these will be compensated for in the long term.	None
Endangered species	The works involve clearing of mostly weed vegetation within the riparian area which is considered potentially suitable habitat for these TECs.	9. Replanting of removed plants along the bank will be replaced with suitable native riparian plants that include suitable Lowland rainforest of subtropical Australia TEC must be undertaken. 10. Workers must be informed of the potential significance of flora and fauna at the site and limitations/controls required for activities to be carried out in this location (e.g. hygiene protocols, speed limits enforced, requirement of a pre-clearance survey by an ecologist).
Long term environmental impacts	The proposed development will disturb potential habitat during construction, however once complete the works will increase the habitat value of the site, provide access for fauna through the riparian area to the Kalang River, limit sediment flowing into the river and reduce flood impacts at the site. Further, the replanting of removed weed species with native vegetation is expected to improve environmental values in the long term.	None
Environment quality (Ecological, social and economic)	The development is expected to improve ecological values in the long term by revegetating the highly degraded riverbank and improving the natural flow of the Kalang River. Decreasing sediment loads will also improve the health of the Kalang downstream of the site and will increase the economic values by	None



Aspect	Potential Impact	Required Controls
	lowering erosion and retaining land on private property	
Safety	During Phase 1 of the project access to Hains Lane will be interrupted and the riverbank will be subject to construction works which will decrease environmental safety from its current state. It is noted that the site is located in an isolated area and may be more susceptible to security risks.	11. If any equipment is to be left on site, these should be locked and left in a secure area overnight. 12. Where possible, materials and tools should not be stored at the site outside construction hours
Beneficial Uses	The proposed development will not change the use of the area and therefore is not anticipated to impact beneficial uses of the site.	None
Pollution	- High risk of temporary erosion and sediment transport due to vegetation clearing and excavation within the riparian area. - Vehicles transporting rocks and organic materials with the potential to produce dusts are intended to be utilised on the project. - Construction equipment and vehicles may reduce air quality by production of excessive or uncontrolled exhaust.	13. An erosion and sediment control plan must be developed for the works. 14. Embankments must be stabilised as soon as practical following disturbance to minimise erosion risk. 15. During vegetation removal, roots within the riparian area should be retained as far as reasonably practicable. 16. Vehicles must only traffic on access roads as far as reasonably practicable. 17. Vehicle access to grassed areas is not permitted during heavy or prolonged rain events. 18. Possible fuel or hydraulic oil spills from construction plant and equipment will be managed by having a spill kit on site and should a spill occur impacted soil would need to be removed and taken for disposal at a licenced waste facility. 19. Works will cease during periods of high wind, precipitation or rain. 20. Vehicles transporting rocks and fill must be equipped with covers or have covers applied. The load must be covered before the vehicle leaves the origin site. 21. If complaints are received, council will consider additional dust suppression controls. 22. Vehicles and equipment will not be left idling when not in use.



Aspect	Potential Impact	Required Controls
		23. Vehicles and equipment must be maintained in accordance with manufacturer's specifications to minimise exhaust pollution. 24. Waste materials must not be burnt at the site. 25. All chemicals required to be stored at the site must be separated by their Globally Harmonised System (GHS) classification be stored within bunds in a secure area of the site compound. 26. Chemicals must be used in accordance with their Safety Data Sheet (SDS) and manufacturers specifications. 27. Vehicles and equipment must be serviced before they arrive at site. 28. Maintenance of all vehicles and equipment is not to be undertaken at the site. 29. In a breakdown situation, vehicles will be transported to a service facility where possible. Where a broken-down vehicle cannot be relocated, servicing may occur on-site with appropriate bunding, waste collection vessels and spill kits. 30. Spill kits must be available on all mobile plant, adjacent to the chemical storage area and within the designated refuelling area. 31. All spill kits must be maintained to ensure the kit contains sufficient supply of materials during a spill event. 32. Due to the risk of flooding, there should be a flood control plan in place for the storage of rocks and logs away from the flood limit.
Noise and Vibration	Receivers most likely to be impacted include rural properties that reside along Hains Lane. The receivers are considered unlikely to be significantly impacted by noise or vibration during the works	33. Construction activities will be limited to EPA recommended standard construction hours: - Monday to Friday 7:00 am to 6:00 pm. - Saturday 8:00 am to 1:00 pm. - No work on Sundays or public holidays.
Waste	The development is anticipated to generate waste in the form of earthworks spoil and	34. If excess imported or generated material cannot be reused on or off-



Aspect	Potential Impact	Required Controls
	litter and food scraps from workers, as well as the potential for waste chemicals associated with construction and the maintenance of vehicles and equipment.	site, it will be disposed off-site at a facility lawfully licensed to accept the waste. 35. Toilets and amenities will be opened up by the landholders to and their location communicated to workers. Rubbish will be taken out of the site at the end of each workday.
Stockpiles	Temporary stockpiling of rocks and logs will be stored within the paddock of 88 Hains Lane. This area is a known floodplain, and alternative site should be selected in the case of flooding.	An alternative stockpile location on higher ground will be located in the flood management plan. Stockpiles will be covered and stabilized in unexpected heavy rainfall.
Demands on natural resources	The development is not expected to significantly impact the demand on natural resources.	None
Cumulative environmental effects	It is unlikely that the proposed development will produce cumulative environmental impacts with other developments in the area.	None
Costal processes/hazards	Due to the distance of the site from the coast, the development is not considered likely to impact on coastal processes or hazards.	None
Other applicable planning instruments	No applicable POM identified.	None
Other relevant factors	• Traffic – Given the relatively low volume of traffic expected to be entering and exiting the site, a significant impact on traffic is not anticipated. • Pedestrians – No footpaths are present. Pedestrian traffic is uncommon but could potentially occur on the roadway. • Services – Bridge strengthening works are in the area of a known Telstra cable and overhead power or communication lines may be present on Hains Lane • Climate Change – the development is not considered likely to have a significant impact on climate change or be impacted by climate change. • Flooding – a high risk of erosion and sediment transport exists during the earthworks phase before stabilisation works are complete. • Consultation with Stakeholders and Regulatory Authorities – works within key fish habitat may require a permit from DPI.	36. Workers should be informed of the risk of pedestrians using the road during the induction process 37. A Before You Dig Australia search must be conducted before the project is commenced to identify services in the area and any service providers that must be notified of works on or near their services. 38. High visibility markers must be placed to denote the presence of overhead lines and clearance available under crossing points from the start of Hains Lane to the site. 39. If services are identified within 2 m of the works area, an accredited service locator should be engaged to undertake service location prior to commencement of works. 40. A flood management plan must be prepared that considers the likely flood



Aspect	Potential Impact	Required Controls
		impacts on the site and construction works at each stage of the development and procedures for preparing for flood events that will be undertaken to mitigate the impact of flooding on construction works. 41. Weather forecasts are to be included within the daily toolbox meeting to ensure risks of flooding are identified in advance 42. The works involve undertaking activities requiring a permit from DPI within key fish habitat. An application for a permit must be made to DPI and a permit received before works commence. All conditions within the permit must be complied with.



9 Conclusions

Based on the review of environmental factors investigation detailed in this report, the proposed works are considered unlikely to result in significant negative impacts to the environment at any stage of the developments lifecycle. Tests of significance tests for threatened species and ecological communities under the FM and BC Acts and Assessments of significances under the EPBC Act were applied to species that were identified to potentially occur within 10km of the site and surrounding areas. These searches identified a potential impact to individuals of the following species within the works area:

- Giant Barred Frog (*Mixophyes iteratus*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Stuttering Frog (*Mixophyes balbus*)
- Sphagnum Frog (*Philoria sphagnicola*) Vulnerable under the BC Act 2016
- Southern Myotis Microbat (*Myotis macropus*)

These impacts are thought to be minimal and temporary in nature, and will be mitigated through pre-clearance surveys by an experienced ecologist. If these species are identified within the surveys, further controls such as the instalment of exclusion infrastructure and relocation will be undertaken.

No significant impact on any of the environmental factors requiring assessment under the EP&A Regulations 2021 was identified during the impact assessment. On this basis, the development is considered suitable to proceed without the need for an SIS, BDAR or EIS.

Overall, the design is expected to improve the flood resilience of the site and increase the habitat value of the aquatic and terrestrial environment. This includes, providing suitable habitat for threatened species with the planting of native species along a highly degraded and eroded bank. The works will also minimize sediment loads and increase the water quality of the Kalang River at this reach and downstream of the project area. The works will also assist landholders retaining grazing paddocks and minimize the loss of land over time.

It should be noted that the investigation has identified some risks to the environment during the construction phase which will require additional controls. This includes the development and implementation of an erosion and sediment control plan, a flood management plan and implementation of council's hygiene protocols. A summary of identified potential impacts and required controls has been provided as Table 8-1 and within Appendix I.



10 Certification and Determination

	Yes	No
This REF complies with requirements under Division 5.1 and Part 8, Division 1 of the Environmental Planning and Assessment Regulation 2021	☒	☐
This REF complies with the Department of Planning and Environment 2022, Guidelines for Division 5.1 Assessments	☒	☐
This REF contains all available information relevant to the assessment of the project and its environmental impacts to the fullest extent possible.	☒	☐
This REF contains no false or misleading information.	☒	☐
The REF contains sufficient information to determine whether the proposed activity should proceed	☒	☐
The activity will proceed without modification. Where modification is required an addendum to the REF will be prepared.	☒	☐
The proposed activity is unlikely to significantly affect the environment and as such an Environmental Impact Statement (EIS) is not required.	☐	☒
The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is unlikely to significantly affect threatened species, populations, ecological communities, or their habitats and as such a Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR) is not required.	☒	☐
The activity can proceed provided the following conditions are adhered to	☒	☐
Publication of the REF Document is required.	☒	☐



Being an employee or agent of the determining authority, I certify that I have reviewed and endorsed the contents of this REF document, and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 171 of the EP&A Regulation, and the information it contains is neither false nor misleading.

REF Author

Signature:

Name: Celeste Lymn

Position: River & Biodiversity Project Officer – Bellinggen Shire Council

Date: 16 June 2025

Reviewed and Endorsed By

Signature:

Name:

Position:

Date: 16 June 2025

Authorising Manager's Approval

Signature:

Name: Sam Tate

Position: Group Leader (Sustainable Environment and Waste) – Bellinggen Shire Council

Date: 16 June 2025



11 Appendices

Table 11-1. Table of Appendices.

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Appendix C	EPBC Act Protected Matters Summary Report
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Appendix J	Acid Sulfate Soils management plan



APPENDIX A



APPENDIX B



APPENDIX C



APPENDIX D



APPENDIX E



APPENDIX F



APPENDIX G



APPENDIX H



APPENDIX I



APPENDIX J



**BELLINGEN
SHIRE COUNCIL**

32 & 88 Haines Lane, Brierfield

Source Data: © Dept. Customer Service - Spatial Services & Bellingen Shire Council
Disclaimer: The information shown in this plan is an extract of the records held by Bellingen Shire Council. Every attempt has been made to ensure the information contained in this plan is accurate, however the position of the work relevant to other structures, services or boundaries has not been verified by precise survey. Bellingen Shire Council accepts no responsibility for any errors, omissions, or inaccuracies.

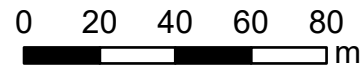
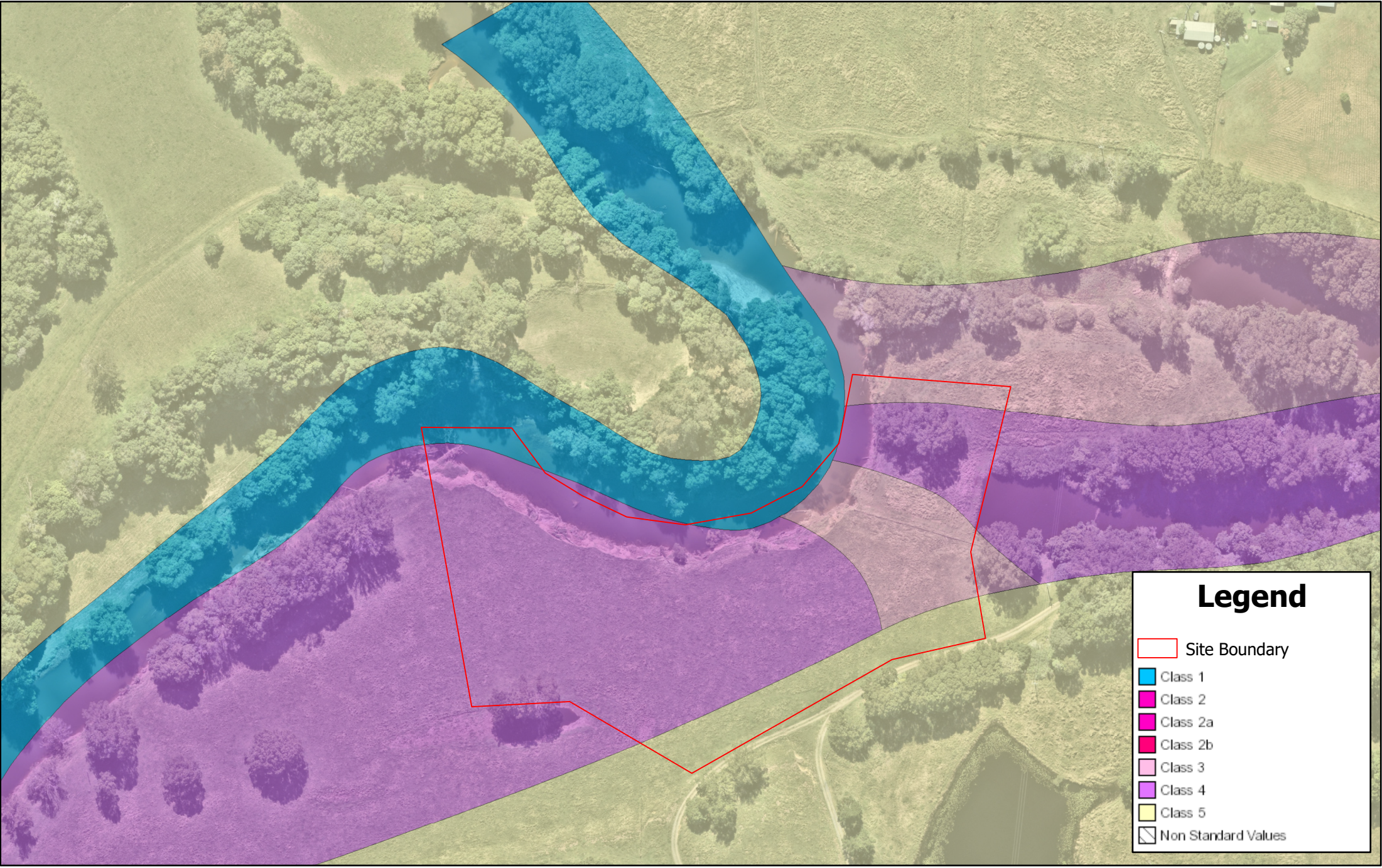


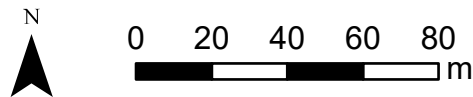
Figure 1- Location

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32 & 88 Haines Lane, Brierfield

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Acid Sulphate Soils

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Date: 13/05/2025
Map Scale: 1:2,000



32 & 88 Haines Lane, Brierfield

Source Data: © Dept. Customer Service - Spatial Services & Bellinghen Shire Council
Disclaimer: The information shown in this plan is an extract of the records held by Bellinghen Shire Council. Every attempt has been made to ensure the information contained in this plan is accurate, however the position of the work relevant to other structures, services or boundaries has not been verified by precise survey. Bellinghen Shire Council accepts no responsibility for any errors, omissions, or inaccuracies.



Fire prone land

Map Generated by: Celeste Lymn
Date: 13/05/2025
Map Scale: 1:2,000



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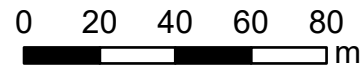


Figure 3 - Contours

Map Generated by: Harry Chapman
Date: 25/03/2025
Map Scale: 1:2,000



Legend

Site Boundary

Level - 1 % AEP Event

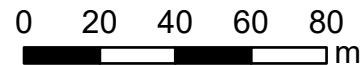
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**BELLINGEN
SHIRE COUNCIL**

32 & 88 Haines Lane, Brierfield

Source Data: © Dept. Customer Service - Spatial Services & Bellingen Shire Council
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Flood prone land

Map Generated by: Celeste Lymn
Date: 13/05/2025
Map Scale: 1:2,000



Photo 1: Overview of the downstream section of the Riverbank works
Date: 20/3/2025



Photo 2: Overview of the midstream section of the Riverbank works
Date: 20/3/2025



Photo 3: Overview of the upstream section of the Riverbank works
Date: 20/3/2025



Photo 4: Cattlegrid which will need strengthening with a steel plate
Date: 20/3/2025



Photo 5: Photo of the environment at Hains Lane access track
Date: 20/3/2025



Photo 6: Wooden Bridge which will need bridge strengthening works
Date: 20/3/2025



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Mar-2025

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	89
Listed Migratory Species:	40

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	51
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	6
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community likely to occur within area	In buffer area only
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Erythroriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In buffer area only
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In buffer area only
FISH			
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
FROG			
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phyloria sphagnicola Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
MAMMAL			
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys oralis			
Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat may occur within area	In buffer area only
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area	In feature area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area	In feature area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bertya sp. Clouds Creek (M.Fatemi 4) [84675]	Endangered	Species or species habitat may occur within area	In buffer area only
Coleus nitidus listed as Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat may occur within area	In buffer area only
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat known to occur within area	In feature area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Harrisoniascincus zia Rainforest Cool-skink [84785]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Myuchelys georgesii listed as Wollumbinia georgesii Bellinger River Snapping Turtle, Georges' Snapping Turtle, Georges Helmeted Turtle [88103]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Saltuarius moritzi New England Leaf-tailed Gecko, Moritz's Leaf-tailed Gecko [89490]	Endangered	Species or species habitat known to occur within area	In feature area

SHARK			
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species	[Resource Information]		
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status	
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only	
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only	
Natator depressus Flatback Turtle [59257]		Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Terrestrial Species				
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area	In feature area	
Hirundapus caudacutus White-throated Needletail [682]		Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]			Species or species habitat may occur within area	In buffer area only
Migratory Wetlands Species				
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area	
Calidris acuminata Sharp-tailed Sandpiper [874]		Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]		Vulnerable	Species or species habitat may occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]		Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area	

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]		
The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.		
Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian & Overseas Telecommunications Corporation [11642]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [11630]	NSW	In buffer area only

Listed Marine Species [Resource Information]			
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Breeding likely to occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area overfly marine area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In buffer area only
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna striata White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area overfly marine area	In buffer area only

Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bollanolla	Nature Reserve	NSW	In buffer area only
Bongil Bongil	National Park	NSW	In buffer area only
Bowraville	Nature Reserve	NSW	In buffer area only
Ganay	Nature Reserve	NSW	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Jaanningga	Nature Reserve	NSW	In buffer area only
Nunguu Mirral	Aboriginal Area	NSW	In buffer area only

Regional Forest Agreements
[\[Resource Information \]](#)

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals
[\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Joyces, Hobarts, Justins, and Duffys bridges upgrades	2024/09805		Post-Approval	In buffer area only
Controlled action				
Nambucca Heads to Urunga Pacific Highway Upgrade, NSW	2013/6963	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Telecommunications Cable Installation	2001/223	Not Controlled Action	Completed	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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Appendix D - Threatened Species and Communities Potential Occurrence Assessment

32 & 88 Hains Lane, Brierfield

This appendix has been used to determine whether threatened species and/or communities are likely to occur at the subject site by comparing site conditions observed during the site inspection to the required habitat for listed threatened species under the Biodiversity Conservation Act 2016 (BC Act), Fisheries Management Act 1994 (FM Act) and Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

A guide to threatened species classifications is presented below:

BC Act Classifications		EPBC Act Classifications	
V	Vulnerable	V	Vulnerable
E1	Endangered	E	Endangered
E4A	Critically Endangered	CE	Critically Endangered

Species and community habitat data have been obtained from the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW), Species Profile and Threats (SPRAT) Database and NSW Government Office of Environment and Heritage (OEH) Bionet Threatened Biodiversity Profile Search.

The threatened species and communities potential occurrence assessment table is presented on the following pages. The table has been sorted by potential to occur at the site, then alphabetically by species scientific name.

**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Acronychia littoralis</i>	Scented Acronychia	E1	E	Occurs in coastal areas (<2 km from the sea) in sub-littoral rainforest, usually in transitional zones between littoral rainforest and swamp sclerophyll forest, littoral and coastal cypress pine communities or on the margin of littoral forest and cleared land. grows only on Quaternary geology, marine-aeolian sands on outer barrier Holocene dunes, inner barrier Pleistocene sands, alluvial benches of re-worked sand and alluvium close to river estuaries or low coastal hills mantled with wind-blown sand. Soils range from humus podzols to deeply-leached podzols, depending on the depth of the water-table.	Unsuitable	Unlikely
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE	Dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Unsuitable	Unlikely



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Ardenna grisea</i>	Sooty Shearwater		V	Breeds on islands off New South Wales (NSW) and Tasmania. The species occurs off the coast of south-east Queensland in small numbers and is a moderately common migrant and visitor to Victoria and South Australia. Forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season.	Unsuitable	Unlikely
<i>Argynnis hyperbius inconstans</i>	Australian Fritillary		CE	The Australian fritillary usually occurs around river estuaries or open, swampy coastal regions. The subspecies is believed to be host-plant specific in the wild and therefore only occurs in areas where its larval food plant, the arrowhead violet, occurs. The arrowhead violet is a small perennial herb which usually grows in damp niches in open habitats. It often grows beneath grasses and other plants, often in association with <i>Lomandra longifolia</i> (long leaved matrush) and <i>Imperata cylindrica</i> (blade grass).	Marginally suitable	Potential
<i>Acacia chrysotricha</i>	Newry Golden Wattle	E		An understorey species on rainforest edges and in wet or dry eucalypt forest in steep narrow gullies on quartzite soils.	Marginally suitable	Potential

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	V	Edges of rainforest and in wet eucalypt forest, often near creeks or swamps as well as woodland.	Unsuitable	Unlikely
<i>Asperula asthenes</i>	Trailing Woodruff		V	Found in scattered locations within NSW from Bulahdelah to Kempsey. Inhabits damp areas, often along riverbanks. Distribution of this species overlaps with the 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'.	Marginally suitable	Potential
<i>Atrichornis rufescens</i>	Rufous Scrub-bird	V	E	Occur in rainforests above 600m elevation, including subtropical, warm temperate and cool temperate rainforests, and nearby moist and wet eucalypt forests. They require dense ground cover, a moist microclimate at ground level and abundant leaf litter, which is usually restricted to ecotones, forested watercourses and wetlands. They forage on small invertebrates, including snails and insects, on the ground and on ground vegetation and debris, within the dense understorey.	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Bertya</i> sp. Clouds Creek (M.Fatemi 4)		E1	E	Endemic to north-eastern New South Wales in typically very steep and relatively inaccessible habitat. Grows on steep, rocky slopes in shallow soil. The parent material is either granitic or metasedimentary. It typically occurs within heath or low shrubland vegetation surrounded by stunted eucalypts. Altitudes range from 300-1000 m above sea level.	Unsuitable	Unlikely
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Occurs mainly in freshwater wetlands with tall dense vegetation, where it forages in still, shallow water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds. The diet of the Australasian Bittern includes aquatic animals such as small fish, frogs, freshwater crayfish, spiders, insects and small reptiles. The species nests adjacent to relatively deep, densely vegetated freshwater swamps and pools. The species prefers to nest in vegetation that is up to 2.5 m tall and the nests are placed about 30 cm above the water level.	Marginally suitable	Potential



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		V	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short sparse vegetation, such as grass or saltmarsh.	Unsuitable	Unlikely
<i>Calidris canutus</i>	Red Knot, Knot		V	Breeds in the Northern Hemisphere. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. The Red Knot usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. Roosts on sandy beaches, spits and islets, and mudflats; also in shallow saline ponds of saltworks.	Unsuitable	Unlikely



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE	Occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They occur in both fresh and brackish waters. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands.	Unsuitable	Unlikely
<i>Calyptorhynchus lathamii</i>	South-eastern Glossy Black-Cockatoo	V	V	Lives in coastal woodlands and drier forest areas, open inland woodlands. Feeds on casuarina species.	Marginally suitable	Potential



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Caretta caretta</i>	Loggerhead Turtle	E	E	Nest on open, sandy beaches. Sand temperatures between 25–33 °C are needed for successful incubation. Beaches free from light pollution are required. Hatchlings enter the open ocean and begin feeding on small animals. Hatchling to subadult loggerheads occur in the open ocean foraging on planktonic organisms. Loggerhead Turtles enter the benthic foraging habitat at a larger size than other hard-shelled sea turtles. Adults and large juveniles with greater than 70 cm curved carapace length occur in waters with both hard and soft substrates including rocky and coral reefs, muddy bays, sandflats, estuaries and seagrass meadows.	Unsuitable	Unlikely



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat	V	E	The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. The majority of records are from canopied habitat, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used. Recorded from a large range of vegetation types including: dry and wet sclerophyll forest; Cyprus Pine (<i>Callitris glauca</i>) dominated forest; tall open eucalypt forest with a rainforest sub-canopy; sub-alpine woodland; and sandstone outcrop country.	Marginally suitable foraging habitat	Potential



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Charadrius leschenaultii</i>	Greater Sand Plover, Large Sand Plover	V	V	Breed in central Asia in mid-July. During the non-breeding season, the species is recorded in many coastal areas of Australia, especially in the north, as well as islands in the south-western Pacific Ocean. The species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs.	Unsuitable	Unlikely
<i>Chelonia mydas</i>	Green Turtle	V	V	Spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum. Settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. To develop successfully, marine turtle eggs must be buried in sand that is aerated (but not exposed), low in salt, high in humidity (but not flooded), and between 25°C and 33°C.	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (south-eastern)	V	V	Relatively undisturbed grassy woodland with native understorey. Large living and dead trees which are essential for roosting and nesting sites and for foraging fallen timber which provides essential foraging habitat and hollows in standing dead or live trees and tree stumps are also essential for nesting.	Marginally suitable	Potential
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	V	V	Found in loose, well mulched friable soil, in and under rotting logs, in forest litter, under fallen hoop pine bark and under decomposing cane mulch. Has been recorded in dry rainforest, northern warm temperate rainforest, subtropical rainforest, grassy wet sclerophyll forest and shrubby sclerophyll forest.	Marginally suitable	Potential
<i>Coleus nitidus</i>	Nightcap Plectranthus, Silver Plectranthus	E1	E	Occurs on rocky cliff faces or amongst rocky outcrops and boulders. Sites are often damp and sheltered or may be shaded by adjacent canopy. Associated vegetation is usually subtropical rainforest or ecotones between open forest and rainforest to altitudes of 180 m	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Reported to occur in a wide variety of habitats including heathlands, heathy woodlands, sedgeland, dry sclerophyll forests, forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests. It often grows near the other tongue-orchids <i>C. subulata</i> and <i>C. erecta</i> . The species is found in coastal areas and nearby ranges Especially difficult to detect due to its leafless habit. Flowers from September to January. Grows like a grass/sedge.	Marginally suitable	Potential
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's Fig-Parrot	E4A	CE	Occupies habitats that occur from sea level to approximately 900 m above sea level. Occurs in rainforest habitats including subtropical rainforest, dry rainforest, littoral and developing littoral rainforest, and vine forest. Likely to favour alluvial areas that support figs and other trees with fleshy fruits. Recent records have been from small stands of remnant native vegetation, at forest edges, thin gallery forest (at edges of rivers or streams), sub-littoral mixed scrub; corridors of riparian vegetation in woodland, open woodland; and isolated stands of fig or other trees on urban, agricultural or cleared land.	Suitable	Potential

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E1	E	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honey Myrtle <i>Melaleuca armillaris</i> scrub to open scrub.	Unsuitable	Unlikely
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Unsuitable	Unlikely



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Various environments including forests, woodlands, coastal heathlands and rainforests. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber. Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creek lines.	Suitable	Likely
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle	E1	E	Highly pelagic species, venturing close to shore mainly during the nesting season. It is known to forage year-round in Australian continental shelf waters. Adults feed mainly on pelagic soft-bodied creatures such as jellyfish and tunicates. Require sandy beaches to nest, with some evidence that coarser sand is more conducive to successful hatching than finer sand. Sand temperatures between 24–34 °C are needed for successful incubation. Beaches free from light pollution are required.	Unsuitable	Unlikely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V	Antipodean Albatrosses are migratory and disperse over the Tasman Sea and South Pacific Ocean. The Antipodean Albatross is marine, pelagic and aerial. It sleeps and rests on ocean waters when not breeding. Nests in open patchy vegetation, such as among tussock grassland or shrubs on ridges, slopes and plateaus.	Unsuitable	Unlikely
<i>Diomedea antipodensis gibsoni</i>	Gibson's Albatross	V	V	In Australian territory, Gibson's Albatross has been recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, Victoria. Gibson's Albatross is marine, pelagic and aerial and flies within 15 m of the sea surface. There are no breeding colonies of Gibson's Albatross in Australian territory. This albatross visits Australian waters while foraging and during the non-breeding season.	Unsuitable	Unlikely
<i>Diomedea epomophora</i>	Southern Royal Albatross		V	Nearly 80 percent of a royal albatross' life is spent directly exposed to the cold, treacherous, open oceans of the Southern Hemisphere. Remote tropical islands are sought out for nesting. They typically nest on slopes with tussock grass providing some shelter, though exposed sites are also common as they ease the often difficult tasks of take-off and landing.	Unsuitable	Unlikely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Diomedea exulans</i>	Wandering Albatross	E1	V	The Wandering Albatross breeds on Macquarie Island and feeds in Australian portions of the Southern Ocean. The Wandering Albatross is marine, pelagic and aerial. It occurs where water surface temperatures range from -2° to 24°C. Nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground.	Unsuitable	Unlikely
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1		Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Marginally Suitable	Potential
<i>Epinephelus daemeli</i>	Black Rockcod, Black Cod, Saddled Rockcod	V	V	The NSW coastline forms the species' main range, both in Australia and internationally. Black cod are known to occur to some degree in all NSW Marine Parks. The black cod's entire range includes warm temperate and subtropical waters of the southwestern Pacific. inhabit near-shore rocky and offshore coral reefs at depths down to 50 m. In coastal waters adult black cod are found in rock caves, rock gutters and on rock reefs.	Unsuitable	Unlikely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Eretmochelys imbricata</i>	Hawksbill Turtle		V	Spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum. Settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. Marine turtle eggs must be buried in sand that is aerated (but not exposed), low in salt, high in humidity (but not flooded), and between 25° and 33° C.	Unsuitable	Unlikely
<i>Erythrorhynchus radiatus</i>	Red Goshawk	E1	E	Occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. Habitats support medium to large high bird numbers which the goshawk requires for prey. Nests in large trees within one km of permanent water. Prefers forest and woodland with a mosaic of vegetation types, large prey populations, and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins.	Suitable	Likely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Euphrasia arguta</i>		E4A	CE	Occur in eucalypt forest with a mixed grass and shrub understorey. Historical information from <i>Euphrasia arguta</i> suggest the species could be found in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm.	Suitable	Likely
<i>Falco hypoleucos</i>	Grey Falcon	V	V	The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. Prey species include doves, pigeons, small parrots and cockatoos and finches. Breeding occurs from June to November. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (<i>Eucalyptus camaldulensis</i>) and Coolibah (<i>E. coolabah</i>).	Suitable	Likely
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe		V	Latham's Snipe breed in Japan and far eastern Russia during the northern hemisphere summer. They migrate south to winter in eastern Australia. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Forages primarily in the canopy of open eucalyptus forest and woodland, also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants and urban trees) also help sustain viable populations of the species.	Suitable	Likely
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Its diet mainly consists of mistletoe fruits, but also includes nectar (from flowering mistletoe, eucalypts and possibly banksias) and arthropods. The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens.	suitable	likely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.	Suitable	Likely
<i>Haloragis exalata subsp. velutina</i>	Tall Velvet Sea-berry	V	V	Occurs in damp places near watercourses and in woodland on steep rocky slopes. The distribution of this species overlaps with White Box-Yellow Box-Blakely's Gum Grassy Woodland and Derived Native Grassland and Upland Wetlands of the New England Tablelands and the Monaro Plateau.	Suitable	Likely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Harrisoniascincus zia</i>	Rainforest Cool-skink		V	The rainforest cool-skink is recorded from high elevation areas of the Great Dividing Range. All records of the rainforest cool-skink are from > 500 m elevation, with most occurrences from > 700 m elevation. Occurs entirely within the Gondwana Rainforests of Australia World Heritage Area in central eastern Australia	Unsuitable	Unlikely
<i>Hicksbeachia pinnatifolia</i>	Red Boppel Nut	V	V	Subtropical rainforest, moist eucalypt forest and Brush Box forest.	Marginally suitable	Potential
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	V	Breeds in Asia and spend the non-breeding season in Australasia, mainly in Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitat, they are probably recorded most often above wooded areas. Almost always forage aerially, above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats.	Suitable	Likely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V		Rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Nocturnal. During the day, shelters between loose bark and tree trunks, amongst vines, in hollow trunks/limbs, rock crevices or under slabs.	Marginally suitable	Potential
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V		Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation.	Unsuitable	Unlikely
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	During summer, it breeds in colonies in blue gum forest of south-east Tasmania. Infrequent breeding also occurs in north-west Tasmania. Breeding occurs in tree hollows and they have high site fidelity. The entire population migrates to the mainland for winter. On the mainland it disperses widely and forages on flowers and psyllid lerps in eucalypts. The birds mostly occur on inland slopes, but occasionally occur on the coast	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Leichhardtia longiloba</i>	Clear Milkvine	E1	V	Grows in open eucalypt forest, or margins of subtropical and warm temperate rainforest, and in areas of rocky outcrops. The distribution of this species overlaps with the "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland".	Marginally suitable	Potential
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit		E	Forage near the edge of water or in shallow water within tidal estuaries and harbours. Most feeding takes place on intertidal flats and beaches. Diet consists primarily of molluscs, crustaceans, worms, aquatic insects, and some plant material. Roosting tends to occur on large intertidal sandflats, spits, and banks. These sites are often near beds of seagrass and sometimes near saltmarshes. Arrive in Australia between August and October and leave between February and April.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Found in a wide range of water bodies except fast flowing streams. Breeding habitat in NSW includes water bodies that are still, shallow, ephemeral, unpolluted, unshaded, with aquatic plants and free of Mosquito Fish (<i>Gambusia holbrooki</i>) and other predatory fish, with terrestrial habitats that consisted of grassy areas and vegetation no higher than woodlands, and a range of diurnal shelter sites.	Suitable	Likely
<i>Lophoictinia isura</i>	Square-tailed Kite	V		Variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Suitable	Likely
<i>Macadamia integrifolia</i>	Macadamia Nut		V	Remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Macronectes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	E1	E	Range widely throughout the southern oceans. In summer they occur predominantly in subantarctic to Antarctic waters, usually below 60oS in the South Pacific and south-east Indian Oceans. Forage over large areas (30-2000 km) from their colony. On land, southern giant petrels (especially the males) scavenge mainly for seal or penguin carrion. At sea, cephalopods and fish are primarily taken by surface seizing. Return to their breeding sites in August. The large nests of southern giant petrels are normally built in exposed areas of open vegetation.	Unsuitable	Unlikely
<i>Macronectes halli</i>	Northern Giant Petrel	V	V	The Northern Giant Petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October). The Northern Giant-Petrel is marine and oceanic. The range of the Northern Giant-Petrel extends into subtropical waters mainly between winter and spring. It frequents both oceanic and inshore waters near breeding islands and in the non-breeding range.	Unsuitable	Unlikely
<i>Marsdenia longiloba</i>	Slender Marsdenia	E1	V	Subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin, Hooded Robin (south-eastern)	E1	E	Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas. Structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging. Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.	Unsuitable	Unlikely
<i>Miniopterus australis</i>	Little Bent-winged Bat	V		Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.	Marginally suitable	Potential
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V		Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Typically found in association with permanent streams through temperate and sub-tropical rainforest and wet sclerophyll forest, rarely in dry open tableland riparian vegetation, and also in moist gullies in dry forest.	Marginally suitable	Potential
<i>Mixophyes iteratus</i>	Giant Barred Frog	V	V	Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that provides for shelter and foraging, as well as open perching sites on the forest floor. Also occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and occasionally around dams.	Suitable	Likely
<i>Myotis macropus</i>	Southern Myotis	V		Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Suitable	Likely
<i>Myuchelys georgesi</i>	Bellinger River Snapping Turtle	E4A	CE	Endemic to the Bellinger Catchment on the north coast of NSW. Habitat preference is for moderate to deep pools with a rocky substrate.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Natator depressus</i>	Flatback Turtle		V	Post-hatchling and juvenile Flatback Turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles. Adults inhabit soft bottom habitat over the continental shelf of northern Australia. Nesting habitat includes sandy beaches in the tropics and subtropics with sand temperatures between 25 °C and 33 °C at nest depth. Beaches free from light pollution are required to prevent disorientation, disturbance, and to allow nesting females to come ashore.	Unsuitable	Unlikely
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V	Grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs. Wetlands both near the coast and in semi-arid zones used for foraging and staging. Breeding range includes Tasmania, coastal southeastern South Australia and southern Victoria.	Marginally suitable	Potential
<i>Niemeyera whitei</i>	Rusty Plum, Plum Boxwood	V		Gullies, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. It occurs on poorer soils in areas below 600 metres above sea level.	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Ninox strenua</i>	Powerful Owl	V		Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. Breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. Roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species.	Marginally suitable	Potential
<i>Notamacropus parma</i>	Parma Wallaby	V	V	Wet sclerophyll forest with a thick, shrubby understorey and nearby grassy patches. The species also occurs in dry sclerophyll forest with a dense understorey and occasionally in rainforest.	Unsuitable	Unlikely
<i>Numenius madagascariensis</i>	Eastern Curlew, Far Eastern Curlew		CE	Shorebird and a long-haul flyer. Takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V		Lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured. Roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings.	Marginally suitable	Potential
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)		V	Breeding is currently known from only from two rock stacks off Macquarie Island. The species as a whole has a circumpolar distribution, and probably frequents subtropical waters during the non-breeding period. Feeds by plucking food from the ocean surface.	Unsuitable	Unlikely
<i>Pandion cristatus</i>	Eastern Osprey	V		Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Parsonsia dorrigoensis</i>	Milky Silkpod	V	E	Subtropical and warm-temperature rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils.	Moderately suitable	Potential
<i>Persicaria elatior</i>	Knotweed, Tall Knotweed	V	V	Knotweed normally grows in damp places, including: coastal with swampy areas, along watercourses, streams and lakes, swamp forest and disturbed areas. Associated species include <i>Melaleuca linearifolia</i> , <i>M. quinquenervia</i> , <i>Lophostemon suaveolens</i> , <i>Casuarina glauca</i> , <i>Corymbia maculata</i> , <i>Pseudognaphalium luteoalbum</i> and <i>Polygonum hydropiper</i> .	Suitable	Likely
<i>Petauroides volans</i>	Southern Greater Glider	E1	E	Occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Petaurus australis</i>	Yellow-bellied Glider	V	V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils	Unsuitable	Unlikely
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	Prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges and isolated rock stacks. Rock-wallabies are closely associated with dense arboreal cover, especially fig trees. A range of vegetation types are associated with Brush-tailed Rock-wallaby habitat, including dense rainforest, wet sclerophyll forest, vine thicket, dry sclerophyll forest, and open forest.	Unsuitable	Unlikely
<i>Phaius australis</i>	Lesser Swamp-orchid	E1	E	Commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany are found. Restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest, swampy rainforest, or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm (<i>Archontophoenix cunninghamiana</i>) or Cabbage Tree Palm.	Marginally suitable	Potential
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V		Dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.	Unsuitable	Unlikely



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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Phascolarctos cinereus</i>	Koala	E1	E	Eucalypt woodlands and forests	Marginally suitable	Potential
<i>Philoria sphagnicola</i>	Sphagnum Frog	V		<i>Philoria sphagnicola</i> is a habitat specialist typically found in wet sclerophyll forest or subtropical rainforest habitats at elevations above 600 asl, but can also occur at lower elevation (to about 250 m) in wet coastal foothills. This species is usually found associated with sphagnum moss beds or seepages on steep slopes, in or near the headwaters of permanent streams.	Marginally suitable	Potential
<i>Phoniscus papuensis</i>	Golden-tipped Bat	V		Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Roost mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes. Specialist feeder on small web-building spiders.	Suitable	Likely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Planigale maculata</i>	Common Planigale	V		Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	Suitable	Likely
<i>Phyllodes imperialis southern subspecies</i>	Southern Pink Underwing Moth	E1	E	Subtropical rainforest below about 600 m elevation. Potential breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, <i>Carronia multisepalea</i> , occurs in subtropical rainforest. Adult Southern Pink Underwing Moths require the low light conditions of the rainforest in order to breed.	Unsuitable	Unlikely
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Often digs small holes in the ground in a similar way to bandicoots.	Marginally suitable	Potential

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Pseudomys novaehollandiae</i>	New Holland Mouse, Pookila		V	The New Holland Mouse has been found from coastal areas and up to 100 km inland on sandstone country. The species has been recorded from sea level up to around 900 m above sea level. Soil type may be an important indicator of suitability of habitat for the New Holland Mouse, with deeper top soils and softer substrates being preferred for digging burrows. Known to inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes. Due to the largely granivorous diet of the species, sites where the New Holland Mouse is found are often high in floristic diversity, especially leguminous perennials.	Unsuitable	Unlikely
<i>Pseudomys oralis</i>	Hastings River Mouse, Koontoo	E1	E	Open canopy and shrub layer between 410 and 1100m elevation. Ground cover varies from almost no cover to a dense, rank cover of grasses, herbs and sedges. Sedges, particularly Carex, Juncus and Cyperus spp. are common to most sites. This habitat occurs beside creeks (permanent and ephemeral) and soakages, but is also found on ridges and grassy plains.	Suitable	Likely

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Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Suitable	Likely
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V		Rainforests, low-elevation moist eucalypt forest, and brush box forests. Most often seen in mature forests, but also found in remnant and regenerating rainforest.	Marginally suitable	Potential
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V		Subtropical and dry rainforest, moist eucalypt forest and swamp forest where fruit is plentiful.	Marginally Suitable	Potential
<i>Rhodamnia rubescens</i>	Scrub Turpentine	E4A	CE	Littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Marginally Suitable	Potential
<i>Rhodomyrtus psidioides</i>	Native Guava	E4A	CE	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Suitable	Likely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Breeding habitat requires shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are mostly from small islands in freshwater wetlands. Recorded nesting in and near swamps, canegrass swamps, also in ground cover of water-buttons and grasses, at the base of tussocks and under low saltbush.	Marginally suitable	Potential
<i>Sarcophilus fitzgeraldii</i>	Ravine Orchid	V	V	Grows in shady areas, usually near streams, from 500 to 700 m altitude, mainly on rocks and sometimes on trees, in cool, moist ravines. It is found in the coastal subtropical rainforests and open forests of northern NSW.	Unsuitable	Unlikely
<i>Senna acclinis</i>	Rainforest Cassia	E1		Grows on the margins of subtropical, littoral and dry rainforests. Often found as a gap phase shrub. Flowering occurs in spring and summer and the fruit is ripe in summer and autumn.	Unsuitable	Unlikely



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Sternula nereis</i>	Fairy Tern		V	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline	Unsuitable	Unlikely
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats. Low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding.	Marginally suitable	Potential
<i>Syzygium hodgkinsoniae</i>	Smooth-bark Rose Apple, Red Lilly Pilly	V	V	The Smooth-bark Rose Apple grows in riverine subtropical or gallery rainforest on deep rich alluvial and basalt soils at altitudes of up to 300 m above sea level. The species is considered a rheophyte (adapted to growing along or sometimes within fast-flowing streams)	Marginally suitable	Potential



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche bulleri</i>	Buller's Albatross, Pacific Albatross		V	Buller's Albatross are marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean. Breeding habitat of Buller's Albatross occurs on subtropical and subantarctic islands and rock stacks. Nests are made in a range of inland habitats including bare substrate or fern and tussock covered cliffs, slopes or ridges, open grassy meadows and summit plateaus.	Unsuitable	Unlikely
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross, Pacific Albatross		V	The Pacific Albatross is a marine, pelagic species. It occurs in subtropical and subantarctic waters of the South Pacific Ocean. The birds breed on subtropical and subantarctic islands and rock stacks on sparsely vegetated slopes, cliff tops and ledges on rocky islands or stacks.	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche cauta</i>	Shy Albatross	E1	E	Regularly venture close to shore along the coasts of Tasmania and southern Australia, even entering bays and harbours. During breeding, adults forage close to their colonies, usually within 300 kms, in waters less than 200m deep. Shy albatrosses nest in colonies, mostly on islands around Tasmania, and have an annual breeding cycle lasting about eight months, from September until April. Most observations of shy albatrosses feeding at sea have been of birds seizing dead or moribund prey at the surface, taking fish from surface schools while flying.	Unsuitable	Unlikely
<i>Thalassarche impavida</i>	Campbell Albatross, Campbell Black-browed Albatross		V	The Campbell Albatross is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats. In breeding and non-breeding seasons, the Campbell Albatross are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks. In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents.	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V	The Black-browed Albatross breeds within Australian jurisdiction on Heard Island. The population migrates northward towards the end of the breeding season. The Black-browed Albatross is a marine species that inhabits Antarctic, subantarctic and temperate waters and occasionally enters the tropics. It can tolerate a broad range of sea-surface temperatures from 0–24° C. It forages around the breaks of continental and island shelves and across nearby underwater banks.	Unsuitable	Unlikely
<i>Thalassarche salvini</i>	Salvin's Albatross		V	Salvin's Albatross is a marine species occurring in subantarctic and subtropical waters. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Salvin's Albatross nest's on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation.	Unsuitable	Unlikely



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche steadi</i>	White-capped Albatross		V	White-capped Albatross is a marine species occurring in subantarctic and subtropical waters. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Birds nest on slopes vegetated with tussock and succulents on Auckland Island.	Unsuitable	Unlikely



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thesium australe</i>	Austral Toadflax, Toadflax	V	V	Austral Toadflax is semi-parasitic on roots of a range of grass species, notably Kangaroo Grass (<i>Themeda triandra</i>). It occurs in subtropical, temperate and subalpine climates over a wide range of altitudes. It occurs on soils derived from sedimentary, igneous and metamorphic geology on a range of soils including black clay loams to yellow podzolics and peaty loams. It occurs in shrubland, grassland or woodland, often on damp sites. Vegetation types include open grassy heath dominated by Swamp Myrtle (<i>Leptospermum myrtifolium</i>), Small-fruit Hakea (<i>Hakea microcarpa</i>), Alpine Bottlebrush (<i>Callistemon sieberi</i>), Woolly Grevillea (<i>Grevillea lanigera</i>), Coral Heath (<i>Epacris microphylla</i>) and grasses, kangaroo Grass grassland surrounded by Eucalyptus woodland and grassland dominated by Barbed-wire Grass.	Marginally suitable	Potential

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Tringa nebularia</i>	Common Greenshank, Greenshank		E	Wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. The edges of the wetlands used are generally of mud or clay, and may be bare or with emergent or fringing vegetation. Roosts and loafs round wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets.	Unsuitable	Unlikely
<i>Turnix melanogaster</i>	Black-breasted Button-quail	E4A	V	The Black-breasted Button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest.	Unsuitable	Unlikely
<i>Tyto novaehollandiae</i>	Masked Owl	V		Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides.	Marginally suitable	Potential



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Tyto tenebricosa</i>	Sooty Owl	V		Rainforest, including dry rainforest, subtropical and warm temperate rainforest, and moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>) or Sugar Glider (<i>Petaurus breviceps</i>). Nests in very large tree-hollows.	Marginally suitable	Potential
<i>Vincetoxicum woollsii</i>		E1	E	Wet sclerophyll/rainforest margins, Eucalypt dominated open forests and disturbed road verges. It grows on brown clay over metasediments at altitudes between 10–750 m above sea level.	Marginally suitable	Potential



**Appendix D - Threatened Species and Communities
Potential Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	-	Coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees.	Unsuitable	Unlikely

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
	Lowland Rainforest of Subtropical Australia	-	CE	Generally a moderately tall (≥ 20 m) to tall (≥ 30 m) closed forest (canopy cover $\geq 70\%$). Lowland Rainforest has the most diverse tree flora of any vegetation type in NSW. The canopy is often multilayered consisting of an upper, discontinuous layer of emergents, over the main canopy and subcanopy. Below the canopy is an understorey of sparse shrubs and seedlings. Occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. It also occurs occasionally on enriched rhyolitic soils and basaltically enriched metasediments. Lowland Rainforest mostly occurs in areas < 300 m above sea level. In addition, Lowland Rainforest typically occurs in areas with high annual rainfall (> 1300 mm). Lowland Rainforest typically occurs more than 2 km from the coast.	Marginally suitable	Potential



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
	Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community	-	E	Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL, on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. There are also minor occurrences on coastal dune swales or flats, particularly deflated dunes and dune soaks. Occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols (grey-black clay-loam and/or sandy loam soils) and sometimes organosols (peaty soils). It may occur in transitional soils (or catenas) where shallow unconsolidated sediments border lithic substrates. Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover of at least 10 per cent. Has a canopy of trees dominated by <i>Casuarina glauca</i> (swamp-oak, swamp she-oak).	Marginally suitable	Potential

Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	-	E	Occurs in the catchments of the eastern watershed of the Great Dividing Range, typically in their lower reaches. occurs at elevations up to 250 m above sea-level (ASL), most typically below 50 m ASL. occurs on alluvial landforms including river floodplains, riparian zones (e.g., along riverbanks, lake foreshores and creek lines), the floors of tributary gullies, floodplain pockets, alluvial flats, fans, terraces, and localised colluvial fans; as well as on localised depressions amongst low rises and on associated sites where water can pond. It occurs on alluvial soils ³ of various textures including silts, clay loams, sandy loams, gravel and cobbles. It does not typically occur on soils that are primarily marine or aeolian sands. It occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland (Specht 1970). The canopy has a crown cover ⁴ of at least 20%.	Suitable	Likely



Appendix D - Threatened Species and Communities Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	-	E	Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL. Occurs on hydric soils with inundation patterns ranging from intermittent to episodic. The vegetation structure varies from tall closed to open forest to woodland, to dense(closed) shrubland or scrub forest. Minimum crown cover is at least 10%, but it is more typically in the range 50% to 70%. The canopy is typically dominated or co-dominated by <i>Melaleuca quinquenervia</i> and/or <i>Eucalyptus robusta</i> . The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically <i>Gahnia</i> spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially <i>Imperata cylindrica</i> (Blady Grass).	Suitable	Likely



Appendix E - Migratory Species Potential Occurrence Assessment

32 & 88 Hains Lane, Brieffield

This appendix has been used to determine whether migratory species are likely to occur at the subject site by comparing site conditions observed during the site inspection to the required habitat for listed migratory species under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). Some of these species are also listed as threatened species under the Biodiversity Conservation Act 2016 (BC Act), Fisheries Management Act 1994 (FM Act) and EPBC Act 1999.

A guide to threatened species classifications is presented below:

BC Act Classifications		EPBC Act Classifications	
V	Vulnerable	V	Vulnerable
E1	Endangered	E	Endangered
E4A	Critically Endangered	CE	Critically Endangered

Species habitat data has been obtained from the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW), Species Profile and Threats (SPRAT) Database and NSW Government Office of Environment and Heritage (OEH) Bionet Threatened Biodiversity Profile Search.

The migratory species potential occurrence assessment table is presented on the following pages. The table has been sorted by potential to occur at the site, then alphabetically by species scientific name.



**Appendix E - Migratory Species Potential
Occurrence Assessment**

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Actitis hypoleucos</i>	Common Sandpiper			In Australia, the Common Sandpiper is found in coastal or inland wetlands, both saline and fresh. It is found mainly on muddy edges or rocky shores. Migratory, breeding in Eurasia with eastern breeding populations wintering in Australia.	Marginally Suitable	Potential
<i>Anous stolidus</i>	Common Noddy			During the breeding season, occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters. Birds may nest in bushes, saltbush, or other low vegetation. They may also nest on the ground in Pigface (<i>Carpobrotus</i> spp.) or grass, on bare rock, on top of rocks protruding above vegetation, on shingle beaches, among coral rubble or in sand close to grassy areas. During the non-breeding period, the species occurs in groups throughout the pelagic zone.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Apus pacificus</i>	Fork-tailed Swift			Almost exclusively aerial. Occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. Leaves its breeding grounds in Siberia from August–September. Arrives in Australia around October and departs again mid-April.	Moderately suitable	Potential
<i>Ardenna grisea</i>	Sooty Shearwater		V	Forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. The Sooty Shearwater feeds on a wide variety of pelagic prey, including cephalopods, fish and crustaceans. Summer breeder in Australia. Birds nest in burrows or rock crevices on coastal slopes, ridges and cliff tops, in herbfields, tussock grassland or forest. Areas with waterlogged or shallow soils and/or dense vegetation are avoided.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		V	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. Forage at the edge of the water on bare wet mud or sand, or in shallow water. Migratory, breeding in northern Siberia and moving in flocks of less than a thousand, to non-breeding areas south of the Equator.	Unsuitable	Unlikely
<i>Calidris canutus</i>	Red Knot, Knot		V	Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks. The species does not breed in Australia. They arrive in north-west Australia from late August and return to breeding grounds from March to April.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE	Occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. Generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands.	Unsuitable	Unlikely
<i>Calidris melanotos</i>	Pectoral Sandpiper			Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. Breeds in northern Russia and North America. Found in Australia from September to June.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Calonectris leucomelas</i>	Streaked Shearwater			Streaked shearwaters breed on islands off the southern Russian Far East, and Japan, east China, Korea and Taiwan. In the non-breeding season they migrate to waters off New Guinea and northern Australia and the South China Sea. Generally pelagic. Feed mainly on fish and squid.	Unsuitable	Unlikely
<i>Caretta caretta</i>	Loggerhead Turtle	E1	E	Nest on open, sandy beaches with sand temperatures between 25–33 °C. Beaches free from light pollution are required. Hatchlings enter the open ocean and begin feeding on small animals. Hatchling to subadult loggerheads occur in the open ocean foraging on planktonic organisms. Adults and large juveniles occur in waters with both hard and soft substrates including rocky and coral reefs, muddy bays, sandflats, estuaries and seagrass meadows.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Charadrius leschenaultii</i>	Greater Sand Plover, Large Sand Plover	V	V	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. The species does not breed in Australia. Greater Sand Plovers breed in open deserts or semi-arid areas.	Unsuitable	Unlikely
<i>Chelonia mydas</i>	Green Turtle	V	V	Spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with rafts of Sargassum. They settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae mats on which Green Turtles mainly feed. Can migrate more than 2600 km between their feeding and nesting grounds.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Cuculus optatus</i>	Oriental Cuckoo, Horsfield's Cuckoo			Forest, Monsoon forests; wet sclerophyll forests; paperbark swamps; mangroves. Northern and eastern Australia; nonbreeding migrant. Breeds northern spring in Eurasia. Laid in nest of another species.	Moderately suitable	Potential
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle	E1	E	Highly pelagic species, venturing close to shore mainly during the nesting season. It is known to forage year-round in Australian continental shelf waters. Adults feed mainly on pelagic soft-bodied creatures such as jellyfish and tunicates. Require sandy beaches to nest, with some evidence that coarser sand is more conducive to successful hatching than finer sand. Sand temperatures between 24–34 °C are needed for successful incubation. Beaches free from light pollution are required.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Diomedea antipodensis</i>	Antipodean Albatross		V	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Does not breed in Australia; instead it nests in the Northern Hemisphere summer and arrive in Australia in August.	Unsuitable	Unlikely
<i>Diomedea epomophora</i>	Southern Royal Albatross		V	Nearly 80 percent of a royal albatross' life is spent directly exposed to the cold, treacherous, open oceans of the Southern Hemisphere. Remote tropical islands are sought out for nesting. They typically nest on slopes with tussock grass providing some shelter, though exposed sites are also common as they ease the often difficult tasks of take-off and landing.	Unsuitable	Unlikely

Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Diomedea exulans</i>	Wandering Albatross	E1	V	Marine, pelagic and aerial. It occurs where water surface temperatures range from -2° to 24°C. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.	Unsuitable	Unlikely
<i>Eretmochelys imbricata</i>	Hawksbill Turtle		V	Spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with rafts of Sargassum. They settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae. Migrates up to 2400 km between foraging areas and nesting beaches.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Fregata ariel</i>	Lesser Frigatebird, Least Frigatebird			Common in tropical seas, breeding on remote islands, including Christmas Island. They nest in low vegetation, where they can land and take off directly from the nest site. Feeds on fish and some cephalopods, all food taken while in flight.	Unsuitable	Unlikely
<i>Fregata minor</i>	Great Frigatebird, Greater Frigatebird			Great frigatebirds are found over open, tropical ocean waters and near offshore, oceanic nesting islands. When not breeding, great frigatebirds wander widely to feed on fish and squid in areas with high concentrations of prey. Great frigatebirds breed on islands without predators. They nest in trees and shrubs, such as beach naupaka, beach heliotrope, pisonia, and mangroves. Nests are usually above 0.5 m and may be several kilometres inland on larger islands.	Unsuitable	Unlikely

Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe		V	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. Usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). Can also occur in habitats with saline or brackish water, in modified or artificial habitats. foraging habitats of Latham's Snipe are characterized by areas of mud and some form of cover. Migratory species. It breeds in Japan and in far eastern Russia during the northern summer and then migrates to Australia, where it remains for the duration of the northern winter.	Moderately suitable	Potential
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	V	Breeds in Asia and spend the non-breeding season in Australasia, mainly in Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitat, they are probably recorded most often above wooded areas. Almost always forage aerially, above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats.	Suitable	Likely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Lamna nasus</i>	Porbeagle, Mackerel Shark			Primarily inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle is thought to be reasonably flexible in the types of habitat used for foraging. The surface temperatures of waters inhabited by the Porbeagle typically range from 8-20° C.	Unsuitable	Unlikely
<i>Limosa lapponica</i>	Bar-tailed Godwit			Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. Usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. Does not breed in Australia; instead it nests in the Northern Hemisphere summer and returns to Australia in August.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Macronectes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	E1	E	Range widely throughout the southern oceans. In summer they occur predominantly in subantarctic to Antarctic waters, usually below 60oS in the South Pacific and south-east Indian Oceans. Forage over large areas (30-2000 km) from their colony. On land, southern giant petrels (especially the males) scavenge mainly for seal or penguin carrion. At sea, cephalopods and fish are primarily taken by surface seizing. Return to their breeding sites in August. The large nests of southern giant petrels are normally built in exposed areas of open vegetation.	Unsuitable	Unlikely
<i>Macronectes halli</i>	Northern Giant Petrel	V	V	Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year while immature birds make long and poorly known movements. At sea, are aggressive opportunists, feeding on fish, cephalopods, birds and crustaceans. During the vulnerable early chick phase adult birds utilise land-based carrion resources extensively.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Mobula alfredi</i>	Reef Manta Ray, Coastal Manta Ray			Often seen inshore around coral and rocky reefs in tropical and subtropical waters, they also occur around offshore reefs and seamounts. Individuals undertake seasonal migrations and aggregate at certain sites, presumably during times of high seasonal plankton productivity.	Unsuitable	Unlikely
<i>Mobula birostris</i>	Giant Manta Ray			The Giant Manta Ray is a large ray that is highly mobile and globally distributed throughout tropical to temperate pelagic waters.	Unsuitable	Unlikely
<i>Monarcha melanopsis</i>	Black-faced Monarch			Occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. Exhibit migratory behaviour, spending spring, summer and autumn in eastern Australia, and wintering in southern and eastern Papua New Guinea from March to August. Feeds mostly in rainforest but also in open eucalypt forest.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Motacilla flava</i>	Yellow Wagtail			Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings. It breeds from April to August. The species is almost wholly migratory with European populations wintering in the southern hemisphere including Australia.	Suitable	Likely
<i>Myiagra cyanoleuca</i>	Satin Flycatcher			Mainly inhabit eucalypt forests, often near wetlands, watercourses or gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level. mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts. Migratory, moving north in autumn to spend winter in northern Australia and New Guinea. They return south in spring to spend summer breeding in south-eastern Australia.	Suitable	Likely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Natator depressus</i>	Flatback Turtle		V	Adults inhabit soft bottom habitat over the continental shelf of northern Australia, extending into Papua New Guinea and Irian Jaya. Hatchling to subadult Flatback Turtles lack a pelagic life stage and reside in the Australian continental shelf. Require sandy beaches to nest. Sand temperatures between 25 °C and 33 °C are needed for successful incubation. Beaches free from light pollution are required.	Unsuitable	Unlikely
<i>Numenius madagascariensis</i>	Eastern Curlew, Far Eastern Curlew		CE	Shorebird and a long-haul flyer. Takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats.	Unsuitable	Unlikely
<i>Pandion haliaetus</i>	Osprey			Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Found in coastal areas but occasionally travel inland along major rivers. They require extensive areas of open fresh, brackish or saline water for foraging. Frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. Young birds may disperse more than 700 km from their natal territories.	Suitable	Likely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Phaethon lepturus</i>	White-tailed Tropicbird			Occupies marine habitats in tropical waters with sea-surface temperatures of more than 22°C. The tropicbird breeds on islands and atolls, where it nests in a variety of habitats including on bare sandy ground, in closed-canopy rainforest, on rocky cliffs and in quarries. In Australia nests in Pisonia trees amongst Pisonia-coconut vegetation, and on sandy ground. In Australian waters they are probably pelagic, as they are rarely found inshore or beachcast.	Unsuitable	Unlikely
<i>Rhipidura rufifrons</i>	Rufous Fantail			In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts, usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests. Breeds from about September to February. The nest is placed in a tree, shrub or vine, between 0.34–6.0 m above the ground. Migratory, being virtually absent from south-east Australia in winter with most spending the winter in coastal lowlands and off-shore islands in south-east Queensland.	Suitable	Likely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Symposiachrus trivirgatus</i>	Spectacled Monarch			Found in Australia, Indonesia, and Papua New Guinea. Its natural habitats are subtropical or tropical moist lowland forests, subtropical or tropical mangrove forests, and subtropical or tropical moist montane forests. Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. Resident in QLD and migrates south during summer breeding. Builds a small cup nest of fine bark, plant fibres, moss and spider web in a tree fork or in hanging vines, 1 m - 6 m above the ground, often near water.	Unsuitable	Unlikely
<i>Thalassarche bulleri</i>	Buller's Albatross, Pacific Albatross		V	Marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean. Have been observed in association with fishing boats close inshore and over waters 180–360 m deep. In Australia, Buller's Albatross are seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16 °C. Breeding habitat of Buller's Albatross occurs on subtropical and subantarctic islands. Nests are made in a range of inland habitats including bare substrate or fern and tussock covered cliffs, slopes or ridges, open grassy meadows, summit plateaus under Olearia forest.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche cauta</i>	Shy Albatross	E1	E	Regularly venture close to shore along the coasts of Tasmania and southern Australia, even entering bays and harbours. During breeding, adults forage close to their colonies, usually within 300 kms, in waters less than 200m deep. Shy albatrosses nest in colonies, mostly on islands around Tasmania, and have an annual breeding cycle lasting about eight months, from September until April. Most observations of shy albatrosses feeding at sea have been of birds seizing dead or moribund prey at the surface, taking fish from surface schools while flying.	Unsuitable	Unlikely
<i>Thalassarche impavida</i>	Campbell Albatross, Campbell Black-browed Albatross		V	Marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats. Migratory, moving from the breeding colonies to the continental shelf waters off Australia. Adults and fledglings leave the breeding grounds mid-April, with breeding birds returning between late August and early September.	Unsuitable	Unlikely



Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V	The Black-browed Albatross is a marine species that inhabits Antarctic, subantarctic and temperate waters and occasionally enters the tropics. It forages around the breaks of continental and island shelves and across nearby underwater banks, but also frequents other marine habitats, such as oceanic waters, and the iceberg belt at the limit of the Antarctic pack ice. In the non-breeding season it follows cold water currents north to the continental shelves of Australia where it can occur in coastal and inshore waters.	Unsuitable	Unlikely
<i>Thalassarche salvini</i>	Salvin's Albatross		V	Marine species and occurs in subantarctic and subtropical waters. noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. The species is scarce in pelagic waters. Nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation.	Unsuitable	Unlikely

Appendix E - Migratory Species Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat	Site Suitability	Potential Occurrence
		BC & FM Act	EPBC Act			
<i>Thalassarche steadi</i>	White-capped Albatross		V	Marine species and occurs in subantarctic and subtropical waters. noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. The species is scarce in pelagic waters. Birds gather to scavenge at commercial fishing grounds. Birds nest on slopes vegetated with tussock and succulents on Auckland Island.	Unsuitable	Unlikely
<i>Tringa nebularia</i>	Common Greenshank, Greenshank		E	Wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. The edges of the wetlands used are generally of mud or clay, and may be bare or with emergent or fringing vegetation. Roosts and loafs round wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets.	Suitable	Likely

Appendix F – BC Act (2016) Tests of Significance

32 & 88 Hains Lane, Brierfield

The Biodiversity Conservation (BC) Act (2016), Part 7, Division 1, Section 7.3 describes the requirements for tests to determine whether a proposed development or activity is likely to significantly affect threatened species, ecological communities, or their habitats. Under this legislation, the following factors must be taken into account when determining whether the proposed development is likely to produce an impact:

- 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.
- b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity—
 - 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,
- c) in relation to the habitat of a threatened species or ecological community—
 - i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
 - ii. 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
 - iii. 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,
- 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),
- 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.

The significance of the potential impact of the proposed development on threatened species and communities identified within the potential occurrence assessment is assessed in the following table.



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
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Giant Barred Frog (<i>Mixophyes iteratus</i>)	No lifecycle impact – The proposed development is located in the area of potential habitat. However, this habitat was noted in the field survey to be highly degraded. No frogs were sighted within the field assessment. However, full amphibian field surveys were not undertaken. In Phase 1 & 2 of the works (bridge strengthening and earthworks) there could be a direct impact to any individual frogs that may occupy the work area which will be temporarily disturbed (1-2 weeks). For this reason, before construction commences, a pre-clearance survey by an experienced ecologist should be undertaken, if any Giant Barred frogs are found, a full survey will be completed with exclusion fencing and controls installed. Once complete, the project works are likely to increase habitat for the	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Potential/ low Impact – The works involve the potential disturbance to individual frogs within the direct vicinity of earthworks and bridge stabilization, this will be minimized by pre-clearance surveys and other controls.	No significant impact
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Name	a)	b)	c)	d)	e)	Conclusion
	species with revegetation of native plants along the riparian edge.					
Wompoo Fruit-Dove (<i>Ptilinopus magnificus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of suitable native vegetation will occur for this project (a key threatening process).	No significant impact
Rose-crowned Fruit-Dove (<i>Ptilinopus regina</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process).	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Square-tailed Kite (<i>Lophoictinia isura</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process).	No significant impact
Coxen's Fig-Parrot (<i>Cyclopsitta diophthalma coxeni</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process).	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Red Goshawk (<i>Erythrotriorchis radiatus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact - No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Grey Falcon (<i>Falco hypoleucos</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact The works will not remove any hollow-bearing trees or clear native vegetation (key threatening process)	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Little Lorikeet (<i>Glossopsitta pusilla</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees or clear native vegetation (key threatening processes)	No significant impact
Painted Honeyeater (<i>Grantiella picta</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Stephens' Banded Snake (<i>Hoplocephalus stephensii</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact- No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Swift Parrot <i>(Lathamus discolor)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase foraging habitat for the species with revegetation of native food plants along the riparian edge.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
White-bellied Sea eagle (<i>Ichthyophaga leucogaster</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees or clear native vegetation (key threatening processes)	No significant impact



Southern Myotis (<i>Myotis macropus</i>)	No lifecycle impact – Southern Myotis are known to roost within wooden bridges and transport structures throughout NSW. Therefore, the works in Phase 1 to strengthen the bridge structure, may potentially disturb individuals who may be utilizing this bridge. While no visible signs of microbats were sighted within the field assessment, full fly-out and call back surveys were not conducted. As temporary disturbance will occur to this structure (1-2 weeks) there could be a direct impact to any individual bats that may occupy the bridge. For this reason, before construction commences, a pre-clearance survey by an experienced ecologist should be undertaken, if any Southern Myotis are found, a full survey will be completed to relocate these species and exclusion fencing and	N/A – Not a threatened ecological community	i) No habitat removal- the access bridge will not be removed, however if individuals are roosting within the structure they may be disturbed. ii) No habitat fragmentation or isolation iii) N/A	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Potential /low Impact to individuals. This will be mitigated by pre-clearance surveys post construction works	No significant impact
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Name	a)	b)	c)	d)	e)	Conclusion
	controls will be installed. As the construction works are outside of the birthing season (Nov- Dec) mother and pups are unlikely to be found, however if a nursery is found, no bridge work will be completed until pups have matured to fly out capacity. Once complete, the projects works are likely to increase habitat for the species with revegetation of native food plants along the riparian edge.					
White-throated Needletail <i>(Hirundapus caudacutus)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Green and Golden Bell Frog (<i>Litoria aurea</i>)	No lifecycle impact – The proposed development is located in the area of potential habitat. However, this habitat was noted in the field survey to be highly degraded. No frogs were sighted within the field assessment. However, full amphibian field surveys were not undertaken. In Phase 1 & 2 of the works (bridge strengthening and earthworks) there could be a direct impact to any individual frogs that may occupy the work area which will be temporarily disturbed (1-2 weeks). For this reason, before construction commences, a pre-clearance survey by an experienced ecologist should be undertaken, if any Green and Golden Bell frogs are found, a full survey will be completed with exclusion fencing and controls installed. Once complete, the projects works are likely to increase habitat for the	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Potential/ low Impact – The works involve the potential disturbance to individual frogs within the direct vicinity of earthworks and bridge stabilization, this will be minimized by pre-clearance surveys and other controls.	No significant impact
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Name	a)	b)	c)	d)	e)	Conclusion
	species with revegetation of native plants along the riparian edge.					
Golden-tipped Bat (<i>Phoniscus papuensis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Common Planigale (<i>Planigale maculata</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Australian Bittern (Botaurus poiciloptilus)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
South-eastern Glossy Black-Cockatoo (Calyptorhynchus lathami)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value with foraging trees being planted within the riparian area.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees (a key threatening process)	No significant impact

Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Large-eared Pied Bat, Large Pied Bat (<i>Chalinolobus dwyeri</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Brown Treecreeper (south-eastern) (<i>Climacteris picumnus victoriae</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Three-toed Snake-tooth Skink (<i>Coeranoscincus reticulatus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact - No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Little Bent-winged Bat (<i>Miniopterus australis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees or clear native vegetation (key threatening processes)	No significant impact



Stuttering Frog (<i>Mixophyes balbus</i>)	No lifecycle impact – The proposed development is located in the area of potential habitat. However, this habitat was noted in the field survey to be highly degraded. No frogs were sighted within the field assessment. However, full amphibian field surveys were not undertaken. In Phase 1 & 2 of the works (bridge strengthening and earthworks) there could be a direct impact to any individual frogs that may occupy the work area which will be temporarily disturbed (1-2 weeks). For this reason, before construction commences, a pre-clearance survey by an experienced ecologist should be undertaken, if any Stuttering frogs are found, a full survey will be completed with exclusion fencing and controls installed. Once complete, the projects works are likely to increase habitat for the	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Potential/ low Impact – The works involve the potential disturbance to individual frogs within the direct vicinity of earthworks and bridge stabilization, this will be minimized by pre-clearance surveys, exclusion fencing if necessary and other controls.	No significant impact
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Name	a)	b)	c)	d)	e)	Conclusion
	species with revegetation of native plants along the riparian edge.					
Blue-winged Parrot (<i>Neophema chrysostoma</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees or clear native vegetation (key threatening processes)	No significant impact
Powerful Owl (<i>Ninox strenua</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees (a key threatening process)	No significant impact

Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Eastern Long-eared Bat (<i>Nyctophilus bifax</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees or clear native vegetation (key threatening processes)	No significant impact
Eastern Osprey (<i>Pandion cristatus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Sphagnum Frog (<i>Philoria sphagnicola</i>)	No lifecycle impact – The proposed development is located in the area of potential habitat. However, this habitat was noted in the field survey to be highly degraded. No frogs were sighted within the field assessment. However, full amphibian field surveys were not undertaken. In Phase 1 & 2 of the works (bridge strengthening and earthworks) there could be a direct impact to any individual frogs that may occupy the work area which will be temporarily disturbed (1-2 weeks). For this reason, before construction commences, a pre-clearance survey by an experienced ecologist should be undertaken, if any Sphagnum frogs are found, a full survey will be completed with exclusion fencing and controls installed. Once complete, the projects works are likely to increase habitat for the	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Potential/ low Impact – The works involve the potential disturbance to individual frogs within the direct vicinity of earthworks and bridge stabilization, this will be minimized by pre-clearance surveys, exclusion fencing if necessary and other controls.	No significant impact
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Name	a)	b)	c)	d)	e)	Conclusion
	species with revegetation of native plants along the riparian edge.					
Koala (<i>Phascolarctos cinereus</i>)	The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Long-nosed Potoroo (<i>Potorous tridactylus</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Hastings River Mouse, Koontoo (<i>Pseudomys oralis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Australian Painted Snipe (<i>Rostratula australis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact
Diamond Firetail (<i>Stagonopleura guttata</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – No clearing of native vegetation will occur for this project (a key threatening process)	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Masked Owl (<i>Tyto novaehollandiae</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees (a key threatening process)	No significant impact
Sooty Owl (<i>Tyto tenebricosa</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact – The works will not remove any hollow-bearing trees (a key threatening process)	No significant impact
Slender Marsdenia (<i>Marsdenia longiloba</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Milky Silkpod <i>(Parsonsia dorrigoensis)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Scrub Turpentine <i>(Rhodamnia rubescens)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Native Guava <i>(Rhodomyrtus psidioides)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Name	a)	b)	c)	d)	e)	Conclusion
Red Boppel Nut <i>(Hicksbeachia pinnatifolia)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
<i>Vincetoxicum woollsii</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Tall Velvet Sea-berry <i>(Haloragis exalata subsp. Velutina)</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Tall Knotweed (<i>Persicaria elatior</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Newry Golden Wattle (<i>Acacia chrysotricha</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Trailing Woodruff (<i>Asperula asthenes</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Leafless Tongue-orchid (<i>Cryptostylis hunteriana</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Clear Milkvine (<i>Leichhardtia longiloba</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Rusty Plum, Plum Boxwood (<i>Niemeyera whitei</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
Lesser Swamp-orchid (<i>Phaius australis</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Smooth-bark Rose Apple, Red Lilly Pilly (<i>Syzygium hodgekinsoniae</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact
Austral Toadflax, Toadflax (<i>Thesium australe</i>)	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact	No significant impact



Appendix F – BC Act (2016) Tests of Significance

Name	a)	b)	c)	d)	e)	Conclusion
<i>Euphrasia arguta</i>	No lifecycle impact – The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase habitat value.	N/A – Not a threatened ecological community	i) No habitat removal ii) No habitat fragmentation or isolation iii) N/A The works do not involve clearing of vegetation or development within the suitable habitat area.	No impact – There are no declared areas of outstanding biodiversity value at the site or in surrounding areas.	Unlikely Impact The works will not remove any hollow-bearing trees (a key threatening process)	No significant impact



Appendix E – EPBC Act (1999) Assessment of Significance

32 & 88 Hains Lane, Brierfield

Under the EPBC Act (1999) an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The Matters of National Environmental Significance (MNES) – Significant Impact Guidelines (2013) describe the requirements for assessment of whether a proposed development or activity is likely to significantly impact MNES. The guidelines provide separate criteria to determine whether a development is likely to have a significant impact on the following:

1. Extinct in the wild species.
2. Critically endangered and endangered species.
3. Vulnerable species.
4. Critically endangered and endangered ecological communities.
5. Listed migratory species.
6. Wetlands of international Importance.
7. The Commonwealth marine environment.
8. World Heritage properties.
9. National Heritage places
10. Nuclear actions
11. Great Barrier Reef Marine Park

The significance of the potential impact of the proposed development on MNES identified within the MNES search is assessed in the following sections.



1 Extinct Species in the Wild

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on a species listed as extinct within the wild.

1.1 Identified Species

No species listed as extinct within the wild have been identified at the site.

1.2 Significant Impact Criteria

An action is likely to have a significant impact on extinct in the wild species if there is a real chance or possibility that it will:

1. Adversely affect a captive or propagated population or one recently introduced/reintroduced to the wild

No species identified at the site. Given the urban location of the site, reintroduction to the wild at the site is considered unlikely.

2. Interfere with the recovery of the species or its reintroduction into the wild.

No species identified at the site. Given the urban location of the site, reintroduction to the wild at the site is considered unlikely.

1.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on extinct species in the wild.



2 Critically Endangered and Endangered Species.

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on a species listed as critically endangered or endangered.

2.1 Identified Species

Critically endangered species which are considered to potentially occur at the Site include:

- Scrub Turpentine (*Rhodamnia rubescens*)
- Native Guava (*Rhodomyrtus psidioides*)
- Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*)
- Australian Fritillary (*Argynnis hyperbius inconstans*)
- Swift Parrot (*Lathamus discolor*)
- *Euphrasia arguta*
- Newry Golden Wattle (*Acacia chrysotricha*)

Endangered species which are considered to potentially occur at the Site include:

- Milky Silkpod (*Parsonsia dorrigoensis*)
- *Vincetoxicum woollsii*
- Green and Golden Bell Frog (*Litoria aurea*)
- Australian Bittern (*Botaurus poiciloptilus*)
- Large-eared Pied Bat, Large Pied Bat (*Chalinolobus dwyeri*)
- Red Goshawk (*Erythrorhynchus radiatus*)
- Australian Painted Snipe (*Rostratula australis*)
- Clear Milkvine (*Leichhardtia longiloba*)
- Lesser Swamp-orchid (*Phaius australis*)
- Koala (*Phascolarctos cinereus*)
- Hastings River Mouse, Koontoo (*Pseudomys oralis*)
- Southern Purple Gudgeon (*Mogurnda adspersa*)
- Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*)
- Swift Parrot (*Lathamus discolor*)

2.2 Significant Impact Criteria

An action is likely to have a significant impact on critically endangered or endangered species if there is a real chance or possibility that it will:

1. Lead to a long-term decrease in the size of a population.

- The proposed development is located in marginal and degraded habitat with short term impacts to the riverbank and creek bed in Phase 1 & 2 of the works (1-2 weeks). Temporary disturbance to potential amphibian habitat may occur while undertaking these activities, and if any Green and Golden Bell Frog (*Litoria aurea*) are noted in the project area during pre-clearance, a stop works order will be issued and relocation and exclusion controls will be put into place. The works will not lead to a long-term decrease in the size of a population.



2. Reduce the area of occupancy of the species.

The works will only remove sparse shrubs and understorey vegetation (mostly exotic pasture grasses) and does not involve clearing of vegetation within the suitable habitat area. The development is therefore unlikely to reduce the area of occupancy of the species.

3. Fragment an existing population into two or more populations.

The works do not involve clearing of vegetation or development within the suitable habitat area. The development is therefore unlikely to fragment an existing population.

4. Adversely affect habitat critical to the survival of a species.

The proposed development is unlikely to adversely affect critical habitat, the riverbank where the core of the works will be done is highly disturbed and degraded. While there will be a temporary disturbance to the creek bed during the instalment of bridge props, this is thought to be minimal. Once complete, the development will increase suitable aquatic and terrestrial habitat at the site through revegetation of the riparian edge. The development is therefore unlikely to adversely affect habitat critical to the survival of a species.

5. Disrupt the breeding cycle of a population.

The proposed development is minor in nature, while there is a potential for some individuals to be disturbed if they are found within the direct construction area, the development is unlikely to disrupt the breeding cycle of a population.

6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The works do not involve clearing or planting of vegetation or development within the suitable habitat area. The development is therefore unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

7. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

The development will be transporting a small amount of materials to the site for the project which are unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

8. Introduce disease that may cause the species to decline.

The project will establish hygiene protocols and controls to ensure no diseases are introduced to the project area.

9. Interfere with the recovery of the species.

The proposed development is minor in nature, while there is a potential for some individuals to be disturbed if they are found within the direct construction area and the development is therefore unlikely to interfere with the recovery of the species.



2.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on critically endangered or endangered species.



3 Vulnerable Species

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on a species listed as vulnerable.

3.1 Identified Species

Vulnerable species which are considered to potentially occur at the Site include:

- Giant Barred Frog (*Mixophyes iteratus*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Slender Marsdenia (*Marsdenia longiloba*)
- Red Boppel Nut (*Hicksbeachia pinnatifolia*)
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*)
- Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*)
- Stuttering Frog (*Mixophyes balbus*)
- Blue-winged Parrot (*Neophema chrysostoma*)
- Long-nosed Potoroo (*Potorous tridactylus*)
- Diamond Firetail (*Stagonopleura guttata*)
- Tall Velvet Sea-berry (*Haloragis exalata* subsp. *Velutina*)
- Tall Knotweed (*Persicaria elatior*)
- Leafless Tongue-orchid (*Cryptostylis hunteriana*)
- Macadamia Nut (*Macadamia integrifolia*)
- Smooth-bark Rose Apple, Red Lilly Pilly (*Syzygium hodgkinsoniae*)
- Austral Toadflax, Toadflax (*Thesium australe*)
- Grey Falcon (*Falco hypoleucos*)
- Painted Honeyeater (*Grantiella picta*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

3.2 Significant Impact Criteria

An action is likely to have a significant impact on vulnerable species if there is a real chance or possibility that it will:

1. Lead to a long-term decrease in the size of an important population of a species.

The proposed development is located in marginal and degraded habitat with short term impacts to the riverbank and creek bed in Phase 1 & 2 of the works (1-2 weeks). Disturbance to potential amphibian habitat may occur while undertaking these activities and if any Giant Barred Frog (*Mixophyes iteratus*) or Stuttering Frog (*Mixophyes balbus*) are noted in the project area during pre-clearance, a stop works order will be issued and relocation and exclusion controls will be put into place. The works will not lead to a long-term decrease in the size of a population.



2. Reduce the area of occupancy of an important population.

The works will only remove sparse shrubs and understorey vegetation (mostly exotic pasture grasses) and does not involve clearing of vegetation within the suitable habitat area. The development is therefore unlikely to reduce the area of occupancy of the species.

3. Fragment an existing important population into two or more populations.

The works do not involve clearing of vegetation or development within the suitable habitat area. The development is therefore unlikely to fragment an existing important population.

4. Adversely affect habitat critical to the survival of a species.

The proposed development is unlikely to adversely affect critical habitat, the riverbank where the core of the works will be done is highly disturbed and degraded. While there will be a temporary disturbance to the creek bed during the instalment of bridge props, this is thought to be minimal. Once complete, the development will increase suitable aquatic and terrestrial habitat at the site through revegetation of the riparian edge. The development is therefore unlikely to adversely affect habitat critical to the survival of a species.

5. Disrupt the breeding cycle of an important population.

The proposed development is minor in nature, while there is a potential for some individuals to be disturbed if they are found within the direct construction area, the development is unlikely to disrupt the breeding cycle of a population.

6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The works do not involve clearing or planting of vegetation or development within the suitable habitat area. The development is therefore unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The development will be transporting a small amount of materials to the site for the project which are unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

8. Introduce disease that may cause the species to decline.

The project will establish hygiene protocols and controls to ensure no diseases are introduced to the project area.

9. Interfere substantially with the recovery of the species.

The proposed development is minor in nature, while there is a potential for some individuals to be disturbed if they are found within the direct construction area and the development is therefore unlikely to interfere with the recovery of the species.



3.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on vulnerable species.



4 Critically Endangered and Endangered Ecological Communities.

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on critically endangered or endangered ecological communities.

4.1 Identified Species

Critically endangered ecological communities which are considered to potentially occur at the Site include:

- Lowland Rainforest of Subtropical Australia.

Endangered ecological communities which are considered to potentially occur at the Site include:

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community – Endangered under the EPBC Act
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland- Endangered under the EPBC Act

4.2 Significant Impact Criteria

An action is likely to have a significant impact on critically endangered or endangered ecological communities if there is a real chance or possibility that it will:

1. Reduce the extent of an ecological community.

The works do not involve clearing of vegetation or development within the suitable habitat area. The development is therefore unlikely to reduce the extent of an ecological community.

2. Fragment or increase fragmentation of an ecological community for example by clearing vegetation for roads or transmission lines.

The works do not involve clearing of vegetation or development within the suitable habitat area. The development is therefore unlikely to fragment or increase fragmentation of an ecological community.

3. Adversely affect habitat critical to the survival of an ecological community.

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to improve the riparian habitat. The development is therefore unlikely to adversely affect habitat critical to the survival of an ecological community.

4. Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.



The works do not involve clearing or planting of vegetation or development within the suitable habitat area. The works are not expected to encounter or disturb groundwater. The works do not involve substantial alteration of drainage or flood patterns or river alignment. The development is therefore unlikely to modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival.

5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. The works do not involve clearing or planting of vegetation or development within the suitable habitat area. Once complete, the development is likely to improve the riparian habitat. The development is therefore unlikely to cause a substantial change in the species composition of an occurrence of an ecological community.

6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- a. Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
- b. Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. The works do not involve clearing or planting of vegetation or development within the suitable habitat area. The works do not involve the application of fertilisers, herbicides or other chemicals in or nearby to the suitable habitat area. The works are proposed a large enough distance from the suitable habitat area that unintentional spills of chemicals that may harm ecological communities are unlikely to spread into the habitat area. The development is therefore unlikely to cause a substantial reduction in the quality or integrity of an occurrence of an ecological community.

7. Interfere with the recovery of an ecological community.

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to improve the riparian habitat. The development is therefore unlikely to interfere with the recovery of an ecological community.

4.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on critically endangered or endangered ecological communities.



5 Listed Migratory Species

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on listed migratory species.

5.1 Identified Species

Listed migratory species which are considered to potentially occur at the Site include:

- White-throated Needletail (*Hirundapus caudacutus*)
- Common Greenshank (*Tringa nebularia*)

5.2 Significant Impact Criteria

An action is likely to have a significant impact on a listed migratory species if there is a real chance or possibility that it will:

- 1. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.**

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. The works do not involve clearing or development within the suitable habitat area. Once complete, the development is likely to increase suitable habitat by providing riparian habitat along the degraded riverbank. The development is therefore unlikely to substantially modify, destroy or isolate an area of important habitat for a migratory species.

- 2. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.**

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. The works do not involve clearing or planting of vegetation or development within the suitable habitat area. The development is therefore unlikely to result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.

- 3. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.**

The proposed development is not located in the area of suitable habitat and is not expected to have a direct or indirect impact during construction. Once complete, the development is likely to increase suitable habitat by providing riparian habitat along the degraded riverbank. The development is therefore unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

5.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on listed migratory species.





6 Wetlands of International Importance

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the ecological character of the Ramsar wetland.

6.1 Identified Wetlands

No wetlands have been identified on the site or surrounding areas within 10 km of the site.

6.2 Significant Impact Criteria

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will:

1. Areas of the wetland being destroyed or substantially modified.

No wetlands have been identified on the site or surrounding areas. The development is therefore unlikely to substantially destroy or substantially modify areas of the wetland.

2. A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland.

No wetlands have been identified on the site or surrounding areas. The development is therefore unlikely to cause a substantial and measurable change in the hydrological regime of the wetland.

3. The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected.

No wetlands have been identified on the site or surrounding areas. The development is therefore unlikely to seriously affect the habitat of native species dependent upon the wetland.

4. A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health.

No wetlands have been identified on the site or surrounding areas. The development is therefore unlikely to cause a substantial and measurable change in the water quality of the wetland.

5. An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

No wetlands have been identified on the site or surrounding areas. The development is therefore unlikely to cause establishment of an invasive species that is harmful to the ecological character of the wetland in the wetland.

6.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on wetlands of international importance.



7 The Commonwealth Marine Environment

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the environment in a commonwealth marine area.

7.1 Identified Commonwealth Marine Environment

No commonwealth marine areas have been identified on the site or surrounding areas within 10km of the site.

7.2 Significant Impact Criteria

An action is likely to have a significant impact on the environment in a commonwealth marine area if there is a real chance or possibility that it will:

1. Result in a known or potential pest species becoming established in the Commonwealth marine area.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in a known or potential pest species becoming established in the Commonwealth marine area.

2. Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.

3. Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to have a substantial adverse effect on a population of a marine species or cetacean including its life cycle.

4. Result in a substantial change in air quality⁴ or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in a substantial change in air quality⁴ or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health.



5. Result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.

6. Have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.

No commonwealth marine areas have been identified on the site or surrounding areas. The development is therefore unlikely to have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.

7.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on the commonwealth marine environment.



8 World Heritage Properties

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the world heritage values of a world heritage property.

8.1 Identified World Heritage Properties

No world heritage properties have been identified on the site or surrounding areas within 10 km of the site.

8.2 Significant Impact Criteria

An action is likely to have a significant impact on the world heritage values of a world heritage property if there is a real chance or possibility that it will cause:

1. One or more of the World Heritage values to be lost.

No world heritage properties have been identified on the site or surrounding areas. The development is therefore unlikely to cause the loss of one or more of the world heritage values of a world heritage property.

2. One or more of the World Heritage values to be degraded or damaged.

No world heritage properties have been identified on the site or surrounding areas. The development is therefore unlikely to cause the degradation or damage of one or more of the world heritage values of a world heritage property.

3. One or more of the World Heritage values to be notably altered, modified, obscured or diminished.

No world heritage properties have been identified on the site or surrounding areas. The development is therefore unlikely to cause the notable alteration, modification, obscuration or diminishment of one or more of the world heritage values of a world heritage property.

8.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on world heritage property.



9 National Heritage Places

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the national heritage values of a national heritage place.

9.1 Identified World Heritage Properties

No national heritage places have been identified on the site or surrounding areas within 10 km of the site.

9.2 Significant Impact Criteria

An action is likely to have a significant impact on the national heritage values of a national heritage place if there is a real chance or possibility that it will cause:

1. One or more of the National Heritage values to be lost.

No National heritage places have been identified on the site or surrounding areas. The development is therefore unlikely to cause the loss of one or more of the national heritage values of a national heritage place.

2. One or more of the National Heritage values to be degraded or damaged.

No National heritage places have been identified on the site or surrounding areas. The development is therefore unlikely to cause the degradation or damage of one or more of the national heritage values of a national heritage place.

3. One or more of the National Heritage values to be notably altered, modified, obscured or diminished.

No National heritage places have been identified on the site or surrounding areas. The development is therefore unlikely to cause the notable alteration, modification, obscuration or diminishment of one or more of the national heritage values of a national heritage place.

9.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on national heritage values of a national heritage places.



10 Nuclear Actions

A nuclear action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the environment.

10.1 Identified Nuclear Actions

The development does not involve nuclear actions.

10.2 Significant Impact Criteria

All nuclear actions, as detailed in section 22 of the Act, should be referred to the Department of the Environment for a decision on whether approval is required. These actions are:

1. Establishing or significantly modifying a nuclear installation or a facility for storing spent nuclear fuel.

The development does not involve establishing or significantly modifying a nuclear installation or a facility for storing spent nuclear fuel.

2. Transporting spent nuclear fuel or radioactive waste products arising from reprocessing.

The development does not involve transporting spent nuclear fuel or radioactive waste products arising from reprocessing.

3. Establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing.

The development does not involve establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing.

4. Mining or milling uranium ore.

The development does not involve mining or milling uranium ore.

5. Establishing or significantly modifying a large-scale disposal facility for radioactive waste.

The development does not involve establishing or significantly modifying a large-scale disposal facility for radioactive waste

6. De-commissioning or rehabilitating any facility or area in which an activity described above has been undertaken.

The development does not involve de-commissioning or rehabilitating any facility or area in which an activity described above has been undertaken.



7. Establishing, significantly modifying, decommissioning or rehabilitating a facility where radioactive materials at or above the activity level specified in regulation 2.02 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations) are, were, or are proposed to be stored.

The development does not involve establishing, significantly modifying, decommissioning or rehabilitating a facility where radioactive materials at or above the activity level specified in regulation 2.02 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations) are, were, or are proposed to be stored.

10.3 Assessment of Impact

The proposed development does not involve nuclear actions.



11 Great Barrier Reef Marine Park

An action will require approval from the minister if the action has, will have, or is likely to have a significant impact on the environment in the Great Barrier Reef Marine Park.

11.1 Identified Commonwealth Marine Environment

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas within 10km of the site.

11.2 Significant Impact Criteria

An action is likely to have a significant impact on the environment in the Great Barrier Reef Marine Park if there is a real chance or possibility that it will:

- 1. Modify, destroy, fragment, isolate or disturb an important, substantial, sensitive or vulnerable area of habitat or ecosystem component such that an adverse impact on marine ecosystem health, functioning or integrity in the Great Barrier Reef Marine Park results.**

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to modify, destroy, fragment, isolate or disturb an important, substantial, sensitive or vulnerable area of habitat or ecosystem component such that an adverse impact on marine ecosystem health, functioning or integrity in the Great Barrier Reef Marine Park results.

- 2. Have a substantial adverse effect on a population of a species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.**

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to have a substantial adverse effect on a population of a species or cetacean.

- 3. Result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological health or integrity or social amenity or human health.**

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in a substantial change in air quality or water quality which may adversely impact on biodiversity, ecological health or integrity or social amenity or human health.

- 4. Result in a known or potential pest species being introduced or becoming established in the Great Barrier Reef Marine Park.**

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in a known or potential pest species being introduced or becoming established in the Great Barrier Reef Marine Park.

- 5. Result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.**



No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected within the Great Barrier Reef Marine Park.

6. Have a substantial adverse impact on heritage values of the Great Barrier Reef Marine Park, including damage or destruction of an historic shipwreck.

No Great Barrier Reef Marine Park areas have been identified on the site or surrounding areas. The development is therefore unlikely to have a substantial adverse impact on heritage values of the Great Barrier Reef Marine Park, including damage or destruction of an historic shipwreck.

11.3 Assessment of Impact

The proposed development is not considered likely to produce a significant impact on the Great Barrier Reef Marine Park.

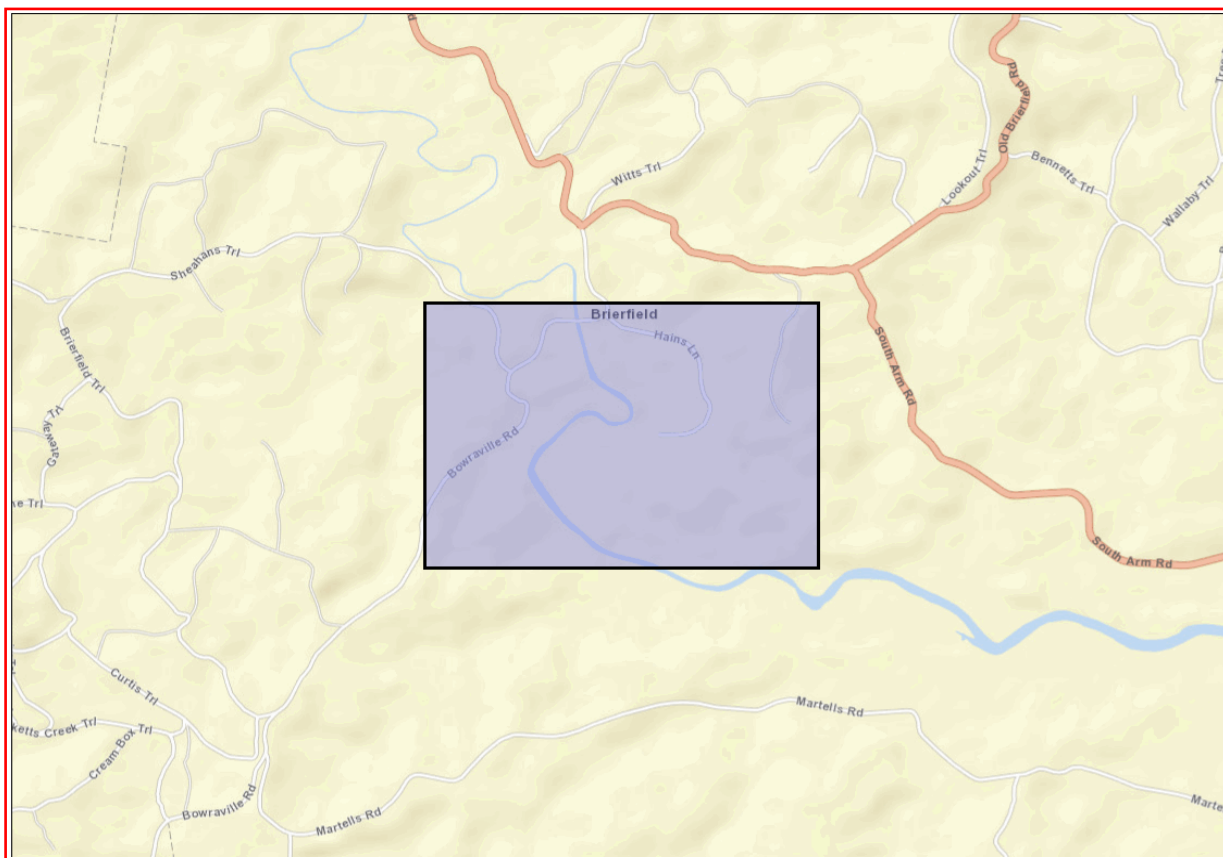
Bellingen Shire Council
 33-39 Hyde St
 Bellingen New South Wales 2452
 Attention: Justine Elder
 Email: jelder@bellingen.nsw.gov.au

Date: 06 May 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.5106, 152.8898 - Lat, Long To : -30.5014, 152.9053, conducted by Justine Elder on 06 May 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

BELLINGER & KALANG ESTUARY RIVERBANK EROSION ASSESSMENTS

REACH 1 – 32 & 88 HAINS LANE, BRIERFIELD

32 Hains Lane

Property of Daniel Whiddon

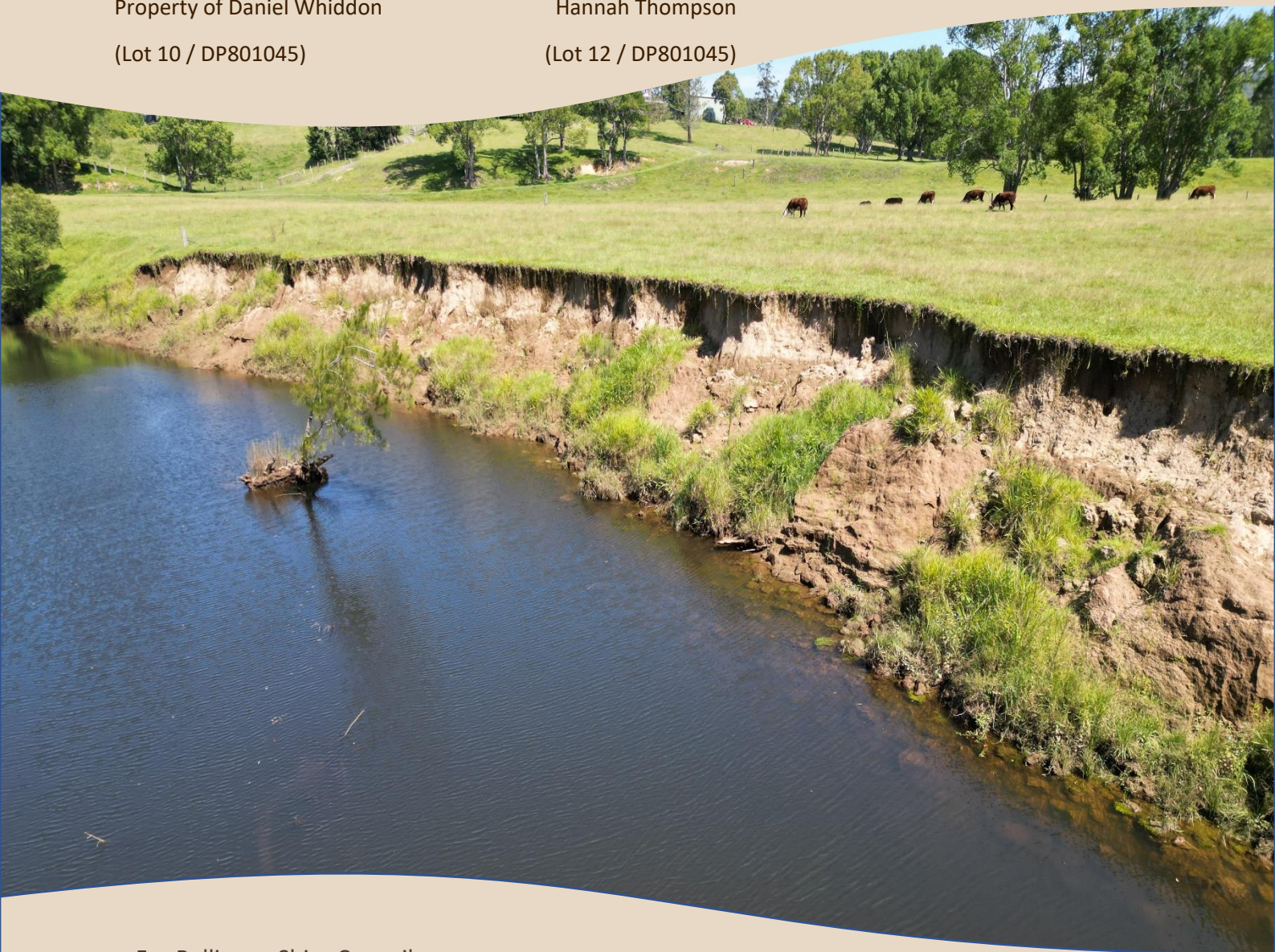
(Lot 10 / DP801045)

88 Hains Lane

Hannah Thompson

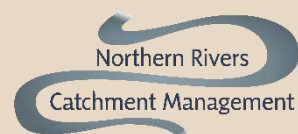
(Lot 12 / DP801045)

Dated: 24 March 2023



For Bellingen Shire Council

Prepared in
partnership with:



m. 0417 171 065

e. clayton@tallowwoodee.com.au

www.tallowwoodee.com.au

TALLOWWOOD
ENVIRONMENT & ENGINEERING



Acknowledgement of Country

Tallowwood Environment & Engineering

acknowledges the traditional custodians of the Gumbaynggirr lands which this report relates to.

We pay respect to the cultural, spiritual and land management relationships held by the

Elders past, present and future.



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1 Introduction

Tallowwood Environment & Engineering has been engaged by Bellinghen Shire Council to provide an Erosion Remediation Concept Plan for approximately 270m of bank length along the Kalang River. The property location map is provided in Figure 1.

The reach occurs across two adjacent properties. The site locations are shown in Figure 2.

Site 1 - 32 Haines Lane, Brierfield

Site 2 – 88 Hains Lane, Brierfield

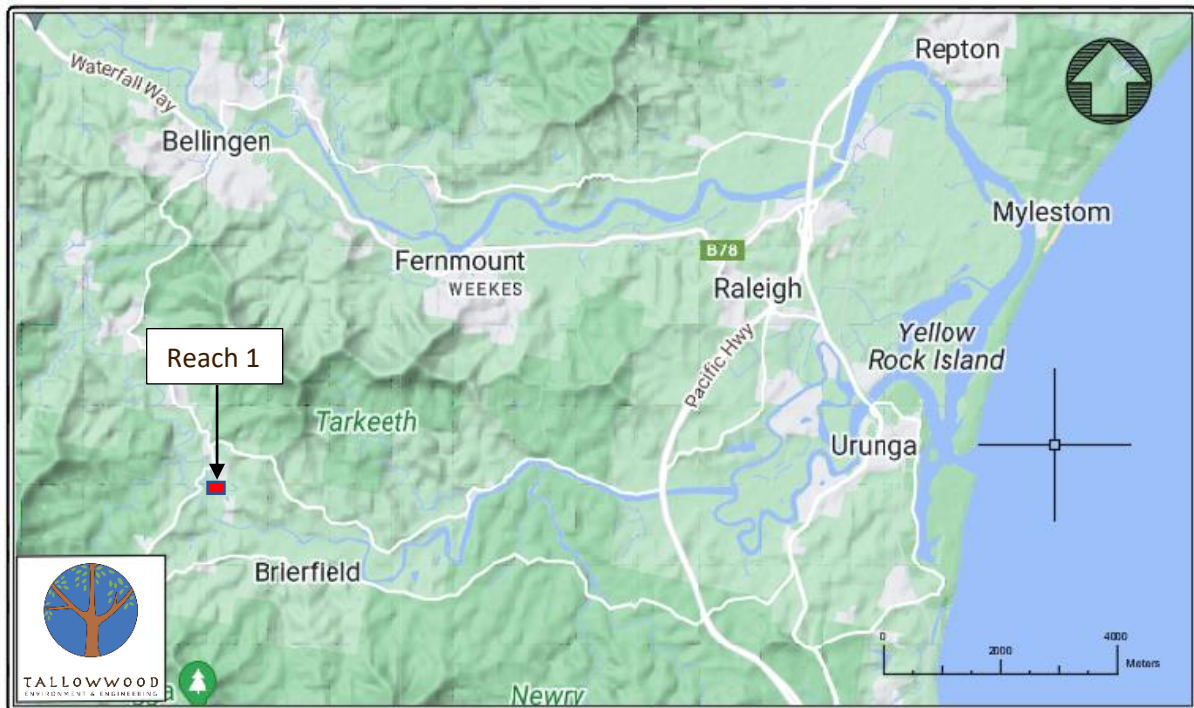


Figure 1 Site location map

2 Purpose and Scope

Significant riverbank erosion has been occurring on the river left bank of this reach of the Kalang River for many years and is progressively eroding several grazing paddock. The site has been subject to gravel extraction on the inside bend deposit and a meander cut-off opposite.

A site inspection was undertaken of the bank erosion site on 6th March 2023 during an outgoing tide. Field data and information was collected to enable the development of an erosion remediation concept plan.

The remediation plan consists of

- Erosion inspection report (brief description of the site, active erosion processes and remediation objectives)

- Concept remediation designs, design rock size & material estimates (not surveyed or engineer certified)
 - UAV / aerial image identifying location of proposed works and areas of proposed fill
 - Design detail of proposed works including typical cross sections
- Identified pathway for landholder to gain all permits required for recommended works

3 Site Assessment

The bank erosion site is located along the outside bend in the upper estuary approximately 600 metres downstream of the tidal limit. The upper estuary of the Kalang River is a high energy reach dominated by fluvial processes in which the floodplain is generally elevated approximately 4m above mean tide level (Telfer and Cohen, 2010). Floodplain bank material is comprised of an alluvial sandy loam (Eddie, 2000) and high terraces are comprised of silty clays. Bed material is predominantly gravel and sand.

Bank erosion was observed to be active for approximately 270 metres along the river left bank which comprises the channel of an old meander cut-off (see figure 1). The meander cut-off, which occurred prior to the living memory (70 years) of a local landholder and evident in 1956 historical aerial imagery, reduced the channel length by approximately 450 metres. A billabong remains located against the river left valley margin and the abandoned channel exiting and re-entering the current channel is apparent on the floodplain. The inside bend of the current channel was used as a gravel extraction site by Council up until the late 1980's / early 1990's. Landholder observations include the loss of riparian vegetation, bank erosion, the shallowing of pool depth and an increase in the tidal influence progressing upstream.

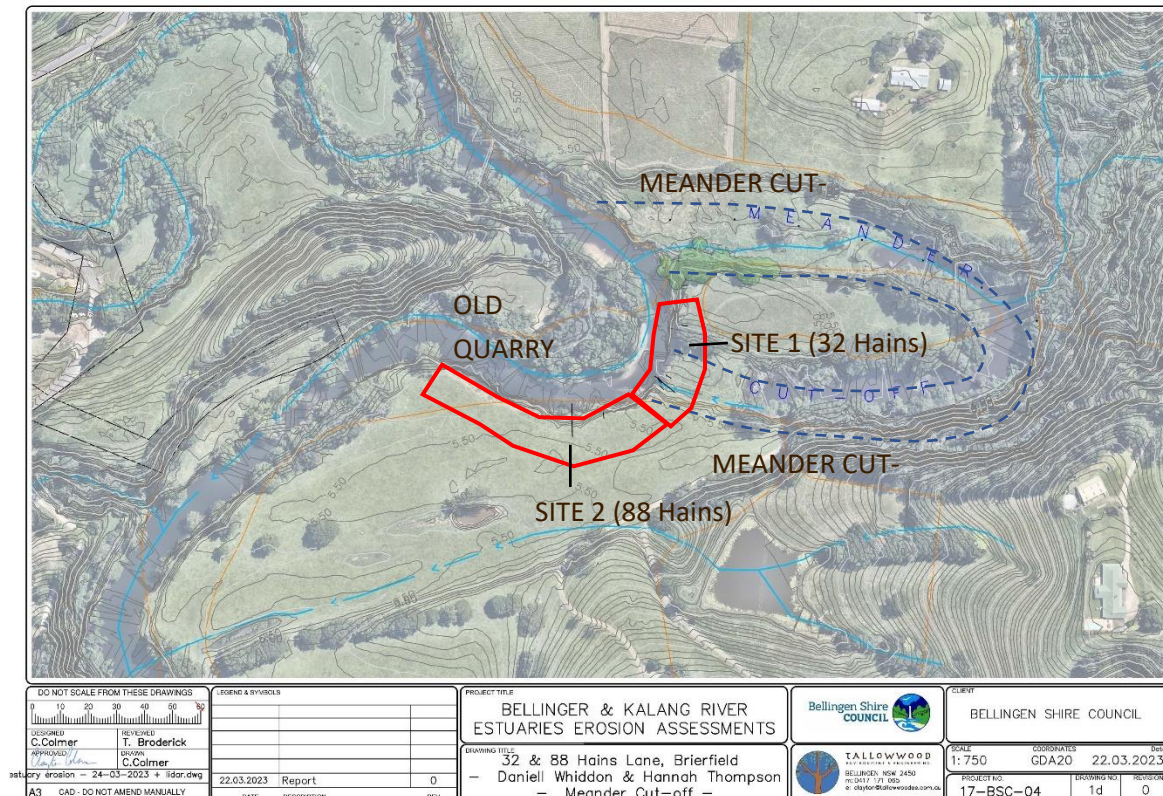


Figure 2 Meander Cut-off & Quarry Locations

Historical aerial imagery (1956-2022) shows a linear strip of riparian vegetation persisting along much of the bank up until the flood events of 2009 when many of the large trees fell into the river. A visual comparison of aerial imagery indicates bank retreat of up to 7 metres since 2009, half of which occurred in the recent floods in the downstream section of the eroded bank on Lot 12 DP 8041045 (88 Hains Lane).

Bank profile cross sections provided in Appendix 2 show the variability in bank profiles and water depths throughout the site. Measurements were taken during an outgoing tide estimated to be 0.3-0.4m AHD. The crest of the high bank of the floodplain is generally between 4.0 and 5.5 metres above water level. Water depths measured at 1.5m, 2m and 3m from the water's edge were deepest at cross Section G and shallow immediately downstream of the boundary between 32 and 88 Haines Lane at cross Section E where a riffle and bank attached bars extend across the channel.

Table 1 Water depths at selected cross sections

Section	1m	2m	3m	4m
A	0.5	0.85	1	2
B	0.65	1.2	1.75	2.2 (5m)
E	0.25	0.3	0.3	0.25
G	0.9	1.9	2.2	2.5

Understanding the active erosion processes is key to the prescription of remediation options. Table 2 provides a description of the various erosion processes identified to be active at the site. Bank slumping is the dominant erosion process throughout the site with meander bank toe erosion a contributing factor in the downstream section of the site. Overbank flow is resulting in bank retreat immediately upstream from the boundary between 32 and 88 Haines Lane at Section D (Chainage 75m).

Stock grazing and trampling is reducing opportunities for the natural regeneration of vegetation and bank recovery.

Table 2: Erosion process types in reach

Erosion Type	Description of process
Bank Slumping / Rotational Slip / Drawdown.	A downward mass movement of unconsolidated soil material that moves suddenly along a curvilinear plane as a result of seepage and gravity. This occurs when floodwaters recede and water drains through the floodplain soil to the stream bank exerting outward pressure on saturated soil particles, causing a seep (usually along the change in soil type) and creating a landslide under the influence of gravity. It is often sandy bank material slipping off an underlying clay or rock. Additional causes include toe erosion and the increased weight and bank slope built through the depositional processes of natural levee formation.
Meander bank toe erosion	Hydraulic forces scouring the bank toe creating a deep-water thalweg against the bank.
Overbank flow	Localised bank scour at flow entry point to channels from upslope runoff. Usually related to sheet flow being confined to a single discharge point (e.g., road drainage network) or flood chute re-entry locations where channel expansion has occurred. Can be exacerbated by eddying currents.

4 Remediation

4.1 Remediation Objectives

The site reach has been divided into seven Sections (A-G) on the basis of site characteristics and active erosion processes (See Appendix 1). Remediation objectives are provided for each of these sections.

Section A – D occurs on 32 Hains Lane.

Sections E-G occur on 88 Hains Lane.

4.1.1 Section A

Bank slumping. Much of the slumped material and associated vegetation has remained in-situ at the bank toe and mid bank and considered to be relatively stable. Reference to Cross-section A shows the profile is in the realm of stable for an earth batter of 2:1.



Plate 1 Looking upstream at Section A – relatively stable profile

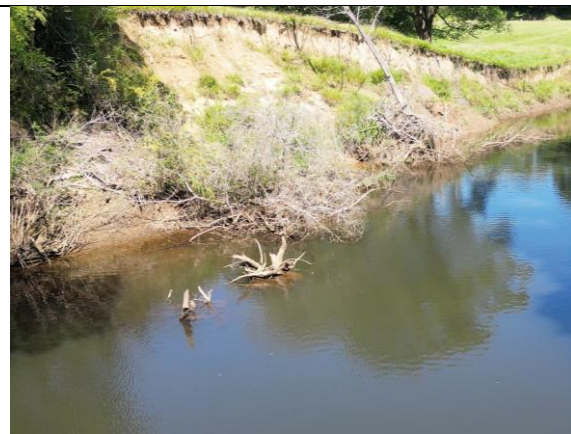


Plate 2 Looking downstream at Section A – relatively stable profile

Remediation objectives are to

- batter mid to upper bank profile to facilitate the revegetation and maintenance of native riparian species.

4.1.2 Section B/C

Bank slumping with some unconsolidated bank material remaining along the bank toe into relatively deep water (1.8m at 3m). Buried logs exposed.

High bank is Section B, low Meander cut-off is Section C.



Plate 3 Looking upstream at Section B/C



Plate 4 Looking downstream at Section B/C

Remediation objectives are to

- provide a stable bank toe
- batter mid to upper bank profile to facilitate the revegetation and maintenance of native riparian species.

4.1.3 Section D

Overbank flow from the billabong re-entering the channel during receding flood levels.



Plate 5 Section D - Overbank flow scour hole

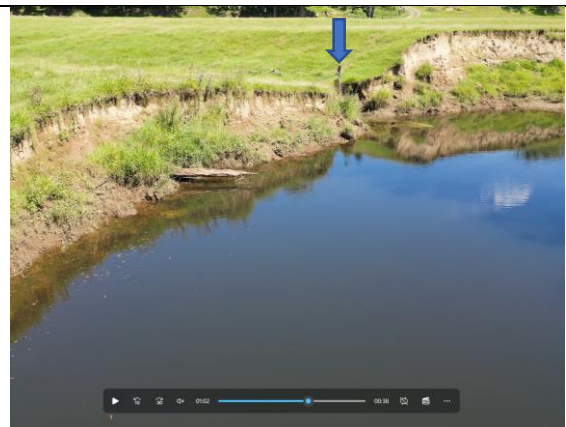


Plate 6 Context photo of billabong re-entry

Remediation objective are to

- provide a stable drop structure at re-entry point and tie into upstream and downstream bank profiles
- revegetate upslope of the drop structure to slow flows

4.1.4 Section E

Bank slumping of the mid to upper bank with gravel deposition at the toe. Over 7m lost since 2009.



Plate 7 Section E – Bank slumping with gravel deposit at toe



Plate 8 Section E – view looking upstream

Remediation objectives are to

- batter mid to upper bank profile to facilitate the revegetation and maintenance of native riparian species.
- Minimise stock impacts
- Include a groyne

4.1.5 Section F

Stable. Water depths measured along the bank at the base of existing tea trees (*leptospermum brachyandrum*) were up to 1.2m, however, the bank toe seems stable and formerly slumped mid to upper bank appears to have recovered to a naturally stable grade.



Plate 9 Section F – stable and partly vegetated

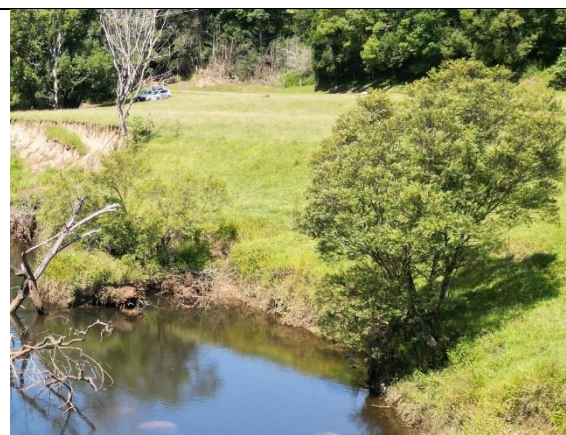


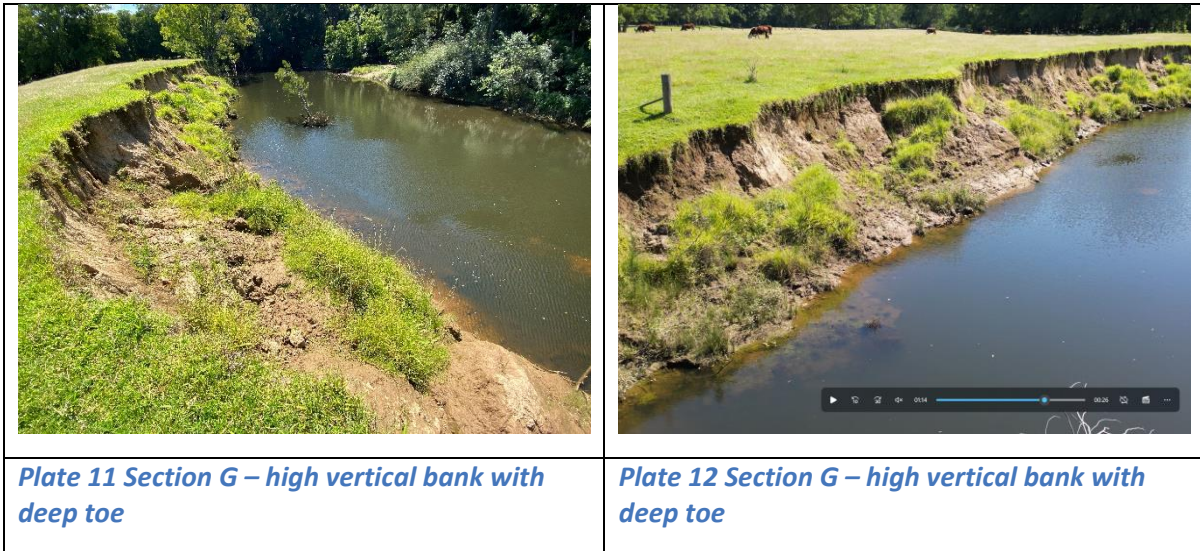
Plate 10 Section F – view looking upstream

Remediation objective is to:

- Remove stock impacts and revegetate the area

4.1.6 Section G

Extensive bank slumping along this lower section is exacerbated by deep water along the bank toe indicating that bank toe erosion may be a contributing factor. Over 7m lost since 2009.



Remediation objective is to

- provide a stable bank toe
- batter mid to upper bank profile to facilitate the revegetation and maintenance of native riparian species
- remove stock impacts

4.2 Remediation Concept Plan

The six concept plans for remediation of this site is detailed in Appendix 3.

The broad concept is bank battering, revegetation and securing the toe with durable igneous rock. Large Woody Debris would also have a place in this reach however rock is deemed more cost and time efficient, and reliable for supply.

4.2.1 Earthworks

Earthworks comprise of topsoil stripping, bulk excavation, battering, spoil disposal, trimming, and placement of organic materials to support revegetation.

Battering slopes have been set at 2:1 for several reasons:

- Mimics the natural angle of repose in adjacent sections (See Section F)
- It is the minimum slope needed to reduce risk of slip failures (in normal situations)
- It applies the minimum possible encroachment into the grazing paddocks
- Minimised earthworks and cost efficiencies

Flatter slopes of 2.5:1 or 3:1 are more stable and easier to maintain, but are higher cost and more disturbance and spoil to manage.

Spoil from battering will be disposed on farm at the landholder's discretion.

4.2.2 Rock

Rock will be placed in selected Sections where the toe is not considered stable. It will be placed below and above the water in these Sections.

Below the water, the rock will follow the bed contours but finish with a minimum 1.5:1 slope (angle of repose). Where required, the toe rock will be fattened out with launch material to allow for bed scour (detailed design stage).

Above the water, the rock will follow the batter slope of 2:1.

4.2.3 Revegetation

All batters are to be prepared and planted out for revegetation. Revegetation of the batters has many advantages:

- Established hardy riparian plants create roughness and pushes moving water away from the bank
- Established hardy riparian plants reduce velocities at the bank
- Dense planting above the rock at the interface with the batter reduces 'edge effect' scouring
- The network of roots from appropriately selected species stabilise the surface soils reducing surface erosion (does not stop mass movement however)
- Creates habitat for terrestrial and aquatic species
- Has aesthetic value

4.2.4 Stock Exclusion

Excluding grazing animals is critical to the success of this treatment. As discussed above, vegetation needs to establish to support the battering. Durable fencing is preferred however electric fences, well maintained will suffice, especially in high frequency flood prone lower sections. Crash grazing may be possible after several seasons of plant establishment.

4.2.5 Section A

Battering can be achieved by smudging the earth to balance the cut and fill and create a uniform surface for revegetation in this section.

4.2.6 Section B/C

The deep profile of the river bed means this section requires significant rock to armour the toe. Large Woody Debris would be a good alternative in this section if available.

4.2.7 Section D

The scour hole needs to be armoured to prevent further retreat and undermining of the embankment. Armouring is with rock and will match the 2:1 profile from Section B/C which it adjoins. Careful placement of rock at the toe is required in this section.

4.2.8 Section E

The gravel deposition at the toe of this section means rock revetment is not required. Simple battering and revegetation as for Section A will apply here.

4.2.9 Section F

Revegetation only.

4.2.10 Section G

This is the most significant section of works at the site. Battering at 2:1 with a rock toe and revegetation.

5 Approvals Pathway

A review of current legislation and reference to the site Property Report (Appendix 4) has determined the following approvals are required for the works to fully comply. They are listed in order of sequence to avoid delays or rejected applications.

	Agency	Legislation	Trigger	Assessment	Requirement	
1	NSW FISHERIES	<i>Fisheries Management Act</i>	Foreshore stabilisation (e.g., revetment walls)	Mapped as Key Fish Habitat	Fisheries Permit (Section 201)	☒
2	CROWN LAND	<i>Crown Lands Act</i>	Permanent works below the Mean High Water Mark on the Crown Foreshore.	Mapped as extending into the MHWL	Crown Land Permit & Lease	☒
3	BELLINGEN SHIRE COUNCIL	<i>Local Government Act</i>	RU1 Primary Production	Permitted without Consent	Nil	☐
			W2 (Recreational Waters)	Permitted with Consent	Development Application	☒
		<i>SEPP (Resilience & Hazards) 2021</i>	In a Coastal Wetlands or Littoral Rainforest area	Not mapped	Designated Development	☐
		<i>Environmental Planning & Assessment Reg 2000</i>	Listed Activity in Schedule 3	Not Listed	Designated Development	☐
		<i>State Environmental Planning Policies</i>	Waterway and Foreshore Management Activities <u>not</u> carried out by Public Authority (e.g., Soil Conservation Service)	Assume private contractor	Development Application	☒
4	WATER NSW	<i>Water Management Act</i>	Works within the riparian corridor	Waterfront Land e-tool - 'likely'	Controlled Activity Permit	☒
			Waterway and Foreshore Management Activities <u>not</u> carried out by Public Authority (e.g., Soil Conservation Service)	Assume private contractor	Controlled Activity Permit	☒

6 Project Estimate

The estimated budget for this project is **\$225,300 ex GST**. The breakdown by Section and Site is shown . The budget estimate is detailed in Appendix 3.

Table 3 Project Budget Estimate Summary

Section	Budget Estimate
Project Management & Approvals	\$51,000
A	\$8,200
B/C	\$38,000
D	\$5,800
Site 1 - 32 Hains Lane, Brierfield	\$52,000
E	\$22,200
F	\$5,500
G	\$94,600
Site 2 – 88 Hains Lane, Brierfield	\$122,100
Project Total ex GST	\$225,300

7 References

Telfer, D. Cohen, T. 2010. Bellinger and Kalang River Estuaries Erosion Study. Report prepared for Bellingen Shire Council.

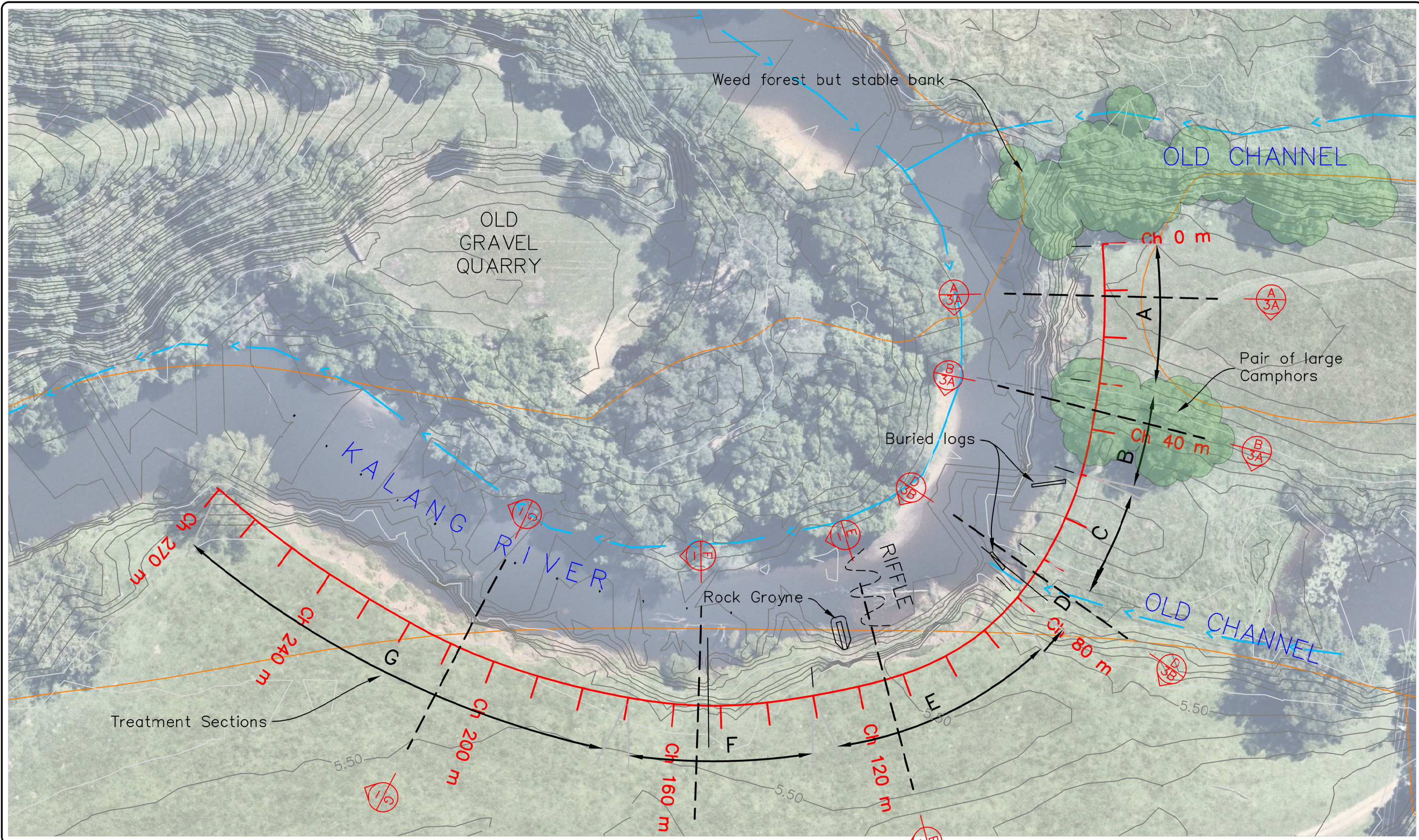
Eddie, M.W. 2000. Soil Landscapes of Macksville and Nambucca 1:100,000 sheets- Department of Land and Water Conservation-Sydney.

- END OF REPORT -

Prepared by:	Clayton Colmer B.E., B.Nat.Res, FIEAust, CPESC		30-03-2023
Reviewed by:	Tony Broderick B. Enc Sc Hons		30-03-2023

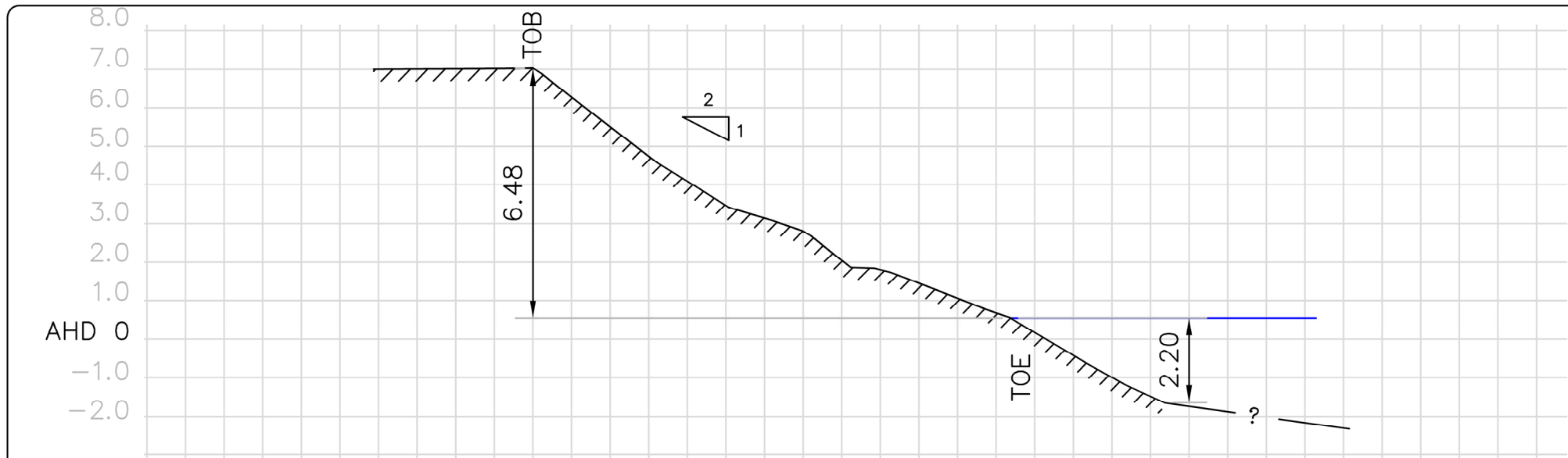
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Appendix 1 Site Plan

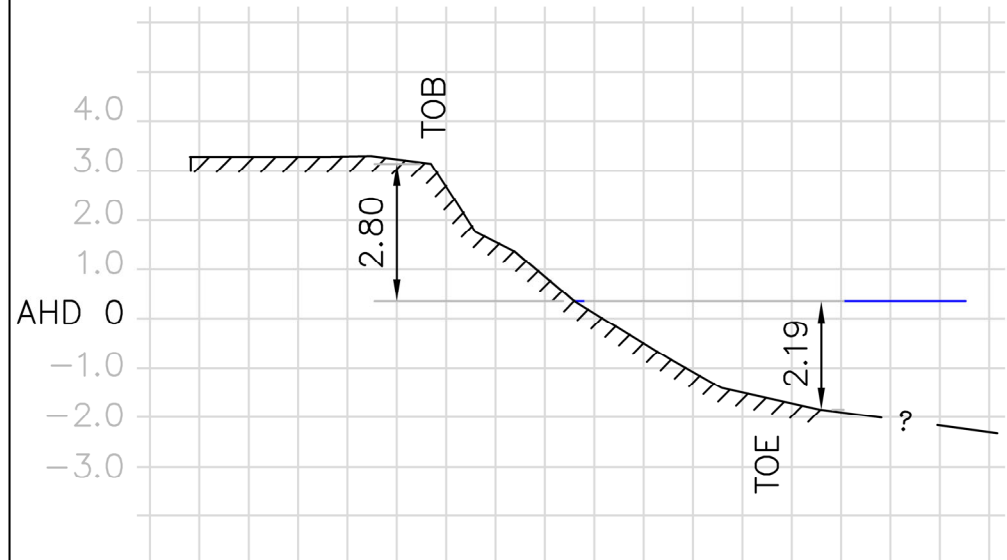


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DESIGNED C.Colmer	REVIEWED T. Broderick			DRAWING TITLE 32 & 88 Hains Lane, Brierfield - Daniell Whiddon & Hannah Thompson - Site Plan -		TALLOWOOD ENVIRONMENT & ENGINEERING BELLINGEN NSW 2450 m: 0417 171 065 e: clayton@tallowood.com.au		SCALE 1:750	
APPROVED <i>C. Colmer</i>	DRAWN C.Colmer					COORDINATES GDA20		Date 22.03.2023	
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DATE		DESCRIPTION		REV		REVISION 0			

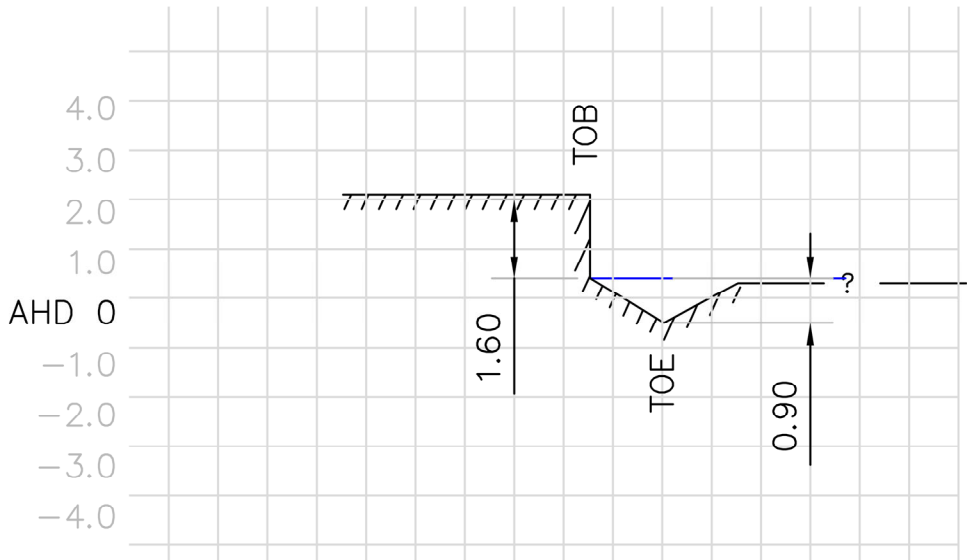
Appendix 2 Cross Sections



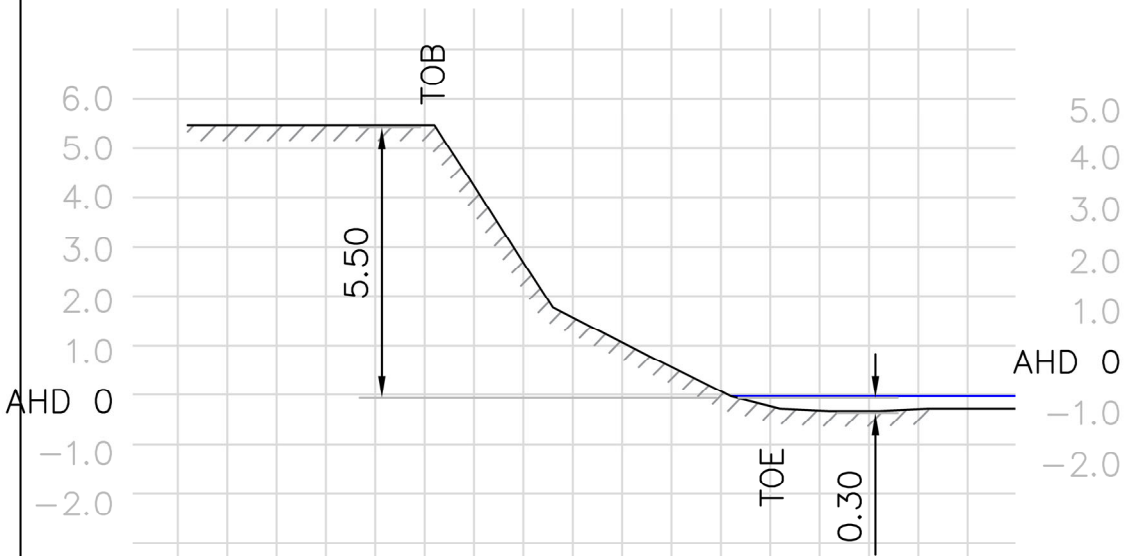
A
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Scale: 1:150



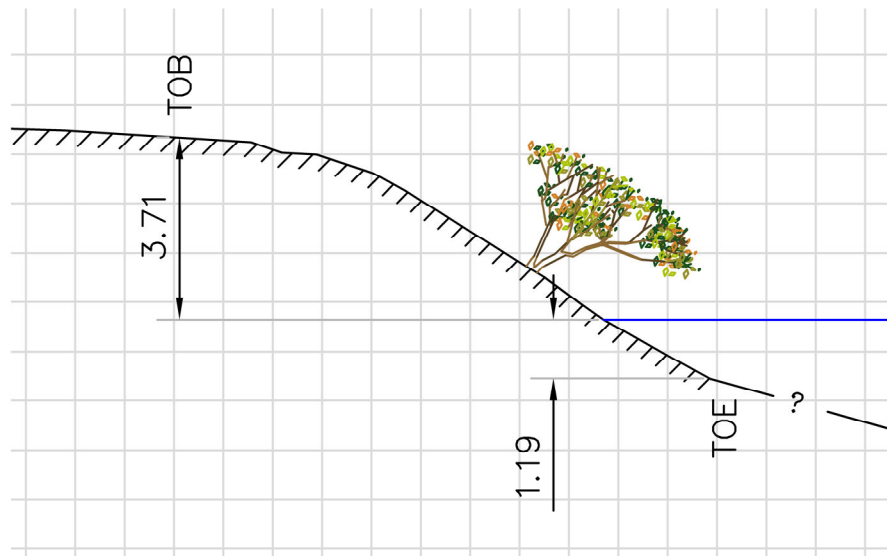
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1A SECTION B/C @ CH. 35m
Scale: 1:150



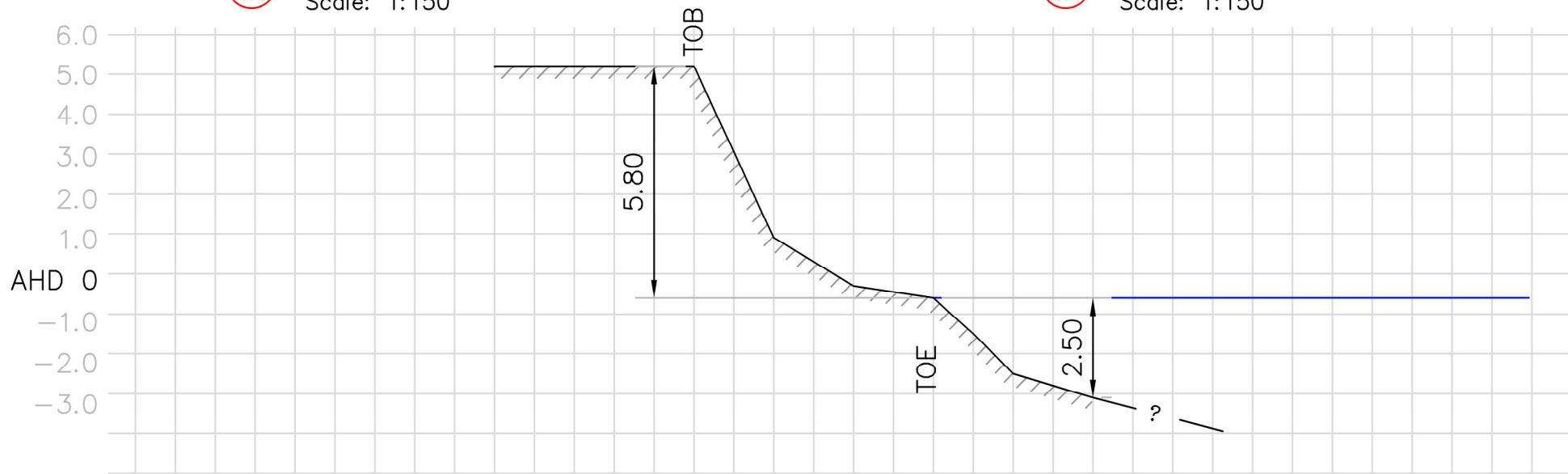
D
1A SECTION D @ CH. 75m
Scale: 1:150



F
1A SECTION E @ CH. 115m
Scale: 1:150



B
1A SECTION F @ CH. 155m
Scale: 1:150



G
1A SECTION G @ CH. 210m
Scale: 1:150

All gridlines 1m x 1m.
No vertical exaggeration

AHD levels determined from
Lidar Survey 2010

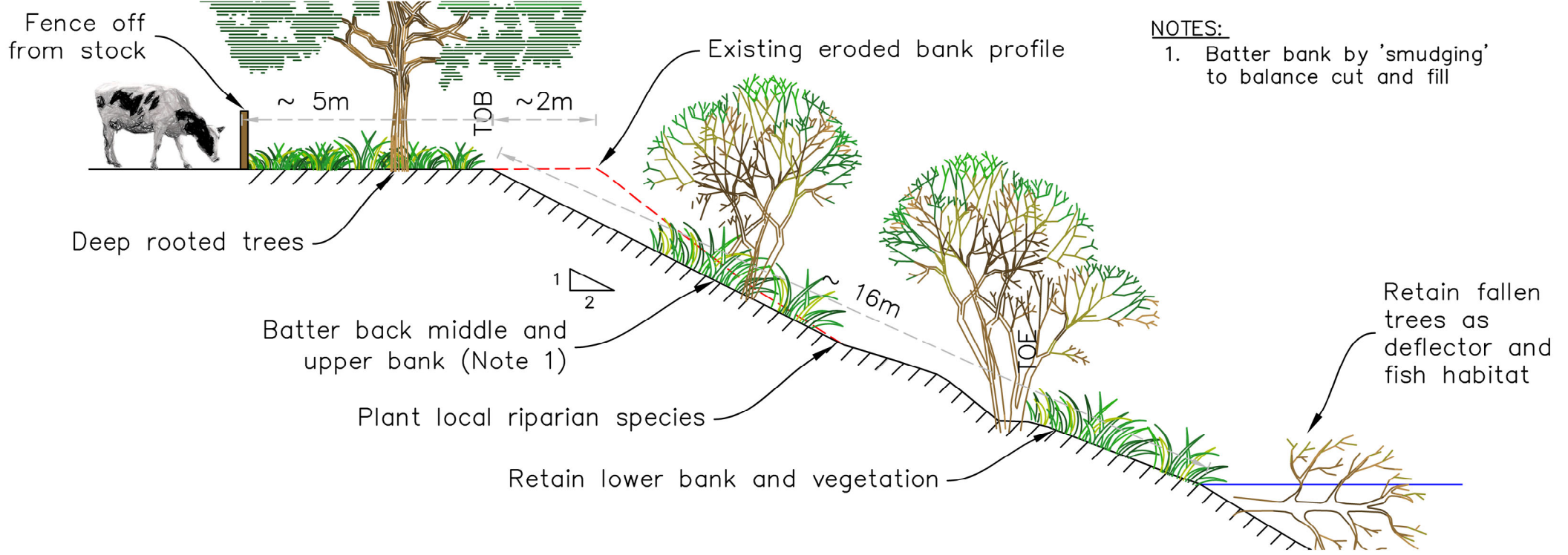
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25.03.2023	Report		0
DESIGNED n/a	REVIEWED T. Broderick	DRAWN CC	APPROVED <i>Clayton Polay</i>
A3 0 10 20 30 40 50 60			

PROJECT TITLE BELLINGER & KALANG RIVER ESTUARIES EROSION ASSESSMENTS	
DRAWING TITLE 32 & 88 Hains Lane, Brierfield — Cross Sections —	

CLIENT LOGO Bellingen Shire COUNCIL
BELLINGEN NSW 2454 m: 0417 171 065 e: clayton@ tallowwoodes.com.au

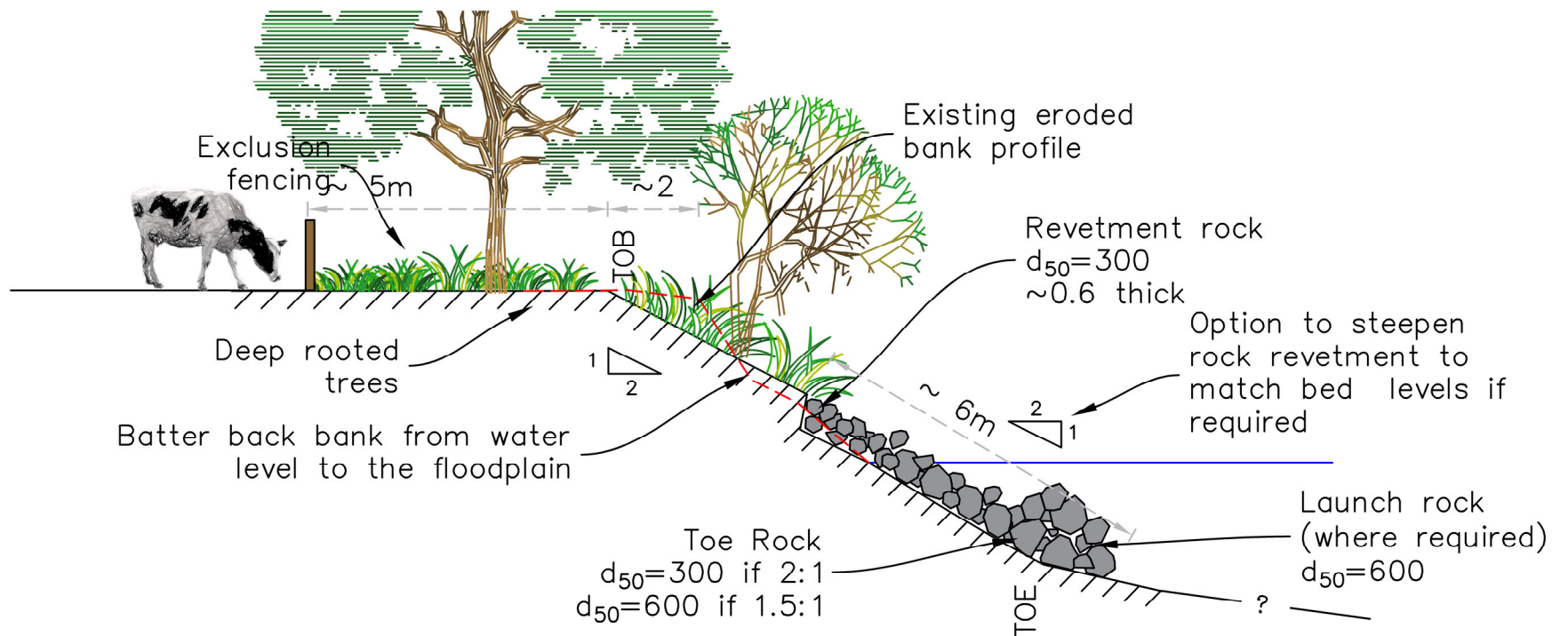
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PROJECT NO. 17-BSC-04	DRAWING No. 1b	REV 0	

Appendix 3 Concept Designs & Bill of Quantities

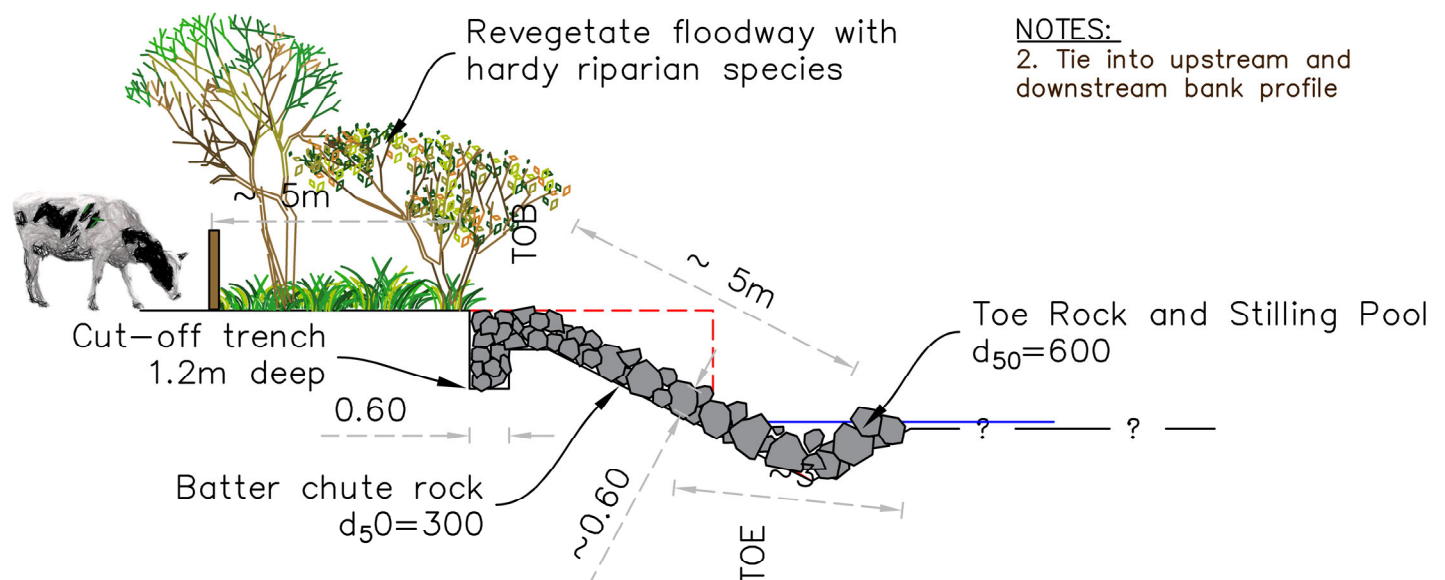


NOTES:
1. Batter bank by 'smudging' to balance cut and fill

SECTION A TREATMENT
Scale: 1:150



SECTION B/C TREATMENT
Scale: 1:150



NOTES:
2. Tie into upstream and downstream bank profile

SECTION D (CHUTE) TREATMENT
Scale: 1:150

REVISIONS			
30.03.2023	Report		0
DESIGNED	REVIEWED	DRAWN	APPROVED
C.Colmer	T.Broderick	CC	Clayton Colmer
A3 0 10 20 30 40 50 60			

PROJECT TITLE	
BELLINGER & KALANG RIVER ESTUARIES EROSION ASSESSMENTS	
DRAWING TITLE	
32 Hains Lane, Brierfield Daniell Whiddon Remediation Concept Plan	

CLIENT LOGO
Bellingen Shire COUNCIL
BELLINGEN NSW 2454 m: 0417 171 065 e: clayton@tallowwood.com.au
TALLOWOOD ENVIRONMENT & ENGINEERING

CLIENT	BELLINGEN SHIRE COUNCIL	
SCALE	COORDINATES	Date
As Shown	GDA94	30.03.2023
PROJECT NO.	DRAWING No.	REV
17-BSC-04	1e	0

Stock exclusion fencing

Existing eroded bank profile

Deep rooted trees on flood plain

Batter back from toe to Top Of Bank (Note 1)

Plant local riparian species on batter



SECTION E TREATMENT

Scale: 1:150

Stock exclusion fencing

Retain existing bank profile which is stable

Deep rooted trees on flood plain

Plant local riparian species on batter

Natural batter is 2:1

Retain existing riparian vegetation and plant around it

Rock Groyne at upstream end near Section E only (See Dwg 1a)



SECTION F TREATMENT

Scale: 1:150

Stock exclusion fencing

Existing eroded bank profile

Deep rooted trees on flood plain

Batter back from toe to Top Of Bank (Note 1)

Plant local riparian species on batter

Rock revetment $d_{50}=300$

Rock fill toe to top of watert $d_{50}=600$



SECTION G TREATMENT

Scale: 1:150

REVISIONS			
30.03.2023	Report		0
DESIGNED	REVIEWED	DRAWN	APPROVED
C.Colmer	T.Broderick	CC	
A3			

PROJECT TITLE	
BELLINGER & KALANG RIVER ESTUARIES EROSION ASSESSMENTS	
DRAWING TITLE	
88 Hains Lane, Brierfield Hannah Thompson Remediation Concept Plan	

CLIENT LOGO	
BELLINGEN NSW 2454 m: 0417 171 065 e: clayton@tallowwoodes.com.au	
TALLOWWOOD ENVIRONMENT & ENGINEERING	

CLIENT		
BELLINGEN SHIRE COUNCIL		
SCALE	COORDINATES	Date
As Shown	GDA94	30.03.2023
PROJECT NO.	DRAWING No.	REV
17-BSC-04	1f	0

BUDGET ESTIMATE			
ITEM	DESCRIPTION	QUANTITY	ESTIMATE
Planning Approvals	Agency & Local Government approvals	–	\$8,000
Project Delivery	Project Management & Site Supervision	280 hours	\$43,000
Fencing	Stock exclusion fencing & gates for access x 2	300m	Landholder
	SECTION A – 30m	A Subtotal +20% Cont.	\$8,200
Battering	20t Digger – Mobilise & smudge soil to stable 2:1 profile. 30m x 4m ² = 120m ³ , spread topsoil & surface preparation for planting	1 day	\$1,800
Mulching	Mulching & biodegradable mesh for weed control until plants established	24m ³	\$2,400
Revegetation	High density planting with riparian species. Batter – 16m x 30m = 500m ² @ 1 plant per 2.5m ² , Paddock 5m x 30 = 150m ²	260	\$2,600
	SECTION B/C – 45m	B/C Subtotal +20% Cont.	\$38,000
Battering	20t Digger – Mobilise & prepare batter to stable 2:1 profile. 40m x 2m ² = 100m ³ , spread topsoil & surface preparation for planting	5 hours	\$700
Rock Armouring	20t Digger – Placing rock at toe and lower bank	2 days	\$3,200
Rock Supply	Delivered to site. Estimate 9t per Lm	360t	\$25,200
Mulching	Mulching & biodegradable mesh for weed control until plants established	10m ³	\$1,000
Revegetation	High density planting with riparian species. Batter – 4m x 40m = 160m ² @ 1 plant per 2 m ² , Paddock – 5m x 40m = 200m ²	150	\$1,500
	SECTION D – CHUTE – 5m	D Subtotal +20% Cont.	\$5,800
Earthworks	20t Digger – Demobilise (at end) & prepare drop structure subgrade and 2:1 profile. 5m x 2m ² = 100m ³ , spread topsoil & surface preparation for planting	5 hours	\$1,100
Rock Armouring	20t Digger – Placing rock at toe and lower bank	5 hours	\$700
Rock Supply	Delivered to site. Estimate 8t per Lm	40t	\$2,800
Mulching & Revegetation	High density planting with riparian species 5m x 5m = 25m ² @ 1 plant per 1 m ²	25	\$250
	SECTION E – 50m	E Subtotal +20% Cont.	\$22,200
Battering	30t Digger for reach – Mobilise & smudge soil to stable 2:1 profile. 50m x 9m ² = 450m ³ , spread topsoil & surface preparation for planting	2 days	\$3,200
Spoil	Tip trucks x 2 – Short haul spoil to disposal site on farm. 10 min turnaround	2 days	\$5,600
Mulching	Mulching & biodegradable mesh for weed control until plants established	42m ³	\$4,200
Revegetation	High density planting with riparian species. Batter – 12m x 50m = 600m ² @ 1 plant per 2.5m ² , Paddock 5m x 50 = 250m ²	340	\$3,400
Rock Groyne	Approx 3 – 4m crest length up to 2m deep at toe	30t	\$2,100
	SECTION F – 40m	F Subtotal +20% Cont.	\$5,500
Mulching	Mulching & biodegradable mesh for weed control until plants established	26m ³	\$2,600
Revegetation	High density planting with riparian species. Batter – 8m x 40m = 320m ² @ 1 plant per 2.5m ² , Paddock 5m x 40 = 200m ²	200	\$2,000
	SECTION G – 100m	G Subtotal +20% Cont.	\$94,600
Battering	30t Digger for reach – Dmobilise (at end) & bulk out soil to stable 2:1 profile. 100m x 10m ² = 1,000m ³ , spread topsoil & surface preparation for planting	4 days	\$6,800
Rock Armouring	30t Digger – Placing rock at toe and lower bank.	4 days	\$6,400
Rock Supply	Delivered to site. 4m ² per LM = 400m ³	720t	\$50,400
Mulching	Mulching & biodegradable mesh for weed control until plants established	85m ³	\$8,500
Revegetation	High density planting with riparian species. Batter – 12m x 100m = 1,200m ² @ 1 plant per 2 m ² , Paddock – 5m x 100m = 500m ²	680	\$6,800
	PROJECT TOTAL – 270m – ex GST	4 weeks & 1,120t rock	\$225,300

REVISIONS

30.03.2023	Report	0

DESIGNED

C.Colmer

REVIEWED

T.Broderick

DRAWN

CC

APPROVED

PROJECT TITLE

BELLINGER & KALANG RIVER ESTUARIES EROSION ASSESSMENTS

CLIENT LOGO

CLIENT

BELLINGEN SHIRE COUNCIL

DRAWING TITLE

32 & 88 Hains Lane, Brierfield
Bill of Quantities & Budget Estimate

BELLINGEN NSW

2454

m: 0417 171 065

e: clayton@tallowoodes.com.au

SCALE

As Shown

COORDINATES

GDA94

Date

30.03.2023

PROJECT NO.

17-BSC-04

DRAWING No.

1g

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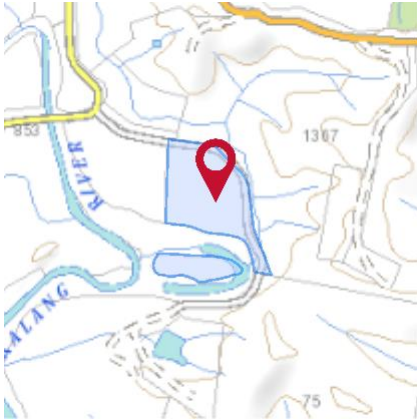
Copyright Soil Conservation Service

all sites – bellinger kalang estuary erosion – 24-03-2023 + lidar.dwg

Appendix 4 NSW Planning Portal - Property Report

Property Report

32 HAINS LANE BRIERFIELD 2454



Property Details

Address: 32 HAINS LANE BRIERFIELD 2454
 Lot/Section 10/-/DP801045
 /Plan No:
 Council: BELLINGEN SHIRE COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Bellingen Local Environmental Plan 2010 (pub. 6-8-2010)
Land Zoning	RU1 - Primary Production: (pub. 6-8-2010) RU4 - Primary Production Small Lots: (pub. 6-8-2010) W2 - Recreational Waterways: (pub. 6-8-2010)
Height Of Building	10 m
Floor Space Ratio	NA
Minimum Lot Size	200 ha 40 ha
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Acid Sulfate Soils	Class 3 Class 4 Class 5
Riparian Lands and Watercourses	Water
Terrestrial Biodiversity	Sensitive Land

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Allowable Clearing Area (pub. 21-10-2022)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 23-9-2022)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Subject Land (pub. 23-9-2022)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



Property Report

32 HAINS LANE BRIERFIELD 2454

Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Bushfire Prone Land

Vegetation Buffer

Land near Electrical Infrastructure

This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.

Local Aboriginal Land Council

COFFS HARBOUR

Regional Plan Boundary

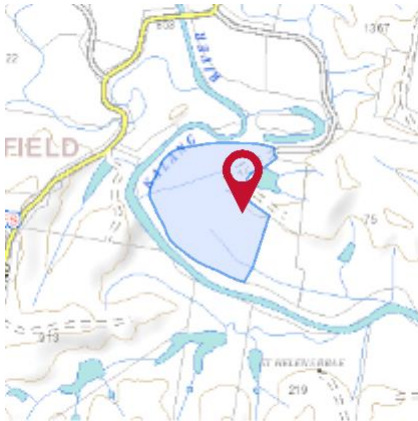
North Coast

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



Property Report

88 HAINS LANE BRIERFIELD 2454



Property Details

Address: 88 HAINS LANE BRIERFIELD 2454
 Lot/Section 12/-/DP801045
 /Plan No:
 Council: BELLINGEN SHIRE COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Bellingen Local Environmental Plan 2010 (pub. 6-8-2010)
Land Zoning	RU1 - Primary Production: (pub. 6-8-2010) RU2 - Rural Landscape: (pub. 6-8-2010) RU4 - Primary Production Small Lots: (pub. 6-8-2010)
Height Of Building	10 m
Floor Space Ratio	NA
Minimum Lot Size	200 ha 40 ha
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Acid Sulfate Soils	Class 3 Class 4 Class 5
Terrestrial Biodiversity	Sensitive Land

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Allowable Clearing Area (pub. 21-10-2022)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 23-9-2022)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Subject Land (pub. 23-9-2022)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
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Property Report

88 HAINS LANE BRIERFIELD 2454

Other matters affecting the property

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Vegetation Buffer

Land near Electrical Infrastructure

This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.

Local Aboriginal Land Council

COFFS HARBOUR

Regional Plan Boundary

North Coast

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)

RIVERBANK EROSION REMEDIATION ACID SULFATE SOIL MANAGEMENT PLAN

32 & 88 HAINS LANE, BRIERFIELD

32 Hains Lane

Property of Daniel Whiddon

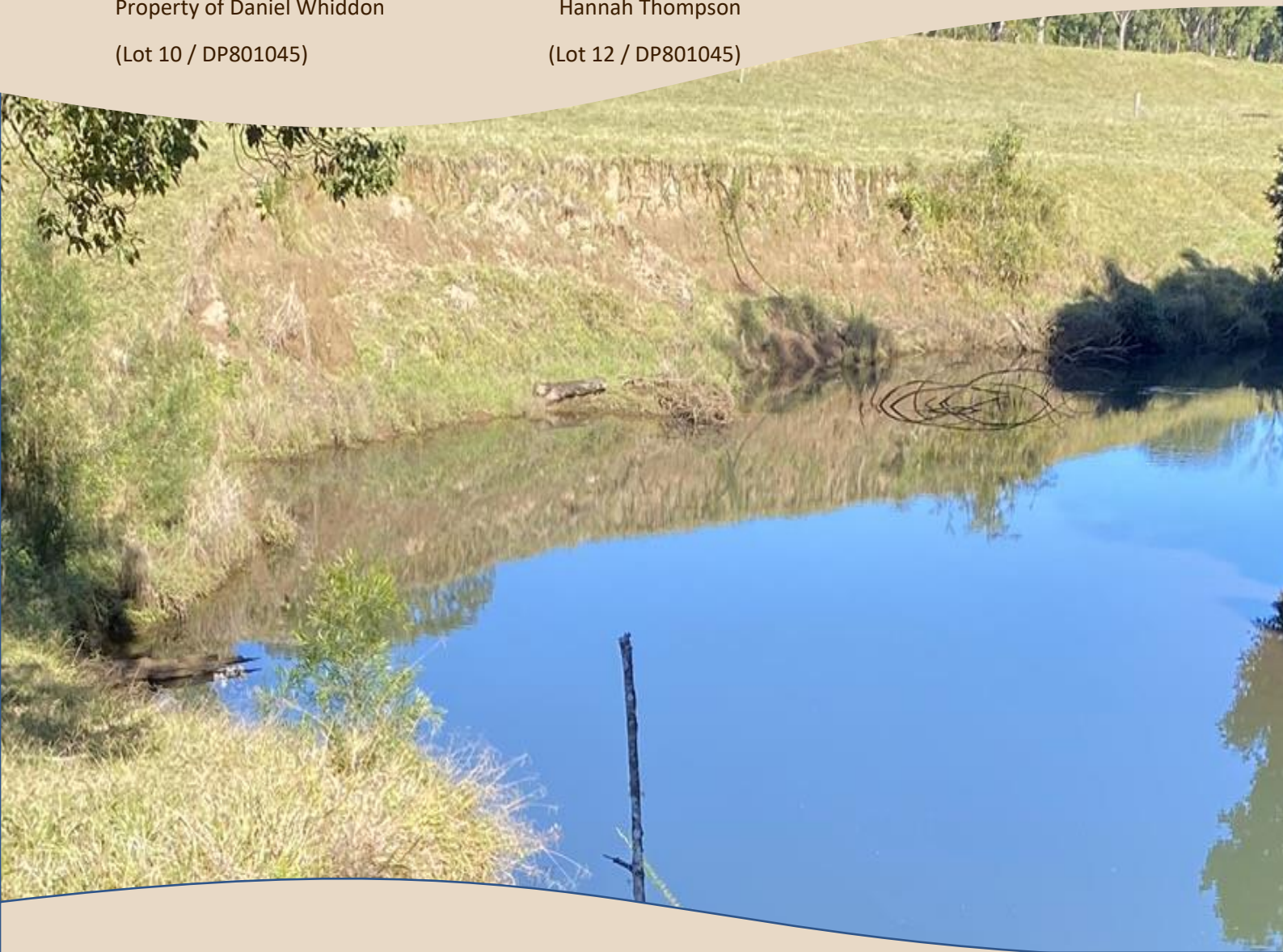
(Lot 10 / DP801045)

88 Hains Lane

Hannah Thompson

(Lot 12 / DP801045)

Dated: 07 March 2025



For DPIRD – Fisheries

m. 0417 171 065

e. clayton@tallowwoodee.com.au

www.tallowwoodee.com.au

TALLOWWOOD
ENVIRONMENT & ENGINEERING





Acknowledgement of Country

Tallowwood Environment & Engineering

acknowledges the traditional custodians of the Gumbaynggirr lands

which this report relates to.

We pay respect to the cultural, spiritual and land management relationships
held by the

Elders past, present and future.



ARTWORK: "Coastal Wajaarr" by BKE 2022 (Copyright 2023 © with rights)

This piece takes in the Birds Eye view from Bowraville to the south and Sawtell to the north, including towns on the coast such as Nambucca Heads, Valla Beach, Wenonah, Urunga, North Beach, Bonville then onto Sawtell.

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1 Introduction

Tallowwood Environment & Engineering has been engaged by the Department of Primary Industries and Regional Development (DPIRD) – Fisheries to prepare an Acid Sulfate Soil Management Plan (ASSMP) for works related to a proposed riverbank erosion remediation project at Hains Lane, Brierfield.

The ASSMP is required for inclusion in a Review of Environmental Factors (REF) prepared by Bellingen Shire Council which supports the proposed project for a 130m reach along the Kalang Estuary. The regional property location map is provided in Figure 1.

1.1 Location

The reach occurs across two adjacent properties. The site locations are shown in **Error! Reference source not found..**

Site 1 - 32 Haines Lane, Brierfield (Lot 10 / DP801045)

Site 2 – 88 Hains Lane, Brierfield (Lot 12 / DP801045)

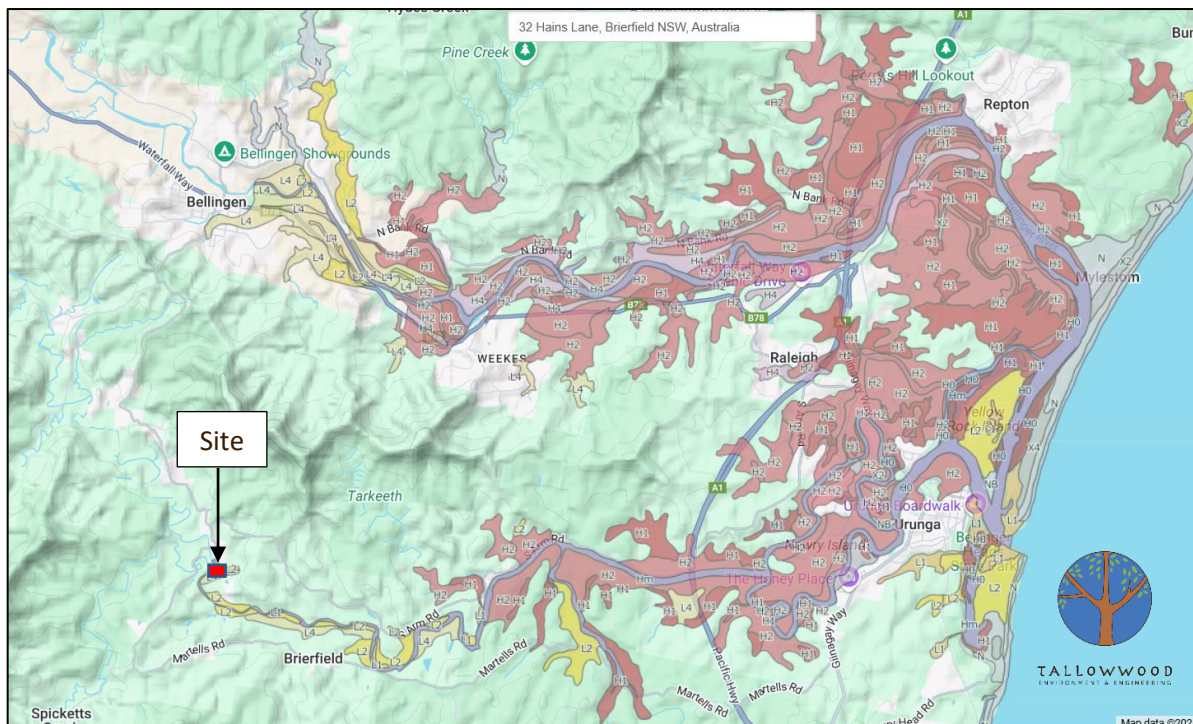


Figure 1 Regional location map

1.2 Background

Bellingen Shire Council (BSC) engaged Tallowwood Environment & Engineering to undertake a riverbank erosion assessment along the project reach with the aim of securing funding for works. The assessment determined that toe armouring, battering and revegetation were required for cost effective treatment of the reach and cost estimates provided.

Bellinghen Shire Council approached the non-profit organization, OzFish which operates as a charity focused on the restoration and conservation of fish habitats across Australia, to secure a modest budget to undertake the critical portion of the proposed works.

Bellinghen Shire Council then prepared an REF as in-kind support for the project, which identified that the site lies within a mapped acid sulfate soil area. A preliminary investigation of the soils was conducted by BSC at two sample points; (ASS-1) toe of bank in the estuary, and (ASS-2) upper bank/flood plain. It identified that ASS-1 was PASS and ASS-2 was ancient reactive soil that is no longer reactive, (actual Acid Sulfate Soil). More detail on the preliminary assessment and results can be found in Section 3 and Appendix 2 respectively.

On this basis, a the ASSMAC guidelines required a detailed assessment and management plan to be prepared to better assess the environmental risks associated with the works.

This acid sulfate soil management plan is prepared in response to the later.

1.3 Report Purpose

The aim of this ASSMP is to undertake a detailed assessment of the proposed works in respect to disturbing PASS and to detail mitigation measures to minimise any potential impacts.

The objectives of the ASSMP are to:

- Control or minimise disturbance of acid sulphate soils;
- Minimise the impact of disturbing acid sulfate soils;
- Validation monitoring of any mitigation measures;
- Compliance with statutory requirements;
- Minimising impact on water quality in the upper Kalang Estuary.

1.4 Scope

This ASSMP scope consists of

- Preliminary Assessment:
 - Site Review
 - Review of acid sulfate soil mapping data
 - Review of Preliminary Acid Sulfate Soil testing results (by others)
 - Review engineering plans to understand the disturbance footprint
- Field Assessment
 - Undertake soil sampling & dispatch
 - Record soil logs
 - NATA accredited laboratory testing
 - UAV / aerial image of the site and of proposed works area
- Acid Sulfate Soil Assessment
 - Review laboratory results
 - Reference to the guideline: *Acid Sulfate Soils Management Advisory Committee (ASSMAC) (1998)*
 - Undertake assessment
 - Document findings

2 Site Context

2.1 Site Plan

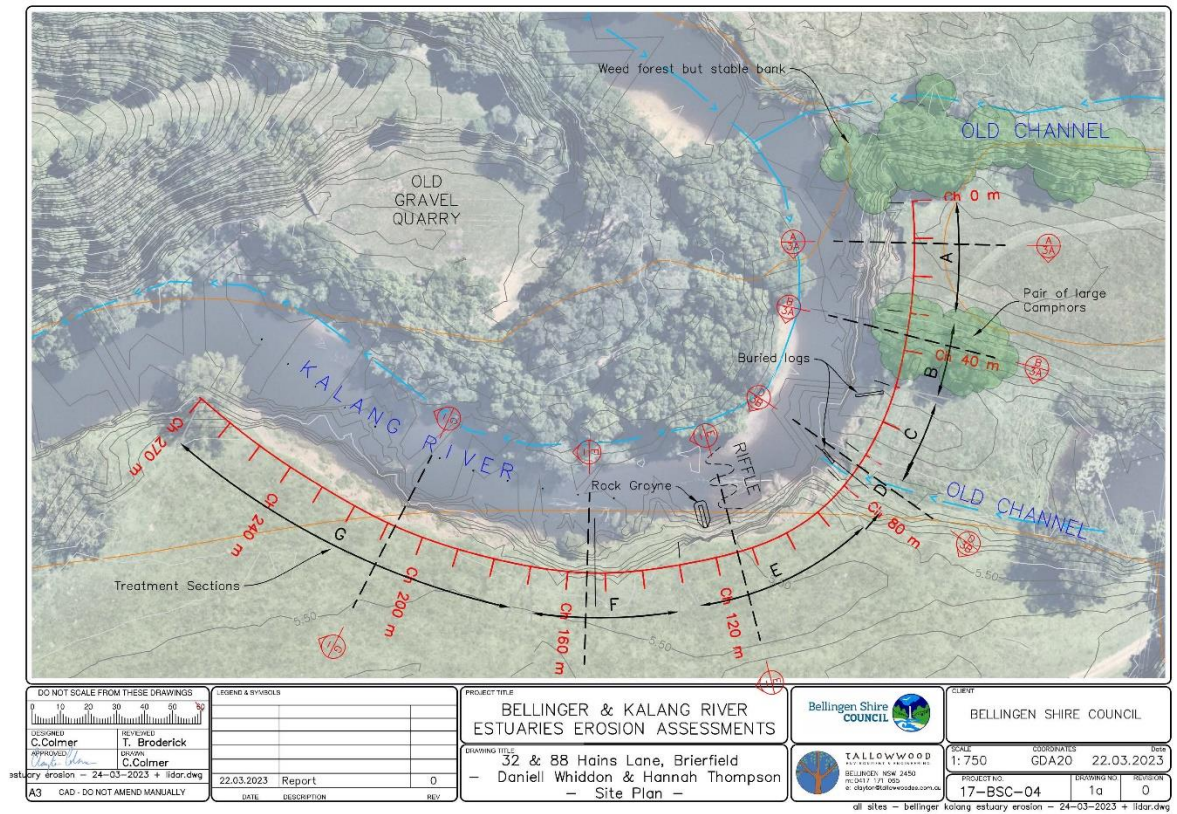


Figure 2 Site Plan

2.2 Proposed Works

The works essentially comprise armouring the toe of the bank to provide support for the middle and upper banks which will be battered back to provide a stable surface for revegetation.

Armouring is a mixture of rock and hardwood logs (not shown). Typically rock is embedded into the riverbed to provide a toe to protect from scour, however at this site, it is proposed to use a 'launched toe' which essentially involves placing surplus rock in front of the armouring to allow for future scour and embedment.

Excavation is proposed on the bank to reduce the steep slope of the erosion face.

Consultation with OzFish and the landholders has resulted in two minor amendments not reflected in the original concept plans:

1. Incorporation of Large Woody Debris in the treatment along the toe of Section E
2. Steepening of the batter at Section E to 1.5:1 to reduce paddock loss from earthworks.

The maximum depth of excavation at each Section is estimated from the design drawings in Figure 3 & Figure 4 and summarised in Table 1 of Section 4.1.

The estimated volume of material to be excavated and relocated as fill is 500m³ or 900 tonnes.

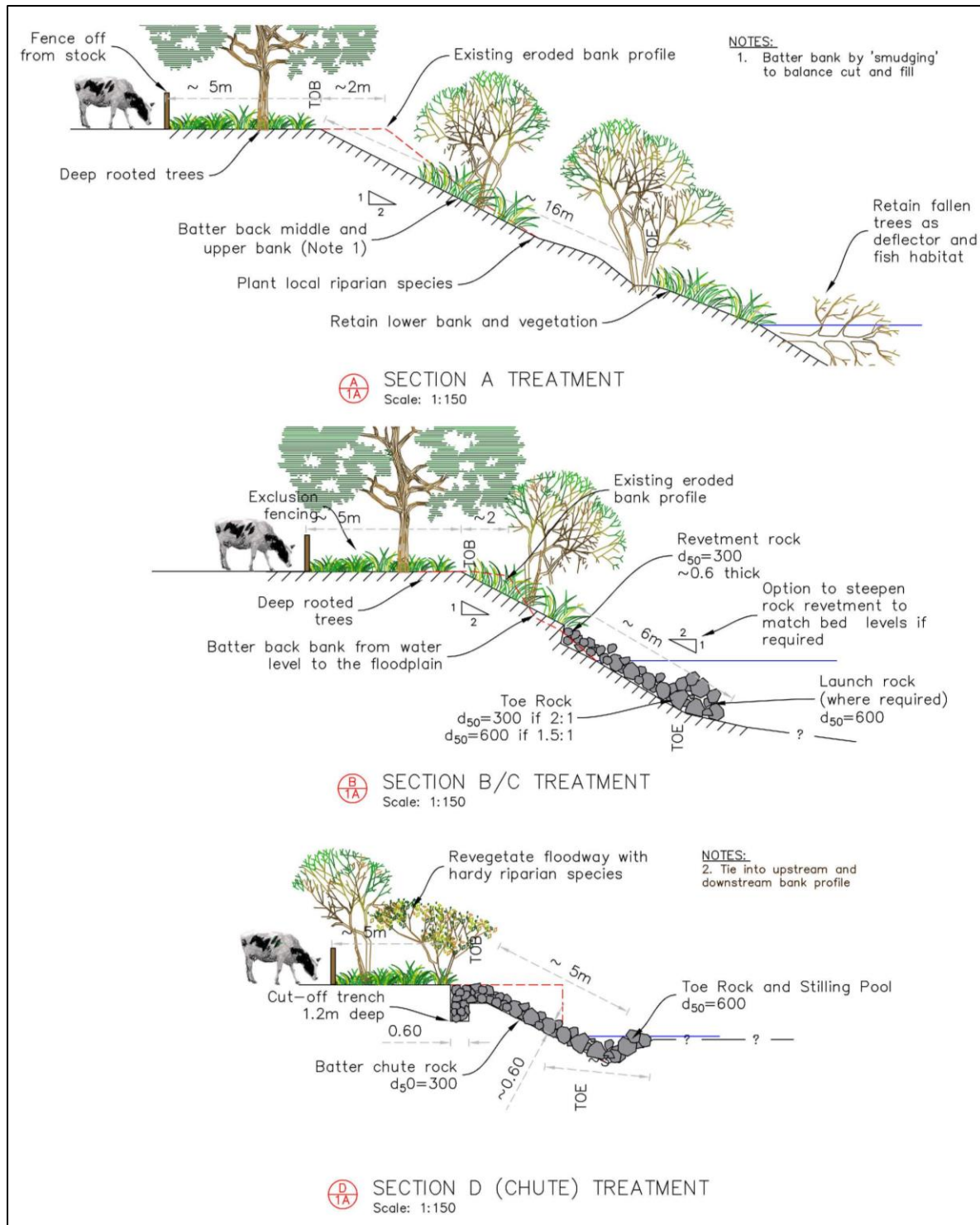


Figure 3 Concept Designs Section A-D

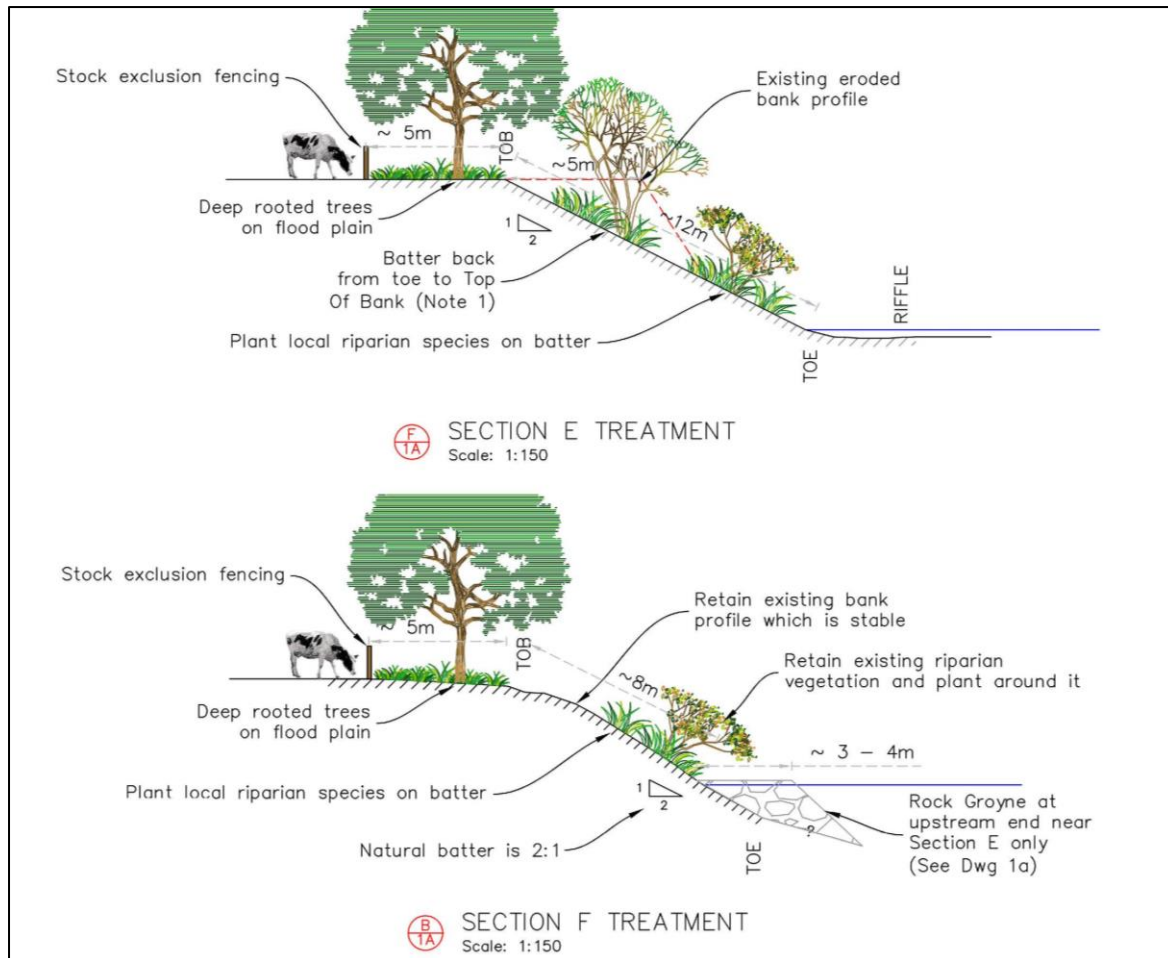


Figure 4 Concept Designs Section E & Rock Groyne at E

2.3 Topography

The site is located in a moderately broad floodplain in the upper Kalang Estuary flanked by low undulating hills and rises. The site is low lying and tidal influenced (See Appendix 6) with relief varying between 5m – 8m and is comprised of a terraced floodplain, incised by the river channel. Slopes in the floodplain are generally flat being 0–3%, with a local steeper area on the channel banks where local relief is around 5m - 8m and >50% slope.

Interestingly, the site is aligned with an old meander cutoff, which has been active since 1956 (earliest historic aerial imagery). The banks are extensively cleared, with some residual riverine forests.

2.4 Geology and Soils

Reference to eSPADE shows the site is mapped as Nambucca River (nr) under the *Soil Landscapes of the Macksville-Nambucca 1:100,000 Sheets*.

This soil group comprises deep soils >300 cm moderately well-drained Brown Kandosols (Prairie Soils) and Red Kandosols (Red Earths), and 50 - 200 cm well-drained gravelly Stratic Rudosols (Alluvial Soils).

There are three distinct soils relevant to the site in this landscape:

1. Floodplain soils (Section E earthworks & Section D)
2. Estuarine soils (Section E toe):
3. High Terrace soils (Section A,B, & C)

2.4.1 Floodplain

The upper horizons of the floodplain soils are brown silty loams with variable fine sand and clay content. These soils layers vary across the floodplain and the sample locations at the site. These soils are generally categorised as medium texture sandy loams to light clays.

At depth in the floodplain soils, the soil contains quartz gravel bands generally at or near to water level.

2.4.2 Estuarine

These soils are grey massive sandy clays (subsoil, basal layers) being gleyed sandy clays with massive or with weak platy or lenticular pedality. They are found in lenses below the floodplain soils at or below watertable probably swampy deposits formed during valley filling.

2.4.3 High Terrace

These soils are massive bright silty clays (subsoil, B horizon, high terraces) being a dull yellowish brown to bright brown silty light to medium clay; earthy fabric; massive or weak 20 - 50 mm polyhedral peds; field pH 5.0 to 6.5; gravels uncommon, with occasional charcoal fragments.

2.4.4 Geology

The underlying geology is unconsolidated sandy loams and gravels of Quaternary alluvium up to 3 m deep, derived from the Nambucca Block.

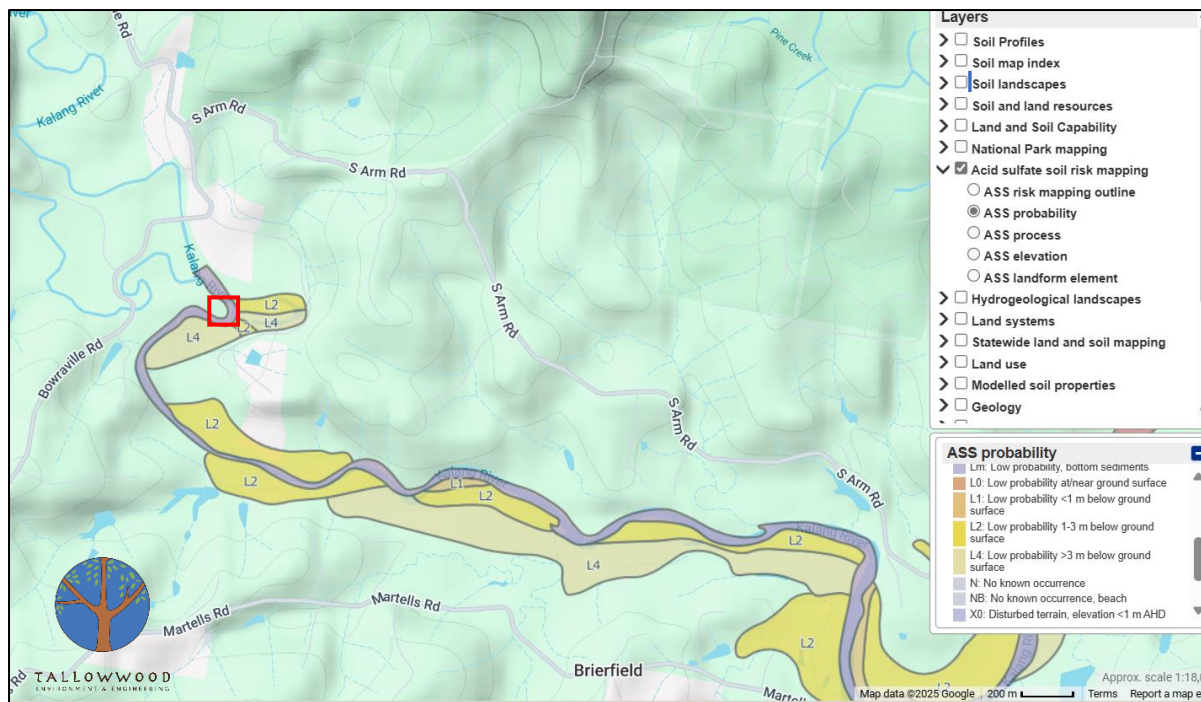
2.4.5 Borelogs

Soil borelogs were recorded at six (6) locations and selected borelogs shown in Appendix 5.

2.4.6 Acid Sulfate Soil

Reference to eSPADE also determined the site to be located in an area mapped as having a probability of acid sulfate soil. Two categories are relevant to the works footprint:

- | | |
|-------------|--|
| Floodplain: | L4: Low probability >3 m below ground Surface |
| Estuary: | Hm: High probability, bottom sediments |



2.5 Surface Water, Groundwater and Flooding

The site is prone to flooding and is mapped as being within the 1:100 year flood zone which includes the floodplain above the works. Flooding also activates the meander cut-off (oxbow) which can remain charged even after the main estuary has dropped. This can cause a gully pour over at the junction between the oxbow and the estuary (see Plate 1).



The floodplain is well drained and outlets into the steep riverbank near the estuary. The back of the floodplain drains to incipient back channels or the oxbow.

A search of the WaterNSW registered groundwater bore on-line database determined no bores were located near the site within 500m.

Groundwater was not encountered in any of the test holes on the floodplain where excavation is proposed. This is not surprising due to the steep bank adjacent to the sample points and works footprint, which drains groundwater down to the lowest point being the estuary water surface. Hence groundwater levels are expected to be contingent on the water level in the estuary, likely occurring at a similar depth.

3 Preliminary Assessment

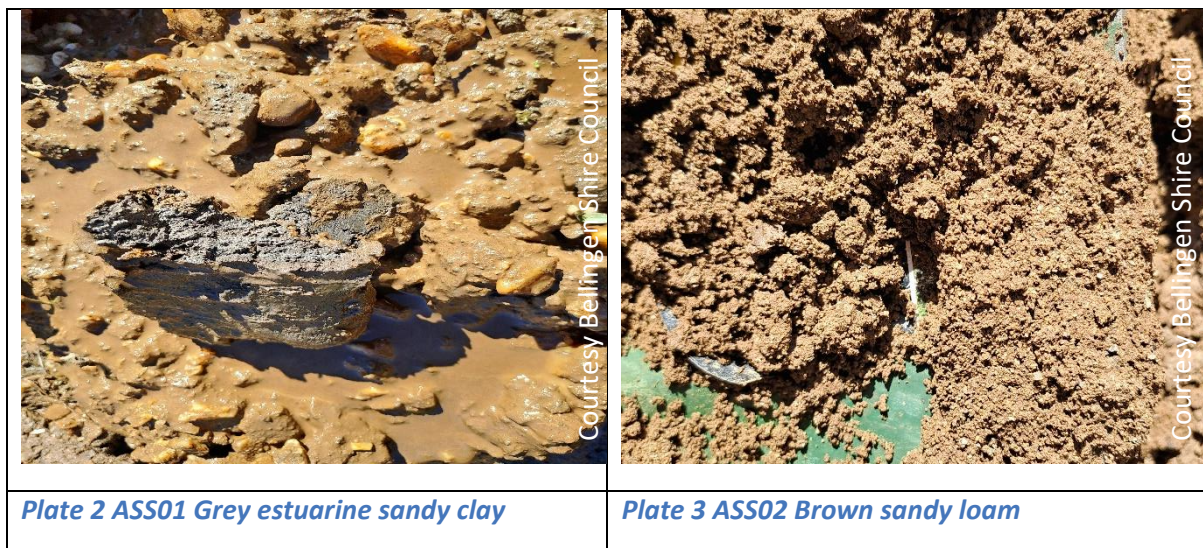
Harry Chapman from Bellingen Shire Council conducted a preliminary assessment for acid sulfate soils at the site on 11th July 2024. Two (2) samples, were collected:

1. ASS01 from the river bed 0.5 mBGL, and
2. ASS02 0.5m into an existing cutting midway between the top of the bank and the water

The soil at ASS01 was a grey mottled black sandy clay just below the quartz gravel layer. The soil at ASS02 was a brown silty sand layer that appeared homogenous throughout the inspected profile. No odours were identified during sampling at either location.

The laboratory testing determined ASS01 to have a CRS (wt% S) 0.45 and Net acidity of 320 (mol H⁺/t). ASS02 had a non-detect for CRS and a Net acidity of 39 (mol H⁺/t).

The results of ASS01 triggered the need for a more detailed assessment.



4 Sampling

4.1 Sampling Density & Depth

The total footprint area of excavation works is around 300m² which requires 4 test holes as the minimum density required by the *Acid Sulfate Soil Management Advisory Committee (ASSMAC)* but

under the new *EPA Contaminated Land Guidelines: Sampling Design Part 1 – Application*, a minimum of 8 samples are required.

Hence, sampling comprising eight (8) boreholes (BH1 to BH8) which targeted all Sections of the remediation and were sampled at various depths according to the proposed works (See Table 1).

Table 1 Excavation and sampling depths

Remediation Section	Maximum Excavation Depth	Sample Depth
Section A	0.5m	1.0m
Section B/C	0.6m	1.0m
Section D	0.3m	0.8m
Section E	2.0m	2.5m

One sample was collected from each of the boreholes, at strategically selected layers to ensure all horizons were tested. No composite samples were taken.

Sampling locations are illustrated in Appendix 1.



4.2 Sampling Method

Boreholes were conducted using a Jarret hand auger with 50mm all-purpose cutting head.

Cuttings were laid out on a display sheet according to depth and samples extracted at target depths and photographs recorded (see Table 2).

BH05 hit refusal due to a quartz gravel layer that persisted beyond 0.4m BGL and hence the target depth could not be reached. The borehole was relocated as BH06 which was successful.

Table 2 Photographic Borelogs

Depth		BH01	BH02	BH03	BH04	BH06	BH07	BH08	BH09
0	m					No image	No image		
0.5	0.1								
	0.2								
	0.3								
	0.4								
0.5									
1.0	0.6								
	0.7								
	0.8								
	0.9								
1.0									
1.5	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
2.0	1.6								
	1.7								
	1.8								
	1.9								
	2.0								
2.5	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
									

Samples were sealed in new 250mL glass jars, supplied by EAL-Lismore, and filled such that it contained no headspace. Only non-putrescible mineral soil was sampled. Collected samples were placed immediately into an insulated container chilled by an ice-brick and stored overnight in a refrigerator. The samples were then prepared and rechilled with a fresh ice-brick the following day

for transport by courier to Environmental Analysis Laboratory (EAL) in Lismore with accompanying chain of custody (COC) documentation (see Appendix 3).

). EAL is a reputable and specialist in acid sulfate soil screening and testing and is NATA accredited (Accreditation No. 14960).

All 8 collected samples were subject to a laboratory controlled field peroxide screening test (AS-PACK-007) and the results were provided to Tallowood E&E for review. The author then selected samples to progress to further testing based on a combination of the results of field observations and peroxide screening results.

The laboratory then performed a second round of testing for net acidity using the chromium reducible sulfur (CRS) suit test (ASS-PACK-008) and retained the samples for 1 month. The results of the laboratory testing are shown in Appendix 4.

5 Action Criteria

The laboratory results were compared against the action criteria for ASS in accordance with the *Acid Sulfate Soils Assessment Guidelines (ASSMAC)* and with reference to the soil type and estimated disturbance tonnage.

Section 2.4 determined the soil type to be Medium sandy loams and light clays. Section 2.2 determined the works to disturb 900 tonnes which falls under the <1000 tonnes threshold in Table 4.4 of the Guideline.

Table 3 Action Criteria from ASSMAC

Table 4.4. Action criteria based on ASS soil analysis for three broad texture categories					
Type of Material		Action Criteria 1-1000 tonnes disturbed		Action Criteria if more than 1000 tonnes disturbed	
Texture range. McDonald et al. (1990)	Approx. clay content (% < 0.002 mm)	Sulfur trail % S oxidisable (oven-dry basis) eg S _{tos} or S _{pos}	Acid trail mol H ⁺ /tonne (oven-dry basis) eg, TPA or TSA	Sulfur trail % S oxidisable (oven-dry basis) eg S _{tos} or S _{pos}	Acid trail mol H ⁺ /tonne (oven-dry basis) eg, TPA or TSA
Coarse Texture Sands to loamy sands	≤5	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	5 - 40	0.06	36	0.03	18
Fine Texture Medium to heavy clays and silty clays	≥40	0.1	62	0.03	18

Hence the site-specific action criteria for this ASS investigation consists of:

Net Acidity (Non-Treated Soil): ≤ 36 mol H⁺/tonne or ≤ 0.06 % Scr

6 Results

6.1 Field Observations

Expanding on the soil descriptions in Section 2.4, the natural soils at the site reflected those in the mapped soil landscape. In summary, the floodplain soils were brown fine sandy silty loams, the estuarine soils were grey fine sandy clays, and the high terrace was yellowy brown light clays.

All soils encountered appeared to be natural soils with the exception that the upper layers of BH04 and BH06 were comprised of slip material from layers in the higher floodplain. An extensive quartz gravel layer covered most of the area around BH04 & BH06 making it difficult to find access to deeper profiles without hitting refusal.

Groundwater was only encountered at the estuarine samples (BH04 & BH06) at water level.

No sulfidic odours were noted in subsurface soils at any locations and no mottling or iron sulfide precipitates were observed in any boreholes. Detailed borehole logs are provided Appendix 5.

An inspection of the eroded bank face (scrap) showed no signs of mottling or precipitates and no scalding evident. Vegetation (weeds) are recruiting readily on all surfaces.

6.2 Laboratory Analysis Results

6.2.1 Field Screening

In accordance with the ASSMAC Guidelines, soil samples were field screened for acid sulphate soil indicators before proceeding with further investigation. The field screening was conducted under laboratory conditions (by EAL) and involved the testing of each sample for field pH and peroxide pH, using 30% hydrogen peroxide to oxidise the soil, and comparing both results. The documents related to this testing are included in Appendix 3.

A positive field screening test, indicating the potential presence of acid sulphate soil, may include one but preferably more of the following.

- Change in colour from grey tones to brown tones;
- Effervescence;
- Release of sulphurous odours;
- The lowering of soil pH by at least one unit
- A final pH <3.5 and preferably pH <3.

Table 4 Field Screen Test Results

Sample ID:	S-01	S-02	S-03	S-04	S-06	S-07	S-08	S-09
Sample Depth:	2.5	1.5	0.5	1	0.5	0.8	1	1
pHF	5.88	5.52	5.44	6.66	5.91	5.61	5.49	5.13
pHFOX	3.7	2.81	2.53	4.27	2.33	2.36	2.62	3.29
pH Change	-2.18	-2.71	-2.91	-2.39	-3.58	-3.25	-2.87	-1.84
Reaction	Low	Low	High	Low	Low	Extreme	Medium	Low

Based on findings of the field screenings, acid sulfate soil could not be ruled out for 5 of the 8 samples which were all sent on for further detailed laboratory testing for net acidity (Scr) testing. Based on the location of sample S-04 (estuarine), it was also included for further testing even though it did not trigger a positive field screening test.

6.2.2 Net Acidity (Scr) Testing

The samples which triggered further testing from the Field Screening were processed under the chromium suite testing by EAL. The results are presented in

Table 5 and all laboratory documents included in Appendix 4.

Table 5 Laboratory results (CRS Suite)

Sample ID:		LOR	S-02	S-03	S-04	S-06	S-07	S-08
Landscape			Floodplain	Floodplain	Estuarine	Estuarine	Terrace	Terrace
Sample Depth:			1.5	0.5	1	0.5	0.8	1
Chromium Reducible Sulfur	% SCR	<0.005	0.007	0.013	< 0.005	0.007	0.007	0.008
Chromium Reducible Sulfur	mol H+/t	<3	5	8	< 3	5	4	5
pH KCl	---	---	5.3	5.12	5.72	5.09	5.15	5.05
Titratable Actual Acidity	mol H+/t	<1	26	36	14	38	34	41
Net Acidity	mol H+/t	<3	30	45	15	43	38	46
Lime Calculation	kg CaCO ₃ /t DW	<1	2	3	1	3	3	3

Interestingly, no samples triggered the Chromium Reduceable Sulfur (Scr) threshold of **0.06 % Scr**, indicating the samples had little sulfidic material to work with to create new acidity in the soils when exposed during excavation.

Some samples did trigger the net acidity threshold of **36 mol H+/tonne** but not significantly (same order of magnitude as the threshold) which indicates the soils are either naturally acidic or remnant ancient reactive soils which are now actual acid sulfate soils.

7 Conclusion

Based on the results of this investigation, the floodplain soils are not PASS but will be treated as acidic even though the liming rates are negligibly small.

Based on the preliminary ASS assessment by Bellingen Shire Council, the grey silty sands in the estuary are to be managed as PASS even though the latest results did not detect the same levels of reactive sulfur.

Due to the Net Acidity levels just exceeding the adopted action criteria, an Acid Sulfate Soils Management Plan (ASSMP) is technically required to minimise any environmental impacts from disturbing the soil during earthworks on-site.

8 Management Options

ASSMAC recommends assessment, and management of ASS where works involving the disturbance of more than 1 tonne of soil are proposed in an area identified to be potentially impacted by ASS. A “more detailed” management plan is generally required where more than 1,000 tonnes of ASS are expected to be disturbed.

The following management controls will apply to the riverbank remediation project:

- **Non-excavation or minimal works:** This control involves precluding excavation in the estuarine soils and estuary generally. It does not preclude non-excavation works such as pinning, or pushing materials into the soft sediments.
- **Disposal of PASS below the water table:** Not applicable.
- **Treatment of the ASS:** This control involves on-site treatment of the ASS, followed by on-site re-use.

Treatment of ASS is practical and appropriate for this site due to the large area available for treatment and the intent to reuse the material in the bank stabilisation works.

8.1 Management Method

Neutralising with agricultural lime is the widely accepted method to minimise the generation of acid and acid products associated with the disturbance of ASS. Fine ground (500 µm) agricultural lime is readily available, relatively easy to handle and less hazardous than some other agents.

The NATA laboratory results have calculated the lime application rate with inclusion of a 50% safety factor to cater for the inefficient mixing and isolated “hotspots”.

All excavated soils will be treated with 3kg/tonne of soil, which for a 900 tonne site equates to 2,700 kg or 3 bulker bags.

8.2 Lime Treatment

The design of the works requires an excavator to be used to install the riverbank remediation structures. In addition, the dosing rates determined in Table 5 are very low. Hence an excavator alone will be sufficient to mix the reagent into the soil so long as there is 6-8 passes¹.

The proposed method is:

- Step 1. Deliver lime in 2 x 1.4 tonne bulker bags (2.8 tonne total)
- Step 2. Strip topsoil from the excavation footprint and wind-row behind and away from work-front
- Step 3. Cut a toe trench just below the daylight line to capture any runoff or fugitive lime
- Step 4. Dose the excavation footprint with lime at half the required rate for the expected volume of cut (use digger bucket to spread out after measurement)
- Step 5. Rake lime into the natural soil in-situ with a toothed bucket before excavation (1 pass-equivalent)
- Step 6. Excavate and stockpile half of the won material (2 pass-equivalent)
- Step 7. Turn the stockpile 2 times before replacing on bank (2-4 pass-equivalent)
- Step 8. Dose the remaining excavation footprint with lime with the final half of the required rate
- Step 9. Excavate and stockpile the final half of the won material (2 pass-equivalent)
- Step 10. Turn the stockpile 2 times before replacing on bank (2-4 pass-equivalent)

¹ Determined from experience on several major remediation projects

Step 11. Excavate stockpile and place on batter and pin wheel into place (3 pass-equivalent)

Stockpiling should occur in a bunded treatment pad and untreated soil material placed in 300mm layers for turning/pass over by an excavator before applying additional layers.

Dose any exposed excavation faces with lime at end of day.

8.3 Stockpile / Treatment Pad

Prior to commencement of excavation of ASS, a stockpile pad is to be prepared for lime treatment/mixing. It should be constructed as follows:

- Locate the pad on relatively level ground
- Size the pad such that material to be treated can be easily placed in 300mm layers and not exceed a total height of 1.8m (6 layers)
- Strip topsoil and form a bund around the entire pad to divert clean water
- Excavate a perimeter drain inside the bunded area to capture any leachate from the stockpile
- Dose the entire base of the stockpile pad with lime at a rate of 1 kg/m²
- Cut a small sump in the lowest corner being a mud bucket wide by 0.3m deep.
- Pin wheel compact entire internal surface of pad
- Provide a plastic cover to shield from rain if forecast.

An example cross-section of a treatment pad is shown in Figure 5 below.

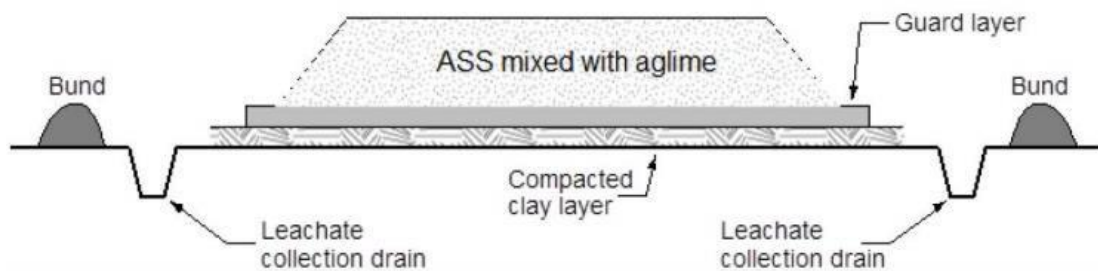


Figure 5 ASS Treatment Pad

8.4 Groundwater Management and Monitoring

No groundwater was encountered during excavation of boreholes in the floodplain soils which represent the excavation footprint (See Section 2.5). Hence dewatering will not be required in this project.

Works are to be conducted outside of flooding events or unseasonally high water levels, ideally around spring (August-November).

If rainfall occurs during works and the treatment pad collects water in the sump. Undertake pH sampling and if outside the range 5.5-8.5, dispose of water via spray irrigation of stockpiled material.

8.5 Verification Testing

Verification of works should be conducted as follows after neutralisation with lime:

- **pH field screening:** to confirm that the appropriate quantities of lime have been added and the soils have been suitably mixed / blended prior to disposal.
- **Screening rate:** The pH testing should be undertaken on the treated material at the following frequency: - One sample per 100 m³ of treated soil.
- **Scr Testing:** Once the pH screening results all meet the criteria given in Section 8.6 laboratory verification testing will be required at the below rate, with each sample tested at the laboratory comprising a composite sample with 5 sub-samples (1 per 100m³) or the “worst case” sample.

Compare the verification results with the acceptance criteria given in Section 8.6. If results meet the acceptance criteria, the ASS will be considered to have been successfully treated.

8.6 Verification Acceptance Criteria

Field screening results will be considered to be acceptable when the results are below the adopted criteria. When soils do meet the following criteria, confirmatory laboratory testing should be undertaken.

- Field pH is ≥ 5.5 (but ideally between pH 6.5 and 8.5); and
- pH_{fox} ≥ 4.5 .

The laboratory (chromium reducible sulfur ((Scr) full suite) results must meet the following criteria:

Scr Analysis

- pH_{KCL} is ≥ 6.5 ;
- TPA = 0;
- TAA = 0; and
- Net acidity ≤ 0 where net acidity is calculated as:

8.7 Work Health and Safety

8.7.1 Work Health and Safety Training

Prior to commencement of excavation all workers should be made aware through site training / induction of potential site hazards in accordance with the SafeWork NSW requirements. The training must be substantiated with a signed attendance sheet for all the workers.

8.7.2 Neutralisation Products

Ag-lime is caustic, and should be handled and stored in accordance with the product advice and SDS. Appropriate staff training should be provided, and the required personal protective equipment (PPE) should be made available and used during handling. Required PPE may include dust masks,

protective clothing, gloves and goggles. Products should be stored on-site in a safe / secure area, and should be kept in appropriate, waterproof covers with the product safety advice.

8.7.3 Emergency Response Procedures

Construction activities in ASS may cause a potential environmental threat. For all construction incidents which pose a potential health or environmental threat, an incident report must be completed in order to:

- Determine the cause of the incident;
- Implement additional control measures as required; and
- Adequately modify work procedures to reduce the likelihood of the incident re-occurring.

8.8 Reporting Requirements

8.8.1 Contractor Reporting Requirements

A record of management, treatment, monitoring, validation and disposal of ASS should be maintained by the contractor, and should include the following details:

- Date;
- Location / area and depth of excavated material;
- Time of excavation and time of stockpiling or placement;
- Neutralisation process undertaken;
- Liming material and rate utilised;
- Results of monitoring;
- Disposal location; and
- Tonnages of material treated/disposed and landfill dockets.

These records should be submitted to the environmental consultant following completion of the works.

8.9 Final Report

Following completion of the works and receipt of the contractor's records, a close-out report should be prepared by the environmental consultant to demonstrate conformance to the management plan. The close-out report should include the following:

- Description of site works undertaken and methodologies;
- Volume of materials treated including quantity and nature of neutralising materials mixed;
- Acid sulfate soil management measures employed;
- Field screening and laboratory analytical results; and
- Discussion of soil monitoring programs and acceptance criteria.

9 References

Eddie M.W., 1999, *Soil Landscapes of the Macksville-Nambucca 1:100,000 Sheets* map and report, NSW Department of Land and Water Conservation, Sydney.

Environment Protection Authority (2022). *Contaminated Land Guidelines: Sampling design part 1 – application*. NSW EPA, Sydney.

Stone et al., 1998. *Acid Sulfate Soils Assessment Guidelines (ASSMAC)*. New South Wales Acid Sulfate Soil Management Advisory Committee.

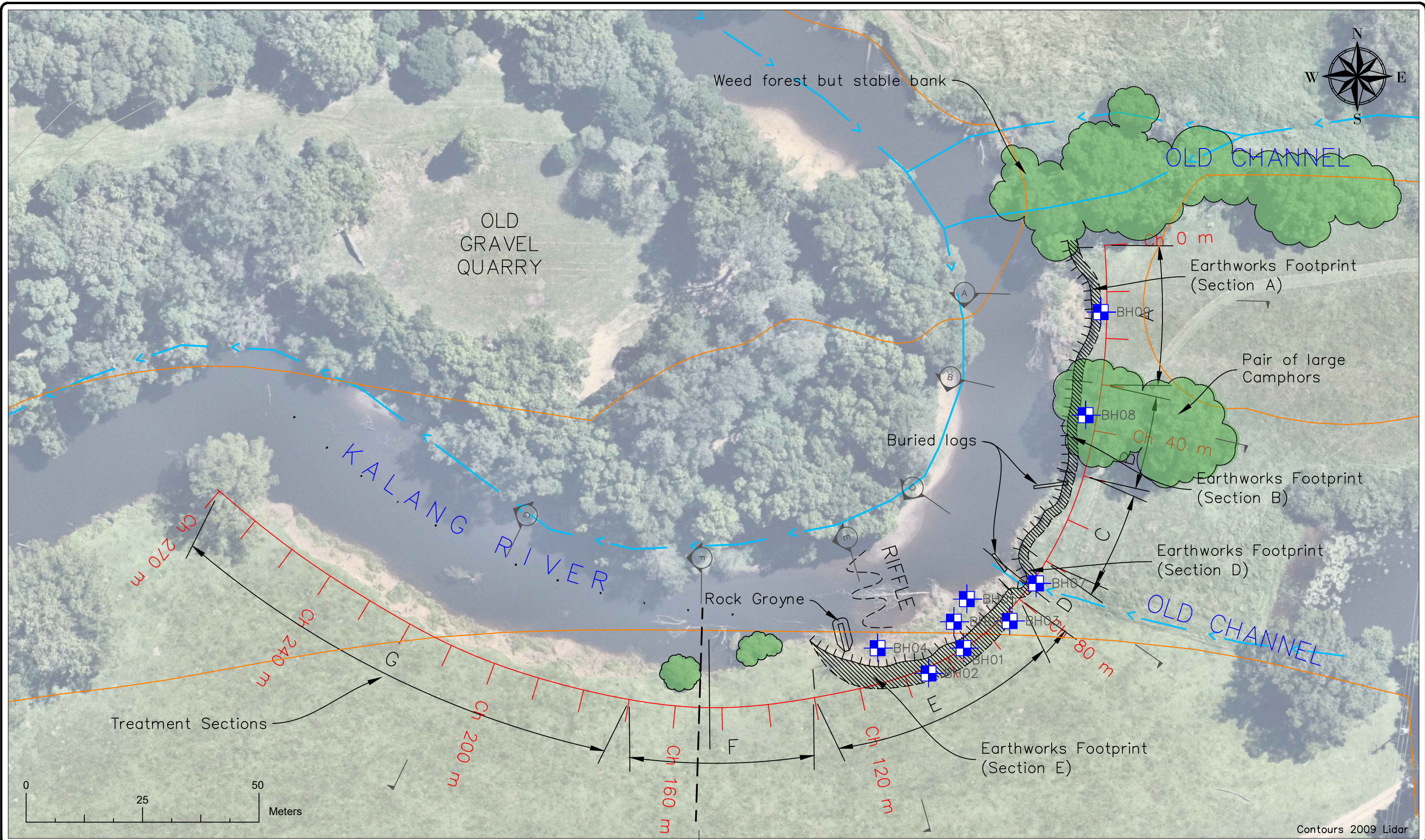
Telfer, D. Cohen, T. 2010. *Bellinger and Kalang River Estuaries Erosion Study*. Report prepared for Bellingen Shire Council.

- END OF REPORT -

Prepared by:	Clayton Colmer B.E., B.Nat.Res, FIEAust, CPESC		7-Mar-25
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Appendix 1 Site Plan



DO NOT SCALE FROM THESE DRAWINGS	
DESIGNED C.Colmer	REVIEWED —
APPROVED 	DRAWN C.Colmer
hains lane ass map - 07-03-25.dwg	
A3	CAD - DO NOT AMEND MANUALLY

LEGEND & SYMBOLS		
	BOREHOLE LOCATION	
07.03.2025	ASSMP Report	0
DATE	DESCRIPTION	REV

PROJECT TITLE	
KALANG RIVERBANK EROSION REMEDIATION	
DRAWING TITLE	
32 & 88 Hains Lane, Brierfield Acid Sulfate Soil Site Plan	

TALLOWOOD
ENVIRONMENT & ENGINEERING
BELLINGEN NSW 2450
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CLIENT		
Department of Primary Industries and Regional Development & OzFish		
SCALE	COORDINATES	Date
1: 750	GDA20	07.03.2025
PROJECT NO.	DRAWING NO.	REVISION
89-0ZGF-01	1	0

Appendix 2 Preliminary Acid Sulfate Soil Test Results



BELLINGEN SHIRE COUNCIL

WINNER AR BLUETT MEMORIAL AWARD 2020
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Service Ethic /
Commitment



Professionalism



Respect



Teamwork



Integrity



Communication

From: Harry Chapman <harry.chapman@bellingen.nsw.gov.au>

Sent: Tuesday, August 6, 2024 12:00 PM

To: Sam Tate <state@bellingen.nsw.gov.au>

Subject: Kalang OzFish Acid Sulfate Soil Results

Hi Sam,

As discussed, please find attached the results of the acid sulfate soil (ASS) sampling I undertook at the site a few weeks ago.

I collected 2 samples, ASS01 from the river bed at a depth of approximately 0.5 m Below Ground Level (mBGL) and ASS02 from the bank approximately midway between the top of the bank and the water surface at a lateral depth of 0.5 m into the bank. At ASS01 I encountered a grey mottled black sandy clay just below the river stone layer. Within the bank I encountered a brown silty sand layer that appeared homogenous throughout the inspected profile. Olfactory signs of ASS were not identified during sampling at either location. I have attached photos of the material encountered at each location. Other photos from sampling are available within the job folder.

The samples were collected in laboratory provided jars and bags, the jars were filled so no headspace remained and sealed. Sample bags were partially filled with soil and air removed as far as reasonably practicable before being placed into a second bag. Samples were immediately placed into an eski with reusable ice bricks for transport. Once at the depot, sample jars were placed into the fridge at 4°C and sample bags were frozen at -18°C overnight. Samples were then placed into an eski with reusable ice bricks for transport to a laboratory NATA accredited for the selected analysis. Samples were analysed for pH_F, pH_{FOX} and a chromium reducible sulfur (CRS) suite. I have attached a copy of the chain of custody (COC) and laboratory

results.

Key results are presented in the table below and compared to criteria presented within the NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC) 1998, Acid Sulfate Soils Assessment Guidelines:

	ASS01	ASS02	ASSMAC Criterial		
			AASS	PASS	Action Criteria*
pH _F	5.1	4.2	4.0		
pH _{FOX}	2.7	3.4		3.5	
pH _F - pH _{FOX}	2.4	0.8		1	
Reaction Rate	4	4		3	
Net acidity (mol H ⁺ /t)	320	39			18
CRS (wt% S)	0.45	<0.005			0.03
Liming Rate (kg/t)	24	2.9			

*Assuming >1000 tonnes of material disturbed

Key takeaways from the above.

- ASS01 is not actual ASS (AASS)
- ASS01 met all criteria to be considered potential ASS (PASS) and has a high concentration of CRS. As such, ASS01 is classified as PASS.
- ASS02 is borderline AASS with a pH of 0.2 above the criteria.
- ASS02 met 2 of 3 criteria and was borderline on the 3rd criteria to be considered PASS. However, ASS02 did not have detectable concentrations of CRS. This in combination the coarse soil grain, low pH_F and erosion impacts in the area may indicate oxidation of sulfur material has already occurred and acidified the soil.
- Both samples exceeded the action criteria for net acidity. However, only ASS01 exceeded the action criteria for CRS. ASSMAC recommends adopting the higher of the 2 values. As such, both samples are taken to have exceeded the action criteria.
- Exceeding the action criteria triggers the need for an ASS management plan. As part of this management plan, additional sampling should be undertaken to target areas of the embankment likely to be disturbed due to the borderline results. Sampling should be undertaken in accordance with ASSMAC, including the recommended sampling density. Note that although the Water Quality Australia 2018 National Acid Sulfate Soil Guidance has been published, the LEP still references ASSMAC and as such, the assessment must be completed in accordance with the older guidelines.

- ASSMAC states “*For projects that disturb >1000 tonnes of ASS soils with >0.03 % oxidisable sulfur or equivalent existing acidity, a detailed management plan and **development consent will be required.***” We need to seek advice from planning on this one. In the case of a conflict between a SEPP (current pathway for part 5) and the LEP (where the acid sulfate soils requirements for a DA are specified), the SEPP prevails. However, there is not exactly a conflict here as the SEPP does not specify any requirements for ASS. It is unlikely, but there is potential for both the SEPP and LEP to apply. I don’t think a DA will be required as we should still be able to approve under a part 5, but there may be some additional requirements such as planning approval of the ASS management plan.

In terms of the REF, I have all the info I need to complete it now. A condition will be that the ASS investigation and management plan is completed, and any controls detailed in the management plan are implemented prior to commencement of work.

Kind Regards,



BELLINGEN
SHIRE COUNCIL

Harry Chapman

Environmental Officer

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Raleigh
NSW 2454



NATA Accredited
Accreditation Number 1261
Site Number 20794 & 2780

Accredited for compliance with ISO/IEC 17025 – Testing
 NATA is a signatory to the ILAC Mutual Recognition
 Arrangement for the mutual recognition of the
 equivalence of testing, medical testing, calibration,
 inspection, proficiency testing scheme providers and
 reference materials producers reports and certificates.

Attention: **Harry Chapman**

Report **1121008-S**
Project name **OZFISH KALANG REHAB**
Project ID **J200019**
Received Date **Jul 18, 2024**

Client Sample ID			ASS01	ASS02
Sample Matrix			Soil	Soil
Eurofins Sample No.			B24-JI0060812	B24-JI0060813
Date Sampled			Jul 11, 2024	Jul 11, 2024
Test/Reference	LOR	Unit		
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	5.1	4.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.7	3.4
Reaction Ratings* ^{S05}	0	comment	4.0	4.0
Extraneous Material				
<2mm Fraction	0.005	g	110	150
>2mm Fraction	0.005	g	66	2.2
Analysed Material	0.1	%	62	98
Extraneous Material	0.1	%	38	1.5
Net Acidity (Excluding ANC)				
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	0.02	% S	0.52	0.06
CRS Suite - Net Acidity - NASSG (Excluding ANC)	10	mol H+/t	320	39
CRS Suite - Liming Rate - NASSG (Excluding ANC)	1	kg CaCO ₃ /t	24	2.9
Actual Acidity (NLM-3.2)				
pH-KCL (NLM-3.1)	0.1	pH Units	4.8	4.7
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	38	39
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	0.062	0.062
Potential Acidity - Chromium Reducible Sulfur				
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	0.45	< 0.005
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	280	< 3
Extractable Sulfur				
Sulfur - KCl Extractable	0.005	% S	N/A	N/A
HCl Extractable Sulfur	0.005	% S	N/A	N/A
Retained Acidity (S-NAS)				
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	N/A	N/A
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	N/A	N/A
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	N/A	N/A
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0
Acid Neutralising Capacity (ANCbt)				
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO ₃	N/A	N/A
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	N/A	N/A
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	N/A	N/A
ANC Fineness Factor		factor	1.5	1.5
Net Acidity (Including ANC)				
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	0.52	0.06
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	320	39
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO ₃ /t	24	2.9

Client Sample ID			ASS01	ASS02
Sample Matrix			Soil	Soil
Eurofins Sample No.			B24-JI0060812	B24-JI0060813
Date Sampled			Jul 11, 2024	Jul 11, 2024
Test/Reference	LOR	Unit		
Sample Properties				
% Moisture	1	%	22	19

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test - Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests	Brisbane	Jul 24, 2024	7 Days
Extraneous Material - Method: LTM-GEN-7050/7070	Brisbane	Jul 24, 2024	6 Week
Chromium Suite - NASSG (Excluding ANC) - Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite	Brisbane	Jul 24, 2024	6 Week
% Moisture - Method: LTM-GEN-7080 Moisture	Brisbane	Jul 24, 2024	14 Days



web: www.eurofins.com.au
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ABN: 50 005 085 521

Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079
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ABN: 91 05 0159 898

Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

ABN: 47 009 120 549

Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554
--

NZBN: 9429046024954

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Company Name: Bellingen Shire Council
Address: 14 Alex Pike Dr
Raleigh
NSW 2454

Project Name: OZFISH KALANG REHAB
Project ID: J200019

Order No.: PO#31383
Report #: 1121008
Phone:
Fax:

Received: Jul 18, 2024 10:30 AM
Due: Jul 25, 2024
Priority: 5 Day
Contact Name: Harry Chapman

Eurofins Analytical Services Manager : Irem Haskara

Sample Detail						Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780						X	X	X
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	ASS01	Jul 11, 2024		Soil	B24-JI0060812	X	X	X
2	ASS02	Jul 11, 2024		Soil	B24-JI0060813	X	X	X
Test Counts						2	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery										
Actual Acidity (NLM-3.2)										
pH-KCL (NLM-3.1)				%	98			80-120	Pass	
Titratable Actual Acidity (NLM-3.2)				%	94			80-120	Pass	
LCS - % Recovery										
Potential Acidity - Chromium Reducible Sulfur										
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)				%	97			80-120	Pass	
LCS - % Recovery										
Extractable Sulfur										
HCl Extractable Sulfur				%	101			80-120	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Acid Sulfate Soils Field pH Test					Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-JI0060812	CP	pH Units		5.1	5.1	pass	20%	Pass	
Duplicate										
Net Acidity (Excluding ANC)					Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-JI0046506	NCP	% S		0.04	N/A	N/A	30%	Pass	
CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-JI0046506	NCP	mol H+/t		26	N/A	N/A	20%	Pass	
CRS Suite - Liming Rate - NASSG (Excluding ANC)	B24-JI0046506	NCP	kg CaCO3/t		1.9	N/A	N/A	30%	Pass	
Duplicate										
Actual Acidity (NLM-3.2)					Result 1	Result 2	RPD			
pH-KCL (NLM-3.1)	B24-JI0046506	NCP	pH Units		4.8	4.7	2.0	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-JI0046506	NCP	mol H+/t		26	26	1.1	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-JI0046506	NCP	% pyrite S		0.042	0.041	1.1	30%	Pass	
Duplicate										
Potential Acidity - Chromium Reducible Sulfur					Result 1	Result 2	RPD			
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	B24-JI0046506	NCP	% S		< 0.005	< 0.005	<1	20%	Pass	
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B24-JI0046506	NCP	mol H+/t		< 3	< 3	<1	30%	Pass	
Duplicate										
Extractable Sulfur					Result 1	Result 2	RPD			
Sulfur - KCl Extractable	B24-JI0046506	NCP	% S		N/A	N/A	N/A	30%	Pass	
HCl Extractable Sulfur	B24-JI0046506	NCP	% S		N/A	N/A	N/A	20%	Pass	
Duplicate										
Retained Acidity (S-NAS)					Result 1	Result 2	RPD			
Net Acid soluble sulfur (SNAS) NLM-4.1	B24-JI0046506	NCP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (s-SNAS) NLM-4.1	B24-JI0046506	NCP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (a-SNAS) NLM-4.1	B24-JI0046506	NCP	mol H+/t		N/A	N/A	N/A	30%	Pass	
Duplicate										
Acid Neutralising Capacity (ANCbt)					Result 1	Result 2	RPD			
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	B24-JI0046506	NCP	% CaCO3		N/A	N/A	N/A	20%	Pass	
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)	B24-JI0046506	NCP	% S		N/A	N/A	N/A	30%	Pass	
ANC Fineness Factor	B24-JI0046506	NCP	factor		1.5	1.5	<1	30%	Pass	

Duplicate								
Net Acidity (Including ANC)				Result 1	Result 2	RPD		
s-CRS Suite - Net Acidity - NASSG (including ANC)	B24-JI0046506	NCP	% S	0.04	0.04	1.1	30%	Pass
CRS Suite - Net Acidity - NASSG (Including ANC)	B24-JI0046506	NCP	mol H+/t	26	26	1.1	30%	Pass
CRS Suite - Liming Rate - NASSG (Including ANC)	B24-JI0046506	NCP	kg CaCO3/t	1.9	1.9	1.1	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	B24-JI0060789	NCP	%	4.0	3.9	3.3	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO ₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m ³ in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m ³ '
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl is greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Irem Haskara	Analytical Services Manager
Jonathon Angell	Senior Analyst-Sample Properties
Jonathon Angell	Senior Analyst-SPOCAS



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Appendix 3 Field Screening (Laboratory controlled) Test Results



PO Box 157 (Military Road)
LISMORE NSW 2480
T: 02 6620 3678 E: eal@scu.edu.au W: www.scu.edu.au

Sample Submission Form (SSF) - Chain of Custody (COC)

Submitting Client Details

Quote Id:
Job Ref: Hains Lane
Company: TAL-108 TALLOWWOOD E&E
Contact: Clay Colmer
Phone:
Mobile: 0417171065
Email: clayton@tallowwoodee.com.au
Postal address: 41 Lyon Street BELLINGEN NSW 2454

Billing Client Details

☒ Tick if same as submitting details
ABN: 57 660 157 317
Company:
Contact:
Phone:
Mobile:

Payment Method:

- ☐ Purchase Order
☐ Cheque
☒ Credit/Debit Card (EAL staff will call/then dispose of details)
☐ Invoice (prior approval)

Relinquished: C. COLMER

Received: *BC*

Time/Date: 05/02/2025

Time/Date: 6.2.25 1pm

Preservation: none freezer bricks ice - acidified - filtered - other
Condition on receipt: ambient cool frozen - other

Please note compositing or mixing of samples MUST be written on the Sample Submission Form. Otherwise, each sample listed will be analysed and charged separately.

In submitting samples, the Client agrees to the EAL Laboratory Services Terms and Conditions. These Terms and Conditions are available on the EAL website: scu.edu.au/eal, or on request.

Comments:

1. Please undertake field screening tests first, then hold the samples, send me the results, and I will confirm which are to be subject to further testing.

Likelihood and nature of Hazardous material:

								Total number of	Sample Analysis Request				
									Price list code (e.g. SW-PACK-06)				
									AS-PACK-007	AS-PACK-008			
Lab ID	Sample ID	Sample Depth	Sampling Date	Sampling Time	Sampler	Your Client	Crop ID	Sample Type (e.g. water, leaf, soil)					

E25-00-1336
8x soil (Acid Sulfate)

Lab ID	Sample ID	Sample Depth	Sampling Date	Sampling Time	Sampler	Your Client	Crop ID	Sample Type (e.g. water, leaf, soil)					
1	S-01	2.5	4/02/2025	11:55	C.Colmer	OzFish		Soil	X	Contact after AS-PACK-007 completed, likely S-04&S-06 only			
2	S-02	1.5	4/02/2025	12:35	C.Colmer	OzFish		Soil	X				
3	S-03	0.5	4/02/2025	12:50	C.Colmer	OzFish		Soil	X				
4	S-04	1.0	4/02/2025	13:11	C.Colmer	OzFish		Soil (wet)	X				
5	S-06	0.5	4/02/2025	13:30	C.Colmer	OzFish		Soil (wet)	X				
6	S-07	0.8	4/02/2025	13:53	C.Colmer	OzFish		Soil	X				
7	S-08	1.0	4/02/2025	14:01	C.Colmer	OzFish		Soil	X				
8	S-09	1.0	4/02/2025	14:09	C.Colmer	OzFish		Soil	X				

Certificate of Analysis E25-00-1336

Client:	Tallowwood Environment & Engineering Pty Ltd	Laboratory:	Environmental Analysis Laboratory
Contact:	Clay Colmer	Contact:	EAL Customer Service Team
Address:	41 Lyon Street, NSW 2454, Australia	Address:	Military Road, East Lismore NSW 2480, Australia
Telephone:	0417 171 065	Telephone:	(02) 6620 3678
Email:	clayton@tallowwoodee.com.au	Email:	eal@scu.edu.au

Customer reference:	Hains Lane	Request ID:	EAL /E25-00-1336
Number of samples:	8	Report ID:	E25-00-1336_EALP1_1
Date samples received:	06 February 2025	Issue date:	14 February 2025

Authorised by:	Graham Lancaster
Position:	Senior Manager



Comments: EAL is a NATA accredited laboratory (14960), accredited for compliance with ISO/IEC 17025 - Testing.

Certificate of Analysis

Request ID: EAL/E25-00-1336 Report ID: E25-00-1336_EALP1_1 Issue date: 14 February 2025

Client Sample ID:				S-01	S-02	S-03	S-04	S-06
Sample Depth:				2.5	1.5	0.5	1.0	0.5
Sample Date:				4 February 2025	4 February 2025	4 February 2025	4 February 2025	4 February 2025
Sample Time:				11:55	12:35	12:50	13:11	13:30
Sampled By:				C.Colmer	C.Colmer	C.Colmer	C.Colmer	C.Colmer
Your Client:				OzFish	OzFish	OzFish	OzFish	OzFish
EAL Sample ID:				E25-00-1336-0001	E25-00-1336-0002	E25-00-1336-0003	E25-00-1336-0004	E25-00-1336-0005
Parameter	Unit	Method Reference	LOR	---	---	---	---	---
Moisture Content (80°C)	% of water in sample	** Inhouse S2c	<0.1	18.1	19.1	23.3	28.9	22.9
Moisture Content (80°C)	g water/ g oven-dry mass	** Inhouse S2c	<0.1	0.2	0.2	0.3	0.4	0.3
Texture	---	** Inhouse S81	---	Fine	Fine	Fine	Fine	Fine
pHF	---	Inhouse S21	---	5.88	5.52	5.44	6.66	5.91
pHFOX	---	Inhouse S21	---	3.70	2.81	2.53	4.27	2.33
pH Change	---	Inhouse S21	---	-2.18	-2.71	-2.91	-2.39	-3.58
Reaction	---	Inhouse S21	---	Low	Low	High	Low	Low

Client Sample ID:				S-07	S-08	S-09
Sample Depth:				0.8	1.0	1.0
Sample Date:				4 February 2025	4 February 2025	4 February 2025
Sample Time:				13:53	14:01	14:09
Sampled By:				C.Colmer	C.Colmer	C.Colmer
Your Client:				OzFish	OzFish	OzFish
EAL Sample ID:				E25-00-1336-0006	E25-00-1336-0007	E25-00-1336-0008
Parameter	Unit	Method Reference	LOR	---	---	---
Moisture Content (80°C)	% of water in sample	** Inhouse S2c	<0.1	26.8	20.7	16.8
Moisture Content (80°C)	g water/ g oven-dry mass	** Inhouse S2c	<0.1	0.4	0.3	0.2
Texture	---	** Inhouse S81	---	Fine	Fine	Fine
pHF	---	Inhouse S21	---	5.61	5.49	5.13
pHFOX	---	Inhouse S21	---	2.36	2.62	3.29
pH Change	---	Inhouse S21	---	-3.25	-2.87	-1.84
Reaction	---	Inhouse S21	---	Extreme	Medium	Low

Notes:

- Where Acid Neutralising Capacity has been corroborated by other data, Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - Acid Neutralising Capacity (Eq. 3.1; Sullivan et al. 2018).
- Where Acid Neutralising Capacity has not been corroborated by other data, Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity (Eq. 3.2; Sullivan et al. 2018).
- The Acid Base Accounting Equation for post-limed soil materials is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - (post treatment Acid Neutralising Capacity - initial Acid Neutralising Capacity) (Eq. 3.3; Sullivan et al. 2018).
- A 1.5 Safety Factor is applied to positive Liming Rates.
- NSCT (2009) texture: coarse and peats = sands to loamy sands; medium = clayey sand to light clays; fine = light medium to heavy clays.
- A management plan triggered by Net Acidity results greater than the texture dependent criterion: coarse ≥ 18 mol H⁺/t; medium ≥ 36 mol H⁺/t; fine ≥ 62 mol H⁺/t.
- Where > 1000 t soil disturbed, coarse trigger used.
- Bulk density required to convert laboratory data to field liming rates.
- ** denotes NATA accreditation does not cover the performance of this service.
- .. denotes not requested, no data/information or no guidelines available.

Certificate of Analysis

Request ID: EAL/E25-00-1336 Report ID: E25-00-1336_EALP1_1 Issue date: 14 February 2025

- All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (available on request or at scu.edu.au/eal).
- Analysis conducted between sample arrival date and reporting date.
- This report is not to be reproduced except in full.
- Results only relate to the item tested.
- Methods sourced from Sullivan L, Ward N, Toppler N and Lancaster G. 2018. National acid sulfate soils guidance: national acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT.
- Samples dried and ground immediately on arrival (unless supplied dried and ground).
- Analysis reported on a dry weight (DW) basis, unless wet weight (WW) specified.

Appendix 4 Net Acidity Chromium Reducible Sulfur Laboratory Test Results

Certificate of Analysis E25-00-1751

Client:	Tallowood Environment & Engineering Pty Ltd	Laboratory:	Environmental Analysis Laboratory
Contact:	Clay Colmer	Contact:	EAL Customer Service Team
Address:	41 Lyon Street, NSW 2454, Australia	Address:	Military Road, East Lismore NSW 2480, Australia
Telephone:	0417 171 065	Telephone:	(02) 6620 3678
Email:	clayton@tallowwoodee.com.au	Email:	eal@scu.edu.au

Customer reference:	Haines Lane - AS-PK-008	Request ID:	EAL /E25-00-1751
Number of samples:	6	Report ID:	E25-00-1751_EALP1_1
Date samples received:	17 February 2025	Issue date:	19 February 2025

Authorised by:	Nick Ward
Position:	Technical Team Leader



Comments: EAL is a NATA accredited laboratory (14960), accredited for compliance with ISO/IEC 17025 - Testing.

Additional testing from E25-00-1336 as per email from Clayton 15/02/25

Certificate of Analysis

Request ID: EAL/E25-00-1751 Report ID: E25-00-1751_EALP1_1 Issue date: 19 February 2025

Client Sample ID:				S-02	S-03	S-04	S-06	S-07
Sample Depth:				1.5	0.5	1.0	0.5	0.8
Sample Date:				4 February 2025	4 February 2025	4 February 2025	4 February 2025	4 February 2025
Sample Time:				12:35	12:50	13:11	13:30	13:53
Sampled By:				C. Colmer	C. Colmer	C. Colmer	C. Colmer	C. Colmer
Your Client:				OzFish	OzFish	OzFish	OzFish	OzFish
EAL Sample ID:				E25-00-1751-0001	E25-00-1751-0002	E25-00-1751-0003	E25-00-1751-0004	E25-00-1751-0005
Parameter	Unit	Method Reference	LOR	---	---	---	---	---
Chromium Reducible Sulfur	% SCR	Inhouse S20	<0.005	0.007	0.013	< 0.005	0.007	0.007
Chromium Reducible Sulfur	mol H+/t	Inhouse S20	<3	5	8	< 3	5	4
pH KCl	---	Inhouse S16b	---	5.30	5.12	5.72	5.09	5.15
Titrateable Actual Acidity	mol H+/t	Inhouse S16b	<1	26	36	14	38	34
Net Acidity	mol H+/t	** Sullivan et al. 2018	<3	30	45	15	43	38
Lime Calculation	kg CaCO ₃ /t DW	** Sullivan et al. 2018	<1	2	3	1	3	3

Client Sample ID:				S-08
Sample Depth:				1.0
Sample Date:				4 February 2025
Sample Time:				14:01
Sampled By:				C. Colmer
Your Client:				OzFish
EAL Sample ID:				E25-00-1751-0006
Parameter	Unit	Method Reference	LOR	---
Chromium Reducible Sulfur	% SCR	Inhouse S20	<0.005	0.008
Chromium Reducible Sulfur	mol H+/t	Inhouse S20	<3	5
pH KCl	---	Inhouse S16b	---	5.05
Titrateable Actual Acidity	mol H+/t	Inhouse S16b	<1	41
Net Acidity	mol H+/t	** Sullivan et al. 2018	<3	46
Lime Calculation	kg CaCO ₃ /t DW	** Sullivan et al. 2018	<1	3

Notes:

- Where Acid Neutralising Capacity has been corroborated by other data, Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - Acid Neutralising Capacity (Eq. 3.1; Sullivan et al. 2018).
- Where Acid Neutralising Capacity has not been corroborated by other data, Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity (Eq. 3.2; Sullivan et al. 2018).
- The Acid Base Accounting Equation for post-limed soil materials is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - (post treatment Acid Neutralising Capacity - initial Acid Neutralising Capacity) (Eq. 3.3; Sullivan et al. 2018).
- A 1.5 Safety Factor is applied to positive Liming Rates.
- NSCT (2009) texture: coarse and peats = sands to loamy sands; medium = clayey sand to light clays; fine = light medium to heavy clays.
- A management plan triggered by Net Acidity results greater than the texture dependent criterion: coarse ≥ 18 mol H+/t; medium ≥ 36 mol H+/t; fine ≥ 62 mol H+/t.
- Where > 1000 t soil disturbed, coarse trigger used.
- Bulk density required to convert laboratory data to field liming rates.
- ** denotes NATA accreditation does not cover the performance of this service.
- .. denotes not requested, no data/information or no guidelines available.
- All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (available on request or at scu.edu.au/eal).
- Analysis conducted between sample arrival date and reporting date.
- This report is not to be reproduced except in full.

Certificate of Analysis

Request ID: EAL/E25-00-1751 Report ID: E25-00-1751_EALP1_1 Issue date: 19 February 2025

- Results only relate to the item tested.
- Methods sourced from Sullivan L, Ward N, Toppler N and Lancaster G. 2018. National acid sulfate soils guidance: national acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT.
- Samples dried and ground immediately on arrival (unless supplied dried and ground).
- Analysis reported on a dry weight (DW) basis, unless wet weight (WW) specified.

Appendix 5 Soil Bore Logs

Client:	DPIRD & OzFish
Project Manager:	Clayton Colmer
Project:	Kaland Estuary Riverbank Erosion Remediation
Location:	32 & 88 Hains Lane, Brierfield

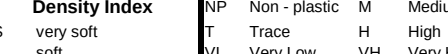
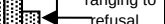
Date started:	4/02/2025
Date completed:	4/02/2025
Logged by:	Clayton Colmer
Checked by:	-

Zone	56	Loc. Description:	Weather Current	Hot & Sunny
Easting			Weather Previous	Dry
Northing			Surface Drainage	Moderately drained
Error	±5.0	Current Land Use	Comments	
Datum	GDA 20	Slope Aspect		
R.L. at Surface		Slope Angle	Undulating ± 2%	Field Site Classification

DRILLING & PIEZOMETER

MATERIAL SUBSTANCE & SAMPLING

Method ¹	Penetration ²	Support ³	Groundwater ⁴	Piezometer ⁵	R.L.	depth (m)	Graphic log ¹¹	Classification ⁶	Material	Moisture Condition ⁷	Consistency / Density Index ⁸	Plasticity ⁹	Pocket (kPa)	DCP			Sampling ¹⁰	Observations		
									soil type: plasticity or particle characteristics, colour, secondary or minor components					From	To (mm)	BLOWS			(notes, samples, tests)	structure and additional observations (i.e. odour, mottles, presence of roots, fragments.)
																1	2	3		
HA	1	NIL				0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90 3.00 3.10 3.20 3.30 3.40 3.50 3.60 3.70 3.80 3.90 4.00			Dark brown loamy topsoil	M				0	150					Roots
									Light brown fine sandy silty loam. Clay ribbon - nil. ~10% Clay - 50% Silt - 40% fine sand								150	300		
													300	450					No odour. No mottling	
													450	600						
													600	750				Sample S-01		
													750	900						
													900	1050						
													1050	1200						
													1200	1350						
													1350	1500						
													1500	1650						
													1650	1800						
													1800	1950						

1 - Method		2 - Penetration		10 - Sampling		6 - Classification		8 - Consistency / Density Index		9 - Plasticity			
AS	auger screwing*	1 2 3 4		U ₅₀	undisturbed sample 50mm diameter	classification symbols and soil descriptions based on the unified classification system (ref: AS1726, table A1)		VS	very soft	NP	Non - plastic	M	Medium
AD	auger drilling*			U ₆₃	undisturbed sample 63mm diameter			V	soft	T	Trace	H	High
RR	roller/tricone			D	disturbed sample			F	firm	VL	Very Low	VH	Very High
W	washbore			N	standard penetration test			L	Low	EH	Extra High		
CT	cable tool	3 - Support		N*	SPT - sample recovered	7- Moisture Condition		St	stiff	11 - Graphic Log			
HA	hand auger	M	mud	N _C	SPT with solid cone			VSt	very stiff				
PT	pushtube	C	casing	V	vane shear (kPa)			H	hard				
B	blank bit	N	nil	P	pressuremeter			Fb	friable				
V	V bit	4 - Groundwater		B _S	bulk sample	5 - Piezometer		VL	very loose				
T	TC bit	SWL	Standing Water Level	E	environmental sample			L	loose				
*bit shown by suffix				R	refusal			MD	medium dense				
e.g. ADT								D	dense				
				C	Case	S	Screen	VD	very dense				



TALLOWOOD
ENVIRONMENT & ENGINEERING

Geotechnical Soil Profile Log

Borehole No.: **BH-06**
Sheet: **1** of **1**
Project No.: **89-OZF-01**

Client:	DPIRD & OzFish	Date started:	4/02/2025		
Project Manager:	Clayton Colmer	Date completed:	4/02/2025		
Project:	Kaland Estuary Riverbank Erosion Remediation	Logged by:	Clayton Colmer		
Location:	32 & 88 Hains Lane, Brierfield	Checked by:	-		
Zone	56	Loc. Description:	Paddock	Weather Current	Hot & Sunny
Easting	490206		88 Hains	Weather Previous	Dry
Northing	6625166		Section E	Surface Drainage	Moderately drained
Error	±1.9	Current Land Use	Grazing	Comments	
Datum	GDA 20	Slope Aspect			
R.L. at Surface	5.5m AHD	Slope Angle	Flat <2%	Field Site Classification	

DRILLING & PIEZOMETER						MATERIAL SUBSTANCE & SAMPLING																
Method ¹	Penetration ²	Support ³	Groundwater ⁴	Piezometer ⁵	R.L.	depth (m)	Graphic log ¹¹	Classification ⁶	Material	Moisture Condition ⁷	Consistency / Density Index ⁸	Plasticity ⁹	Pocket (kPa)	From	To (mm)	BLOWS			Sampling ¹⁰	Observations		
									soil type: plasticity or particle characteristics, colour, secondary or minor components							1	2	3	(notes, samples, tests)	structure and additional observations (i.e. odour, mottles, presence of roots, fragments.)		
HA	1	NIL	SWL			0.10			Light brown, fine silty sandy clay (suspected slump material)	W					0	150					Sample S-06	No odour. No mottling
						0.20																
						0.30																
						0.40			Quartz gravel & small cobble (<40mm)	W				150	300							
						0.50			Grey fine sandy clay	W												
						0.60																
						0.70																
						0.80																
						0.90																
						1.00																
						1.10																
						1.20																
						1.30																
						1.40																
						1.50																
						1.60																
						1.70																
						1.80																
						1.90																
						2.00																
						2.10																
						2.20																
						2.30																
						2.40																
						2.50																
						2.60																
						2.70																
						2.80																
						2.90																
						3.00																
						3.10																
						3.20																
						3.30																
						3.40																
						3.50																
						3.60																
						3.70																
						3.80																
						3.90																
						4.00																

1 - Method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
PT pushtube
B blank bit
V V bit
T TC bit
*bit shown by suffix e.g. ADT

2 - Penetration
1 2 3 4

no resist. ranging to refusal
3 - Support
M mud
C casing
N nil
4 - Groundwater
SWL Standing Water Level
water inflow
water outflow

10 - Sampling
U₅₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test
N* SPT - sample recovered
N_c SPT with solid cone
V vane shear (kPa)
P pressuremeter
B_s bulk sample
E environmental sample
R refusal
5 - Piezometer
C Case
S Screen

6 - Classification
classification symbols and soil descriptions based on the unified classification system (ref: AS1726, table A1)
7 - Moisture Condition
D dry
M-D moderately dry
M moist
W wet
W_p plastic limit
W_L liquid limit

8 - Consistency / Density Index
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

9 - Plasticity
NP Non - plastic
T Trace
VL Very Low
L Low
M Medium
H High
VH Very High
EH Extra High
11 - Graphic Log

Appendix 6 Tidal Limit Search

ABN: 36 092 724 251
Ph: 02 9099 7400
(Ph: 0412 199 304)

Level 14, 135 King Street, Sydney
Sydney 2000
GPO Box 4103 Sydney NSW 2001
DX 967 Sydney

Search

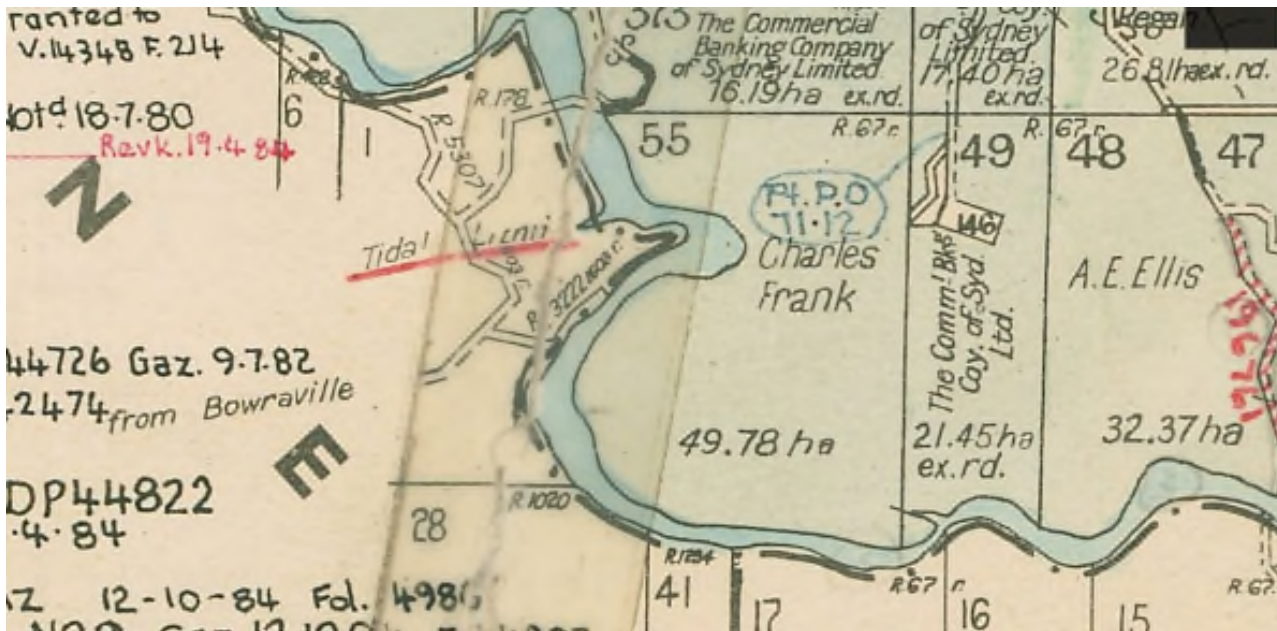
Re: - Lots 10 & 12 D.P. 801045 at Brierfield

The site of Kalang River in this location was found to be tidal. See the Tidal Limited noted on the attached extracts of the Parish Maps below.

In view of my findings and the tidal Limited defined on the Parish Maps, the Ad Medium Filum Aquae Rule will not be enjoyed by Lots 10 & 12 D.P. 801045.

The Crown will have an interest in the bed of Kalang River in this location.

REGIONAL OFFICE EDITION PARISH OF SOUTH BELLINGEN



ABN: 36 092 724 251
Ph: 02 9099 7400
 (Ph: 0412 199 304)

Level 14, 135 King Street, Sydney
Sydney 2000
GPO Box 4103 Sydney NSW 2001
DX 967 Sydney

REGIONAL OFFICE EDITION PARISH OF GLADSTONE



Yours Sincerely
Mark Groll
16 July 2024

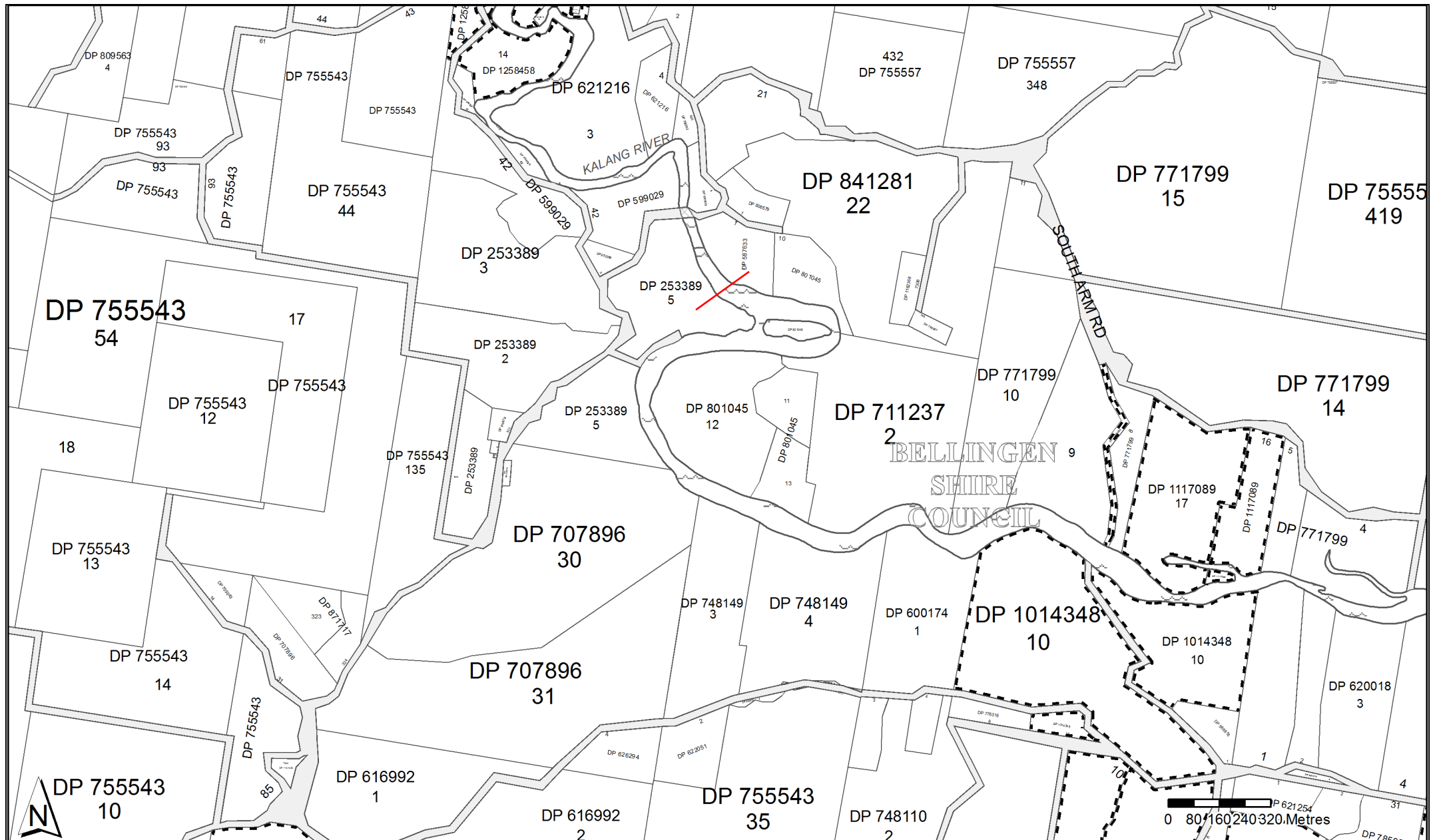
Cadastral Records Enquiry Report : Lot 12 DP 801045

Locality : BRIERFIELD

Parish : SOUTH BELLINGEN

LGA : BELLINGEN

County : RALEIGH



L. D. BELLINGEN.



41/6330
LAND IN CLOSURE
DEPT. OF LANDS
STAFF

PLAN OF PORTION 28
County of Raleigh Parish of Gladstone
Land District of Bellingen Land Board District of Grafton

~~Resumed Area No~~ ~~Pastoral Holding Eastern Division~~

~~Applied for under the Section of the Crown Lands Act of 1884 by~~

Measured in anticipation of demand

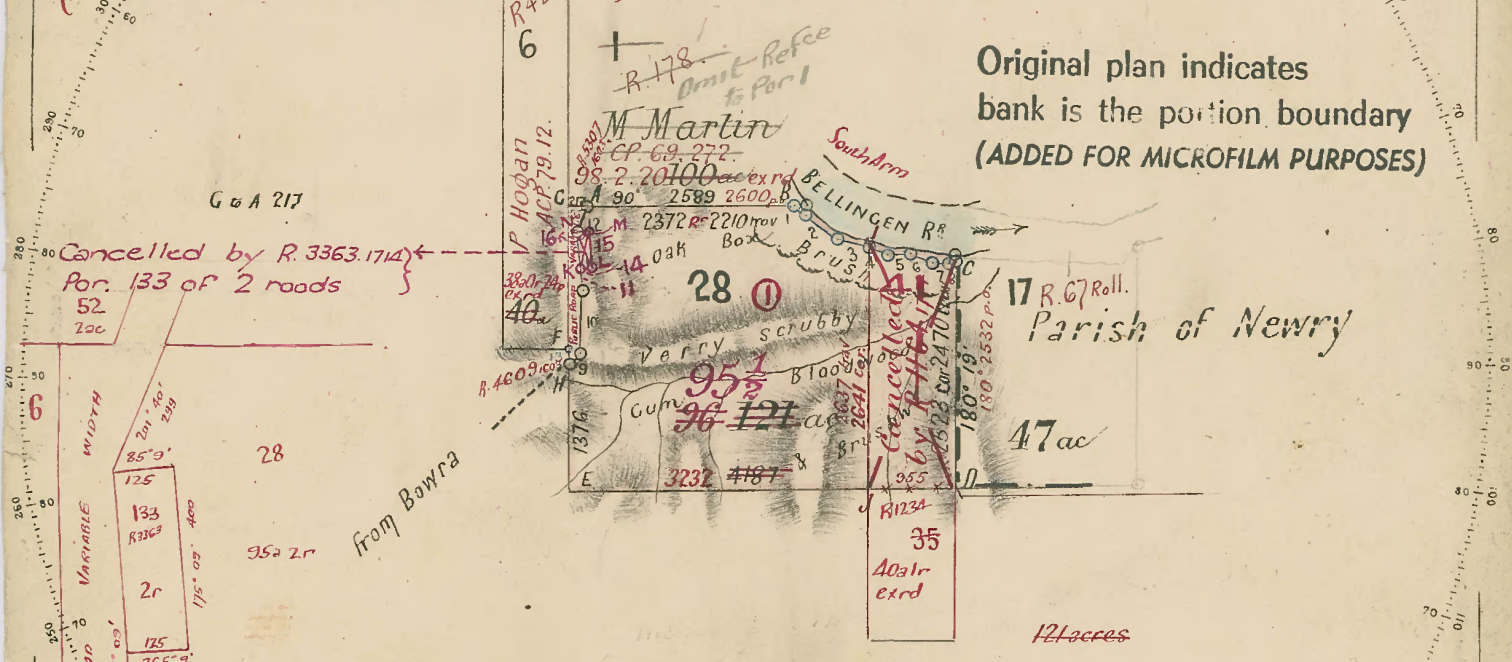
Within the Orara Gold Field Proclaimed 12th Aug 1891, partly open to Conditional Purchase.

Por. No C.P. No
Por. No C.L. No

Partly within Res. 91. Not^d 31st May. 1880.
Res: 21 Revoked 6th Feb 92

CL 97:1 by Lee, Sec 18, May 20 vide R. 1164 1714
CL 02:26 by Thomas Thornton O'Connor Sec 48 July 24th. Confirmed 11th Oct. '02. Rent £2-16/-
Approved as N^o 32521, annual rent £2-16/-, vide Gaz. 18th July 1903.

(Por 28 ACP 07.57 of 4th April Thos: Thornton O'Connor J^r now 95 ac 2r by subdivision. Sec. 257 CLC Act 1913.
Now The Commercial Banking Company of Sydney Limited Sale comp^d Sales. 34. 12021



Plan as amended approved for 36 acres
3rd August 1898 Edw. H. Bennett

District Surveyor

Re-approved for 95 ac. 2r.

[Signature]
Draftsman-in-charge
15 12 92

Compare to
B.M. 15.12.91

Azimuth taken from S. by S. 1
Field Book Vol. Folio

Reference to Corners

Corner	Bearing	From	Links	N ^o on Tree
A	187° 04'	Tallowd	44	28
B	Brushwood at cor.			28
C	0°	Stump	68	XVII 28
D	N.	oak	2	XVII
E	57° 49'	Brushd	32	28
F	331° 30'	Blackbutt	15	6
G	195° 00'	Sly. bark	12	1
H		Stake		
I	262° 30'	Gate	39	28-35
J	309° 18'	Box	13	28

Value of Improvements Nil
K, L, M, N. Numbered posts 28.133

Reference to Traverse

Line	Bearing	Distance
1	131° 49'	153
2	127° 21'	422
3	103° 12'	363.376
4	144° 36'	214
5	52° 07'	256
6	116° 39'	260
7	92° 38'	193
8	71° 04'	097
9	43° 14'	166
10	2° 31'	692
11	355° 09'	64.221
12	21° 40'	199
13	180° 00'	52
14	85° 09'	125
15	355° 09'	406
16	265° 09'	125

Scale 20 Chains to an Inch.

PLAN MICROFILMED

NO ADDITIONS OR AMENDMENTS TO BE MADE

I hereby certify that I in person made and on the 27 July 1891 completed the survey represented on this plan on which are written the bearings and lengths of the lines measured by me and I declare that the survey has been executed in accordance with the regulations published for the guidance of Licensed Surveyors and the practice of the Department of Lands.

[Signature]
Licensed Surveyor

Transmitted to the District Surveyor with my letter of 31 August 91. N^o 65

Voucher N^o 91.65 Passed £ 11.9.8. 1891
Calculation Book N^o 1518 Folio 41
Checked and Charted
Examined
Plan approved 17 Nov 1891

[Signature]
1891

R. 1020 1714

Laid before the Executive Council
on the 15th February 1872.

PLAN

95. 6881

a proposed deviation in part of the road
from Bowra to Bellingen

from a point at the South boundary of Portion 1, Parish of Gladstone Margaret Hanley's 100ac to a point on the reserved road within Portion 135, Parish of South Bellingren ^{with} Rigney's CP of 66ac ex road ^{with a loop line and a branch head} Parishes of Gladstone and South Bellingren.

COUNTY OF RALEIGH

Proposed to be opened as a Parish road under Act of Council IV. William IV. N^o 11
and to be resumed under the Crown Lands Act 53 Vict. N^o 21
Partly in lieu of parts of Road Conf^o in Gov. Gaz. 18th 1884 vol. 1854 (P. 2555. 1603)
and reserved roads shown by blue tint

Scale 10 chains to an inch

Proposed Roads 100 links wide & uneven

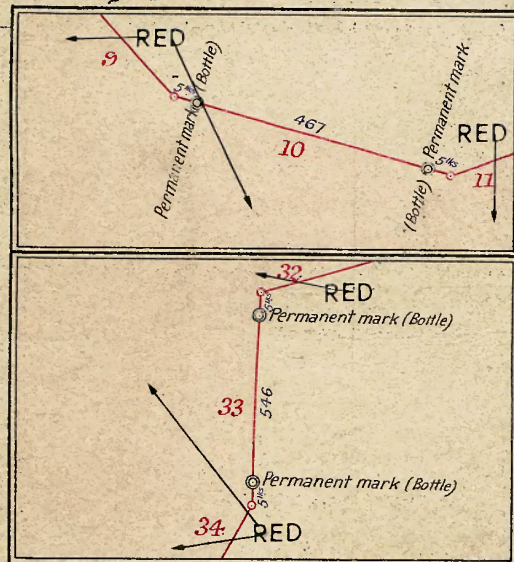
CL-D. Belling

Notes

Azimuth. Magnetic
Field Book. Vol. A.5028. Folio 91

[illegible]

Diagram of Permanent Marks



Road Traverse

Line	Bearing	Red bearing	Distance	Latitude		Departure	
				N	S	E	W
1	171° 18'	S 8° 42' E	174		171.9	26.3	
2	110° 13'	S 69° 47' E	219		75.7	205.5	
3	184° 24'	S 4° 24' N	428		426.7		52.8
4	158° 23'	S 21° 37' E	93		86.4	34.2	
5	126° 53'	S 53° 07' E	236		141.6	188.8	
6	165° 04'	S 18° 56' E	265		256.0	68.8	
7	139° 38'	S 40° 22' E	248		189.0	160.8	
8	157° 12'	S 22° 48' E	1736		1600.4	672.7	
9	138° 22'	S 41° 38' E	319		238.4	211.0	
10	105° 44'	S 74° 16' E	477		123.4	459.1	
11	70° 13'	N 70° 13' E	559	189.1		526.0	
12	132° 16'	S 87° 44' E	224		150.7	165.8	
13	152° 42'	S 27° 18' E	176		156.4	80.8	
14	135° 71'	S 44° 49' E	142		100.7	100.1	
15	156° 03'	S 23° 57' E	328		298.8	133.1	
16	112° 08'	S 67° 52' E	246		32.8	228.0	
17	158° 04'	S 21° 56' E	492		456.4	183.7	
18	145° 54'	S 34° 06' E	919		761.1	515.2	
19	54° 49'	N 54° 49' E	363	209.2		206.7	
20	70° 15'	N 70° 15' E	208	70.3		195.7	
21	144° 02'	S 55° 58' E	379		306.8	222.6	
22	181° 48'	S 1° 48' N	747		746.6		23.5
23	121° 00'	S 59° 00' E	464		233.0	397.7	
24	151° 49'	S 28° 11' E	418		368.5	137.4	
25	165° 29'	S 15° 31' E	774		749.9	184.1	
26	126° 38'	S 53° 22' E	265		158.1	212.6	
27	110° 47'	S 69° 13' E	118		41.9	110.0	
28	158° 17'	S 21° 43' E	165		153.2	57.1	
29	195° 36'	S 15° 36' N	247		237.8		66.5
30	244° 44'	S 64° 44' N	358		152.8	323.7	
31	279° 18'	N 80° 42' N	239	48.3		295.1	
32	253° 45'	S 73° 45' N	469		131.2	450.1	
33	181° 24'	S 1° 24' N	556		535.9	13.5	
34	209° 39'	S 28° 39' N	245		212.9	121.2	
35	230° 38'	S 56° 38' N	497		316.2	384.2	
36	172° 55'	S 7° 05' E	1122		1113.4	138.4	
37	227° 32'	S 47° 32' N	674		456.1	437.2	
38	248° 31'	S 69° 31' N	247		30.4	229.8	
39	176° 34'	S 3° 26' E	183		182.7	11.0	
40	232° 01'	S 52° 01' N	251		154.5	197.8	
41	179° 14'	S 0° 48' E	202		202.0	2.7	
42	245° 24'	S 65° 24' N	296		123.3	269.1	
43	192° 06'	S 12° 06' N	351		343.2	73.6	
44	270° 07'	N 89° 53' N	115	0.2		115.0	

Connections

Line	Bearing	Distance	Notes
36	172° 55'	1122	
44	270° 0'	115	to S.W. cor. for #1
45	127° 46'	270	(from cor. of res. road through for #135
46	166° 48'	3000	
47	177° 15'	592	
48	321° 48'	72	(to N.W. cor. for # LV) (Sum marked 4-corners
49	350° 21'	38	from cor. for #133, 134

"Note" { For lengths and bearings of the
Loop line and of the Branch
Road See plan p. 3181. 1603.
and p. 3222. 1603 respectively

Connections

TRACING AVAILABLE

I hereby certify that I in person made and on the 14th October 1835 completed the survey represented on this plan on which are written the bearings and lengths of the lines measured by me, and I declare that the survey has been executed in accordance with the regulations published for the guidance of Licensed Surveyors and the practice of the Department of Lands

5307-1603 *H. A. Emery* Voucher No.
Licensed Surveyor

Transmitted to the District Surveyor with my letter of the 30th November N^o 95/38

R. 5307.1603