Review of Environmental Factors

Bridge Replacement on road from Whiporie to Bungwalbin over Jacky Bulbin Creek

March 2023

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1 EXECUTIVE SUMMARY

Richmond Valley Council (RVC) proposes to replace the existing JackyBulbin Bridge, over the Jackybulbin Creek on Bungawalbin-Whiporie Road. The bridge requires replacement as the existing bridge is at risk of "catastrophic failure" (Bridge Knowledge, 2022) in future flood events. Engineering and Civil Contractors (ECC) are responsible for undertaking the design and construction of the Project, including preparing this REF and all other necessary environmental approvals. This REF is being prepared by ECC in consultation with RVC. RVC will remain the proponent for the Project and the determining authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

RVC engaged Bridge Knowledge (Oct, 2022) who identified the existing JackyBulbin Bridge as having an ongoing risk of "catastrophic failure" during future flood events as a result of damage sustained to the bridge during recent flooding events in March 2021. Therefore, a proposal was prepared for Transport for NSW Essential Public Asset Reconstruction funding to replace the bridge. Funding was granted under the NSW Disaster Recovery Funding Arrangements (DRFA).

The JackyBulbin Bridge is currently load limited to five tonnes which is impacting the continued movement and safety of tourist, freight, commercial and residential traffic in the community. Additionally, it has been identified that the location of the structure (Bungawalbin / Whiporie Rd) is utilised as a designated general access detour route should closure occur on the Summerland Way and Casino / Coraki Rd. Therefore, without replacing the existing bridge, there would be a significant impact to the connectivity of transport in the local region as well as for the local community.

Section 7 below provides an environmental assessment of the proposed Project. The outcomes of the assessment have demonstrated that, through the implementation of management and mitigation measures, the overall environmental impacts of the Project can be minimised and the impact is therefore considered low.

The key environmental impacts are summarised as:

- Removal of vegetation at the site which is characteristic of Plant Community Type 3102 *Northern Lowland Swamp Turpentine Wet Forest* which is consistent with both the *Environment Protection and Biodiversity Conservation Act 1999* listed threatened ecological community (TEC) *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and the *Biodiversity Conservation Act 2016* listed *TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Approximately 0.1334 ha of this community will be affected by the Activity.
- Impacts to habitat that potentially supports threatened fauna species
- Short term impacts to water quality in JackyBulbin Creek during construction
- Short term increase in noise and dust during construction
- Short term impact to visual amenity.

These key environmental impacts can be managed using the following:

- Removal of vegetation to be minimised as far as practical, use of flagging to delineate the project boundary to reduce the risk of inadvertent clearing is required
- Pre-clearing requirements to be undertaken by a qualified Ecologist to ensure threatened fauna is not at risk

- An Erosion and Sediment Control Plan in accordance with the Blue Book (Managing Urban Stormwater: Soils and Construction, Landcom) has been prepared (see Appendix A) and must be implemented.
- Ensure works remain within the approved working hours or are justified to occur outside of working hours.
- Ensure water sprays are used to control dust
- Ensure the work site is kept clean and free of litter, with good housekeeping.

A Fisheries Permit from the Department of Primary Industries under the Fisheries Management Act for “dredging and reclamation works” is also required for this Project.

Contents

2 Introduction

2.1 PROPOSAL IDENTIFICATION

Envirocivil Consultants Pty Ltd (Herein known as Envirocivil) has been engaged by Engineering and Civil Contractors Pty Ltd (Herein known as ECC) to prepare a Review of Environmental Factors (REF) for the proposed bridge replacement works for JackyBulbin Bridge along the Bungawalbin-Whiporie Road, in Bungawalbin, New South Wales (NSW). ECC has been contracted by Richmond Valley Council (RVC) to design and construct the new replacement bridge for JackyBulbin Bridge (herein known as the Project).

RVC proposes to replace the existing JackyBulbin Bridge, over the Jackybulbin Creek on Bungawalbin-Whiporie Road. The bridge requires replacement as the existing bridge is at risk of “catastrophic failure” (Bridge Knowledge, 2022) in future flood events. ECC are responsible for undertaking the design and construction of the Project, including preparing this REF and all other necessary environmental approvals. This REF is being prepared by ECC in consultation with RVC. RVC will remain the proponent for the Project and the determining authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

As the proposal for the Project is for the construction of a road (and bridge) and is to be carried out by RVC, within the existing road reserve it can be assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Development consent is not required under Part 4 of the EP&A Act.

The Project involves the construction of a new bridge in the same location as the existing bridge. A temporary steel bridge will be utilised adjacent to the western side of the existing bridge to provide traffic access during construction of the new bridge. The existing Jackybulbin Bridge was damaged during recent flood events in March 2021, therefore, the bridge is currently at risk of failure. A new bridge is required, as the existing bridge cannot be repaired (M.Stuart Pers Comm).

2.2 LOCATION

The Jackybulbin Bridge is located over Jackybulbin Creek on the Bungawalbin-Whiporie Road adjacent to Double Duke State Forest. Figure 1 below shows the location of the Proposed bridge replacement. Figure 2 shows the general locality of the Project within the wider region. RVC has identified the road reserve as a 21m corridor, ECC has confirmed that all works will be undertaken within this corridor and access to land outside of the corridor is not required. Should the design of the works require land acquisition beyond the Road Reserve, this will remain the responsibility of RVC and is outside of the scope of this REF.

The surrounding land is Double Duke State Forest which is Lot 82 DP755609 and private property to the south of the site which is Lot 134 DP1101708.

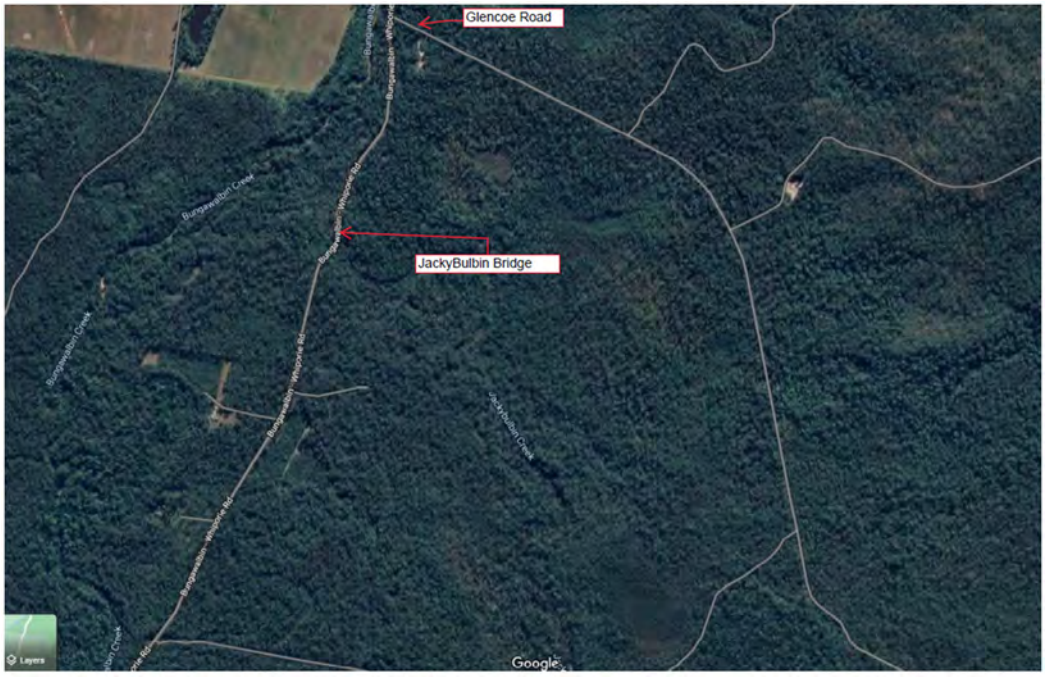


Figure 1 – Location of JackyBulbin Bridge on Bungawalbin-Whiporie Road (image from Google Maps, www.google/maps).

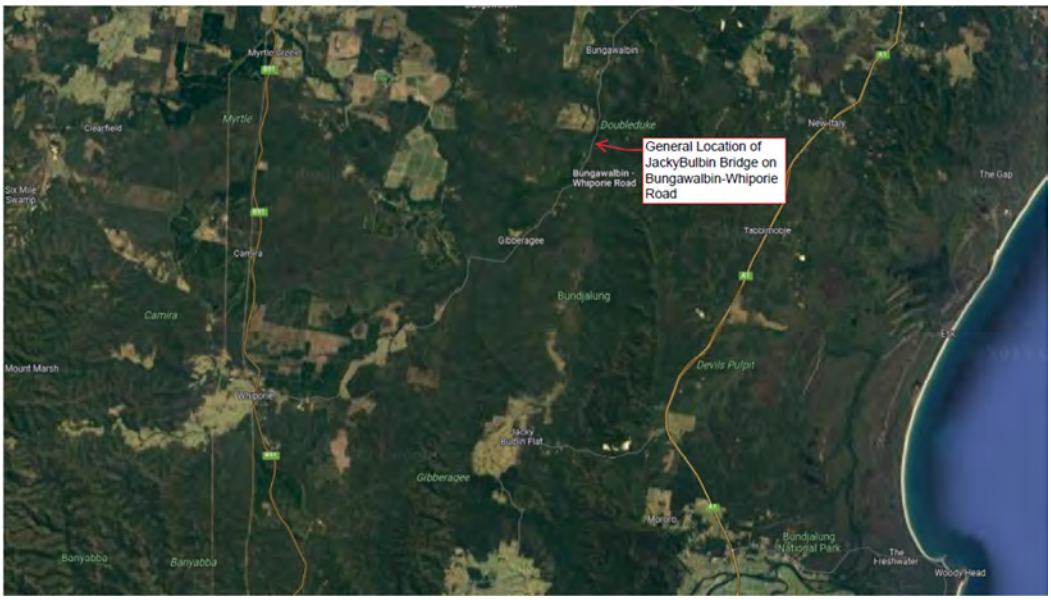


Figure 2 – General Locality of Bungawalbin-Whiporie Road in the wider Richmond Valley region (image from Google Maps, www.google/maps).

2.3 PURPOSE OF REPORT

The purpose of the REF is to describe the Project and to document the likely impacts of the proposal on the environment and fulfil the requirements of Part 5 of the EP&A Act. The document will also propose suitable and

adequate management measures to mitigate any potential impacts that the Project may have on the surrounding environment.

The description of the proposed works and associated environmental impacts have been undertaken in context of the following legislation:

- Clause 171 of the Environmental Planning and Assessment Regulation 2021
- the Biodiversity Conservation Act 2016 (BC Act) (detail provided in Appendix B)
- the Fisheries Management Act 1994 (FM Act) (detail provided in Appendix B)
- the National Parks and Wildlife Act 1974 (NPW Act) (detail provided in Appendix C)
- the NSW Heritage Act 1977 (H Act) (detail provided in Appendix D)
- the Federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (detail provided in Appendix A)

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, that RVC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for approval to be sought under Part 4 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in Section 5.5 of the EP&A Act and therefore the requirement for a Species Impact Statement/Biodiversity Development Assessment Report (BDAR).
- The potential for the proposal to significantly impact a matter of national environmental significance and the need to make a referral to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) for a decision by the commonwealth minister for the Environment on whether assessment and approval is required under the EPBC Act.

3 Need and Options Considered

3.1 STRATEGIC NEED FOR THE PROPOSAL

RVC engaged Bridge Knowledge (Oct, 2022) to prepare a concept criteria report which identified the existing JackyBulbin Bridge as having an ongoing risk of “catastrophic failure” during future flood events as a result of damage sustained to the bridge during recent flooding events in March 2021. Therefore, a proposal was prepared for Transport for NSW Essential Public Asset Reconstruction funding to replace the bridge. Funding was granted under the NSW Disaster Recovery Funding Arrangements (DRFA).

As identified by Bridge Knowledge, RVC is responsible for managing road-related transport infrastructure and providing a safe and efficient road network within the LGA. The JackyBulbin Bridge is currently load limited to five tonnes which is impacting the continued movement and safety of tourist, freight, commercial and residential traffic in the community. Additionally, it has been identified that the location of the structure (Bungawalbin / Whiporie Rd) is utilised as a designated general access detour route should closure occur on

the Summerland Way and Casino / Coraki Rd. This highlights the importance of the structure to the road network and Richmond Valley Council (Bridge Knowledge, 2022).

Therefore, without replacing the existing bridge, there would be a significant impact to the connectivity of transport in the local region as well as for the local community. It is noted that the bridge is not subject to repair due to the extent of damage to the bridge abutments (M.Stuart (ECC) Pers Comms).

3.2 PROPOSAL OBJECTIVES

The JackyBulbin Bridge Replacement Project will provide a new bridge in the location of the existing bridge. The existing bridge will be demolished. The objective of the new bridge is to provide connectivity to the community, ensure that the bridge is secure and safe for future flood events and lastly, to ensure that the bridge can carry adequate load capacity and is not limited to five tonnes.

4 Description of the Proposal

4.1 THE PROPOSAL

The existing JackyBulbin Bridge on Bungawalbin Whiporie Road currently consists of a single span Doolan deck (composite timber and concrete) type bridge founded on pad footing abutments, with an overall length of 12 metres. The bridge consists of 1 deck unit which provides a narrow bridge with a maximum width of 3.4 metres between barriers. Both approaches are asphalt sealed ranging in 4 to 5 metre formations with MASH compliant safety barriers. The asphalt sealed approaches and the structural integrity of the northern and southern headstocks of the existing bridge were significantly damaged during the recent flood events in March 2021.

The Project will be designed in accordance with the criteria provided in Section 4.2 below. The new bridge will located where the existing bridge is situated, this will require the demolition of the existing bridge prior to the commencement of the new bridge construction. A temporary steel bridge will be utilised to the west of the existing bridge (within the road reserve) during construction to allow the continuous flow of traffic. The temporary steel bridge is shown in Figure 4 below and does not require any footings within the creek itself.

Plate 1 below shows the general location of the southern bridge approach along the existing Bungawalbin Whiporie Road, works will be required to utilize the temporary steel bridge during construction between the existing road and the Project Boundary.

Plate 2 shows the proposed ancillary area for laydown, shipping container and equipment storage.

Plate 3 shows the location of the temporary steel bridge and northern abutment looking north.

Plate 4 shows the location of the temporary steel bridge and southern abutment looking south.

Plate 5 shows the location of the northern project extent and the existing road looking north.

Figure 3 shows the general works footprint and the proposed Project Boundary.

Plate 1 – Southern approach to existing/new bridge looking north

Plate 2 – Proposed laydown area

Plate 3 – Temporary steel bridge location – looking north

Plate 4 – Temporary steel bridge location – looking south

Plate 5 – Northern Project boundary extent – looking north

Figure 3 – General Project Footprint (google maps www.google/maps).

4.2 DESIGN CRITERIA

RVC has provided ECC with criteria for the design and construction of the replacement JackyBulbin Bridge in tender document “Part 3 – Specification, Request for Tender” which was issued on the 11th July 2022. The criteria provided in the request for tender documents is stated below.

The bridge site is in a flood plain and the design should incorporate consideration to future flood immunity and resilience. The damage requires the bridge to be replaced with a concrete structure compliant to AS 5100.5.2017 Bridge Design. The following was also required in the specification tender documentation:

- Undertake a hydraulic assessment to see if a relieving culvert is required on the northern approach and attain what scour protection is required (No longer required).
- Construct a single lane side track on the western side of the bridge (where the creek narrows in) using the option of the existing bridge. The side-track will need to be designed and constructed in a manner that is suitable for all general access vehicles to traverse the site during the construction phase of the project. Plans will need to be provided as part of the construction documentation. (No longer required as a temporary steel bridge will be utilised to provide traffic movement whilst construction is underway).
- Demolish and dispose existing timber abutments and any unwanted materials.
- Construct a new concrete bridge with approach slabs tying into existing road alignment. The new bridge will need to be slightly increased in height and length to ensure the underside of the bridge matches the existing, this will also improve road alignment, flood immunity and existing watercourse width. The new bridge will need to be 14m long, 4.5m wide between safety barriers, with 2-metre-high abutments and wing walls around 3m in length. The concrete structure must comply with AS5100 and be supported on piles with design compliant to AS 2159 (and aligned to recommendations in the geotechnical report).
- Reconstruct the pavement with TfNSW specification material to suit the new bridge height and alignment (approximately 20m either side tying into non damaged pavement), rock amour table drains and batters. Pavement works are to be designed and constructed to TfNSW specifications (3051, R75, R106 and R141).
- Road safety barriers will need to be removed and reinstated to suit the new structure. Road safety barriers will be designed to AS3845 meeting current MASH standards and are to be a propriety safety barrier product approved by TfNSW.
- Consult with a guardrail contractor on whether the guardrail can be reused or requires full replacement. The safety barrier needs to be a propriety product (MASH Standards) approved by TfNSW.
- Stabilise the southern western embankment slip as per geotechnical recommendations.

During post tender review, ECC was advised by RVC that the installation of a single lane sidetrack on the western side of the bridge was no longer required as ECC was to utilise a temporary steel bridge which would be placed to the western side of the existing bridge alignment to cater for local traffic during construction. ECC will undertake minor earthworks to place concrete blocks underneath each of the abutments for the temporary bridge and will ensure that a temporary track is formed for the northern and southern approaches to the temporary bridge. Figure 4 below shows the temporary steel bridge and how it will be set up on site.

The following table was extracted from the Bridge Knowledge (Oct, 2022) document which provides the design criteria for the new proposed replacement bridge.

Table 1 – Excerpt from Concept Criteria Report (Bridge Knowledge, Oct 2022).

Element	Key Criteria	AS5100 Reference
Bridge width	Single lane with 4.2 - 4.5m between face of barriers	AS 5100.1:2017 Section 13.4 Road bridge carriageway widths
Shoulder width	600mm	AS 5100.1:2017 Table 13.5
Lane width	1 x 3.0 – 3.3 m lanes	AS 5100.1:2017 Section 13.4 Road bridge carriageway widths
Longitudinal grade	Level	N.A.
Cross fall	2.0% crown	N.A.
Design vehicle loads	Australian Standard 5100 Bridge Design code (2017)	AS 5100.2:2017 Section 7 Road Traffic SM1600
Road Traffic Barriers Performance Level	Low performance	AS 5100.1:2017 Section 14 Road Traffic Barriers and Appendix A (of Standard)
Durability	Likely B1*	AS 5100.5:2017 Table 4.3
Design Life	100 Years	AS 5100.1:2017 Section 8.2 Design life

As this site is damaged from a natural disaster event and part of an EPAR Disaster Claim, under the NSW Natural Disaster Essential Public Asset Restoration Guidelines Council is bound to comply with the Guidelines. Any variations or scope changes will require Transport for New South Wales and Resilience NSW approval.

Once construction commences, the construction phase is anticipated to take 16-20 weeks to complete.

4.3 CONSTRAINTS

There are a number of constraints that have been identified in the tender documentation. The key constraints are summarized as:

1) The site is subject to flooding. The Project works are scheduled to take place during what would be considered the dry season, therefore the risk of flooding during construction has been reduced. The design is to consider enhanced flood immunity (as stated in Section 4.2 above) by slightly increasing the height of the new bridge.
2) The geotechnical report identified a slip plane of erosion in the existing creek bank on the south western side of the existing bridge. ECC are to ensure that this has been stabilized in the permanent design and adequate scour rock has been accounted for to protect the permanent bridge abutments.
3) The works are within the Road Reserve, however adjacent to the Road Reserve in this location is State Forest land. Should the works require access to State Forest Land, this would require land acquisition which is the responsibility of RVC. Also, it has been identified that the State Forest Land is subject to

Native Title under the Native Title Act 1993 which has not been extinguished. Appropriate consultation with the relevant indigenous parties may be required by RVC.

4.4 CONSTRUCTION ACTIVITIES

Construction activities will be undertaken by ECC in accordance with their Integrated Project Management Plan which includes environmental management measures. The Integrated Management Plan includes a Construction Environmental Management Plan which has been prepared for this Project. This will be provided to RVC prior to the commencement of construction.

4.5 WORK METHODOLOGY

The replacement bridge works will be undertaken generally in accordance with the steps below:

1) Initial clearing of the vegetation within the construction works footprint (see Figure 3 for details on the construction works footprint);
2) Removal and stockpiling of topsoil and any soil material that is not deemed suitable for construction in accordance with relevant engineering specifications.
3) Localised earthworks to allow the placement of concrete blocks for the temporary bridge abutments, placement of the temporary steel bridge, localized earthworks to create a track to and from the temporary bridge to the existing Bungawalbin Whiporie Road.
4) Demolition of the old bridge and stabilization of the creek banks (as required);
5) Installation of sheet piles and temporary works parallel to the location of the bridge abutments within the creek line;
6) Excavation of the abutments in accordance with the relevant engineering specification and design requirements;
7) Installation of 3 steel driven piles per abutment;
8) Installation of pre-fabricated steel abutment formwork on concrete blinding layer to tie into the steel piles;
9) Backfill of abutments using suitable site-won or imported material in accordance with the relevant specification (if the backfill material is not site-won, it will be imported from a suitable quarry or site approved by RVC);
10) Completion of scour protection and removal of sheet piles before landing of deck units;
11) Installation of pre-fabricated steel bridge deck;
12) Concreting of bridge deck;
13) Earthworks to ensure that both approaches to the bridge deck are at the correct level and to allow for the appropriate road geometry;
14) Application of a 14/7mm double seal on road on either side of the bridge for 20m either side of the new bridge;
15) Installation of road furniture and safety barriers;
16) Site clean up and removal of erosion and sediment controls.

Figure 4 – Temporary steel bridge set up that will be utilised during construction

4.6 PLANT AND EQUIPMENT

The following plant and equipment may be required to complete the construction works (other plant and equipment may be required that is not listed below):

- 25 tonne Excavator and attachments
- 25 tonne Excavator and attachments
- 5 tonne excavator
- 5 tonne excavator and attachments
- Pile driving excavator
- Tip Truck
- Air compressors and generators (diesel and petrol)

- Temporary steel bridge structure and concrete blocks
- Toilet
- Skid Steer loaders
- Roller
- Grader
- Water cart
- Handheld equipment
- Concreting equipment and handtools
- Vibrating plates
- Spray seal team

4.7 EARTHWORKS

Earthworks will be required to facilitate the construction of both of the abutments for the replacement bridge. Approximately 200m3 (bank cubic metres) of material will be removed from the bank of the creek on either side of the channel (approx.. 100m3 bank cubic metres from each abutment) to allow the placement of the pre-fabricated steel abutment. The abutments will then be backfilled with appropriate backfill material that meets engineering specification requirements sourced from MacLennan's Quarry north of Grafton.

Minor earthworks are also required to ensure that the bridge approaches are at the correct level with the new bridge and to ensure that the road geometry of the design is met. A minor quantity of spoil may need to be removed to achieve the correct road level and imported material may also be brought to site to ensure the material used will meet the engineering specification requirements. Imported material will likely be sourced from MacLennan's Quarry north of Grafton.

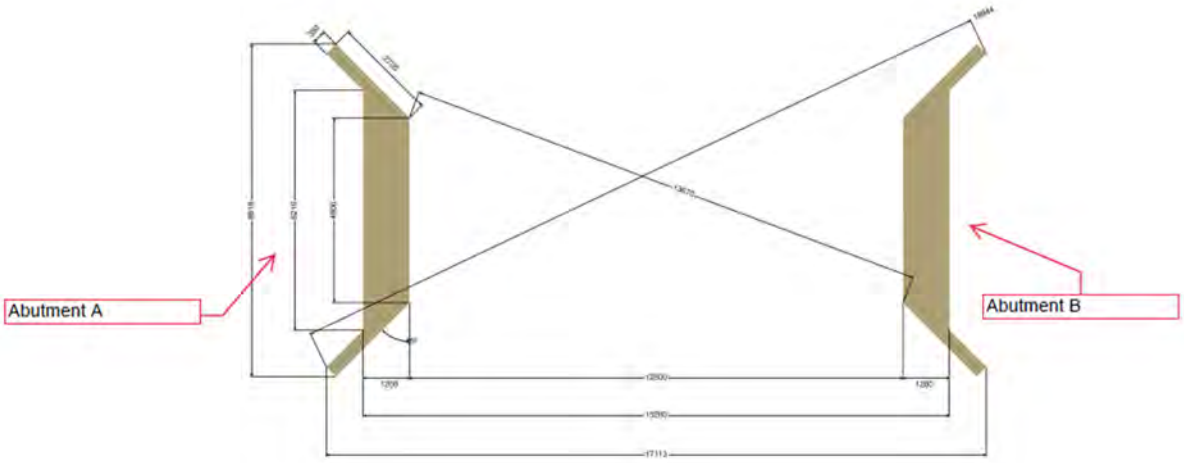


Figure 5 – Concept design showing dimensions of abutments (plan view)

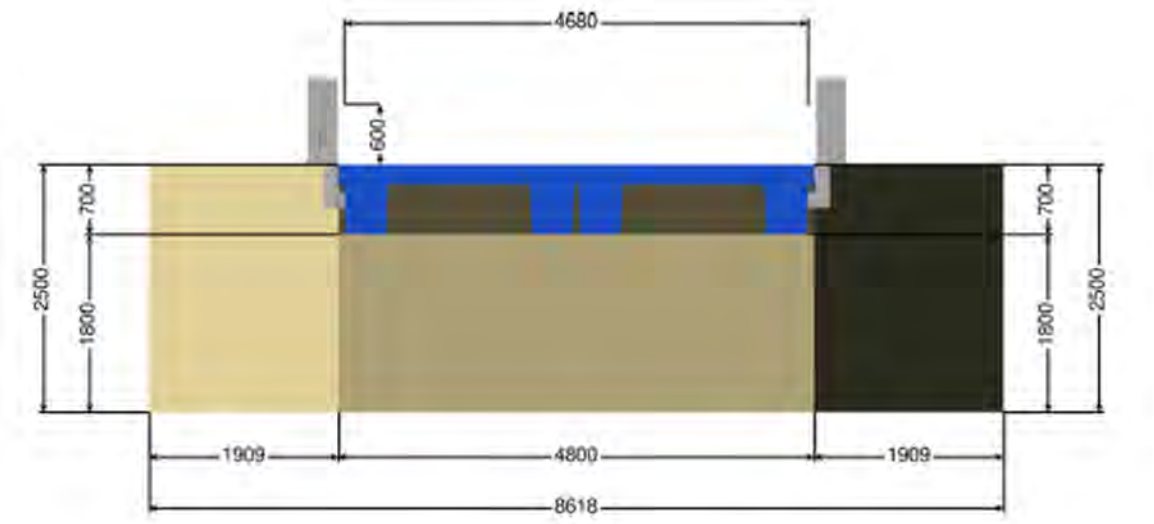


Figure 6 – Concept design showing dimensions of abutments (cross section view)

Appendix A includes Concept Design drawings for the Proposed new bridge construction.

Only minor earthworks and shaping of the existing creek bank is required for the placement of the temporary steel bridge. ECC is estimating less than 20m3 of material will require removal/replacement for the temporary bridge.

4.8 SOURCE AND QUANTITY OF MATERIAL

The source of material used for the construction of the bridge will be site-won material from within the Road Reserve, or material imported from MacLennan's Quarry north of Grafton

Approximately 200m3 of imported material is required for the bridge abutments. An additional 200m3 may be imported to establish the bridge approaches and provide material that meets the required engineering specification.

Rock that is suitable for use as scour protection will also be imported from MacLennan's Quarry north of Grafton for use to protect the bridge abutments and slip plane.

4.9 TRAFFIC MANAGEMENT AND ACCESS

The temporary steel bridge will be utilised during the construction period, therefore access will remain unhindered. There will be a small period of time in which the Bungawalbin Whiporie Road is reduced to one lane to allow for the temporary bridge specifications and the speed limit will also be reduced to 20km/h over the bridge itself, however this only be for the duration of construction. Traffic and access are further discussed in 7.2 below.

4.10 WORKING HOURS

Normal construction working hours will apply to this Project which are Monday-Friday: 7am to 5pm. Saturday: 8am to 1pm. Sunday and Public Holidays: no work. Should works be required outside of these hours, the work should not create any audible noise at the closest sensitive receiver. If work will create audible noise, the sensitive receiver should be notified of the activity. Section 7.6 below discusses the impact of noise on the local community.

4.11 ANCILLARY FACILITIES

Ancillary areas such as a stockpiling area and laydown area will be provided within the Road Reserve as shown on Figure 3 on existing disturbed ground. A construction compound is not required for this site.

The ancillary area occupied as part of the project will be kept in tidy condition. Any hazardous material such as fuel and oils will be stored and kept under lock with appropriate material datasheets in accordance with regulations applicable to each substance and prescriptive SWMS for all activities relating to project works will be completed.

Stockpiled spoil and topsoil will have adequate erosion and sediment control measures installed.

4.12 PUBLIC UTILITY ADJUSTMENT

The proposal does not require the adjustment or relocation of any public utilities. All public and private infrastructure in the area affected by the proposed works such as roads, driveways, fences, services will be maintained, protected and or re-instated as required.

4.13 PROPERTY ACQUISITION

The Project is within the Road Reserve and no property acquisition is required.

5 Statutory and Planning Framework

5.1 STATE ENVIRONMENTAL PLANNING POLICIES (SEPP'S)

5.1.1 STATE ENVIRONMENTAL PLANNING POLICY (TRANSPORT AND INFRASTRUCTURE) 2021

In accordance with Division 17, Subdivision 1, Clause 2.109 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure), states:

"Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land".

As the proposal is for the construction of a road and is to be carried out by RVC, within the existing road reserve it can be assessed under Part 5 of the Environmental Planning and Assessment Act 1979. Development consent from council is not required.

The SEPP (Transport and Infrastructure) sections below are also applicable:

- Division 17, Subdivision 1, Clause 2.109 (3 (c)) allows for alterations or additions to an existing road (such as widening, duplication or reconstruction of lanes, changing the alignment or strengthening of the road) without development consent.
- Division 17, Subdivision 1, Clause 2.109 (3 (d)) allows for environmental management works, if the works are in or adjacent to a road corridor without development consent.
- Division 17, Subdivision 1, Clause 2.109 (3 (a(i))) allows for construction works including temporary buildings or facilities for the management of construction, if they are in or adjacent to a road corridor without development consent.

5.1.2 STATE ENVIRONMENTAL PLANNING POLICY (BIODIVERSITY AND CONSERVATION) 2021

The land use zoning for the location of the Project is RU-3 Forestry for the immediate vicinity of the project works and RU1 – Primary Production to the immediate south of the Project. Part 3.2 of the SEPP (Biodiversity and Conservation) covers Koala Habitat Protection which applies to this land. Section 7.1 below discusses whether the vegetation within and adjacent to the site can be considered “core koala habitat” in accordance with Section 3.7 of the SEPP (Biodiversity and Conservation).

5.1.3 STATE ENVIRONMENTAL PLANNING POLICY (RESILIENCE AND HAZARDS) 2021

Chapter 2, Division 3 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP (Resilience and Hazards), Clause 2.10 includes provisions for development on land within a coastal environment area. The Project site is mapped as “Coastal Environmental Use”, “Coastal Environmental Area” and within the “Land Application Area”.

SEPP (Resilience and Hazards), Clause 2.10 requires that development consent must consider whether the proposed development is likely to cause an adverse impact within Coastal Environmental Areas, to the:

(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 of the SEPP (Resilience and Hazards),
(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.

Clause 2.11 of the SEPP (Resilience and Hazards) requires that development consent must consider whether the proposed development is likely to cause adverse impact within the Coastal Use Area, to the:

(a) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
(b) overshadowing, wind funneling and the loss of views from public places to foreshores,
(c) the visual amenity and scenic qualities of the coast, including coastal headlands,
(d) Aboriginal cultural heritage, practices and places,

(e) cultural and built environment heritage, and

Clause 2.12 of the SEPP (Resilience and Hazards) requires that development consent only be granted if the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land.

Clause 2.13 of the SEPP (Resilience and Hazards) requires that development consent only be granted if the consent authority has considered the relevant provisions of any certified coastal management program that applies to the land.

RVC is currently preparing the Richmond River Estuary Coastal Management Program (CMP), the Stage 1 Scoping Study is currently being prepared and is the first of five stages of the CMP development. The Coastal Zone Management Plan for the Richmond River Estuary (CZMP) is currently in place.

Due to the nature, scale and extent of this proposal, it is unlikely to cause increased risk of coastal hazards on this land or other land. The CZMP includes management measures to protect the Richmond River Estuary and Coastal areas. The management measures relevant to this proposal include climate change which could see an increase in sea levels and increase in adverse climatic conditions. Climate change is discussed further in Section 7.12 below and is unlikely to be a risk to this Project. Secondly, erosion of the estuary bed and banks can cause significant impact to water quality and aquatic habitat. The erosion hazard of the existing creek bank will be rectified as required by the design specifications.

5.2 LOCAL ENVIRONMENTAL PLANS

The Richmond Valley Local Environmental Plan 2012 (LEP) applies to the proposed Project site. The proposal is within the road reserve which is surrounded by land zoned as RU-3 Forestry and RU-1 Primary Production to the south.

LEP mapping shows that the site does not have a risk of Acid Sulphate Soil. The proposal does require works over Jackybulbin Creek which is mapped as having Key Fish Habitat upstream of the proposal site (See Figure 7 below). The proposal site does not have any mapped heritage items or conservation areas. The proposal site is also mapped as having biodiversity significance. The management of biodiversity is discussed in Section 7.1 below. Further discussion regarding the implications of key fish habitat are discussed in Section 5.4 and 7.1 below.

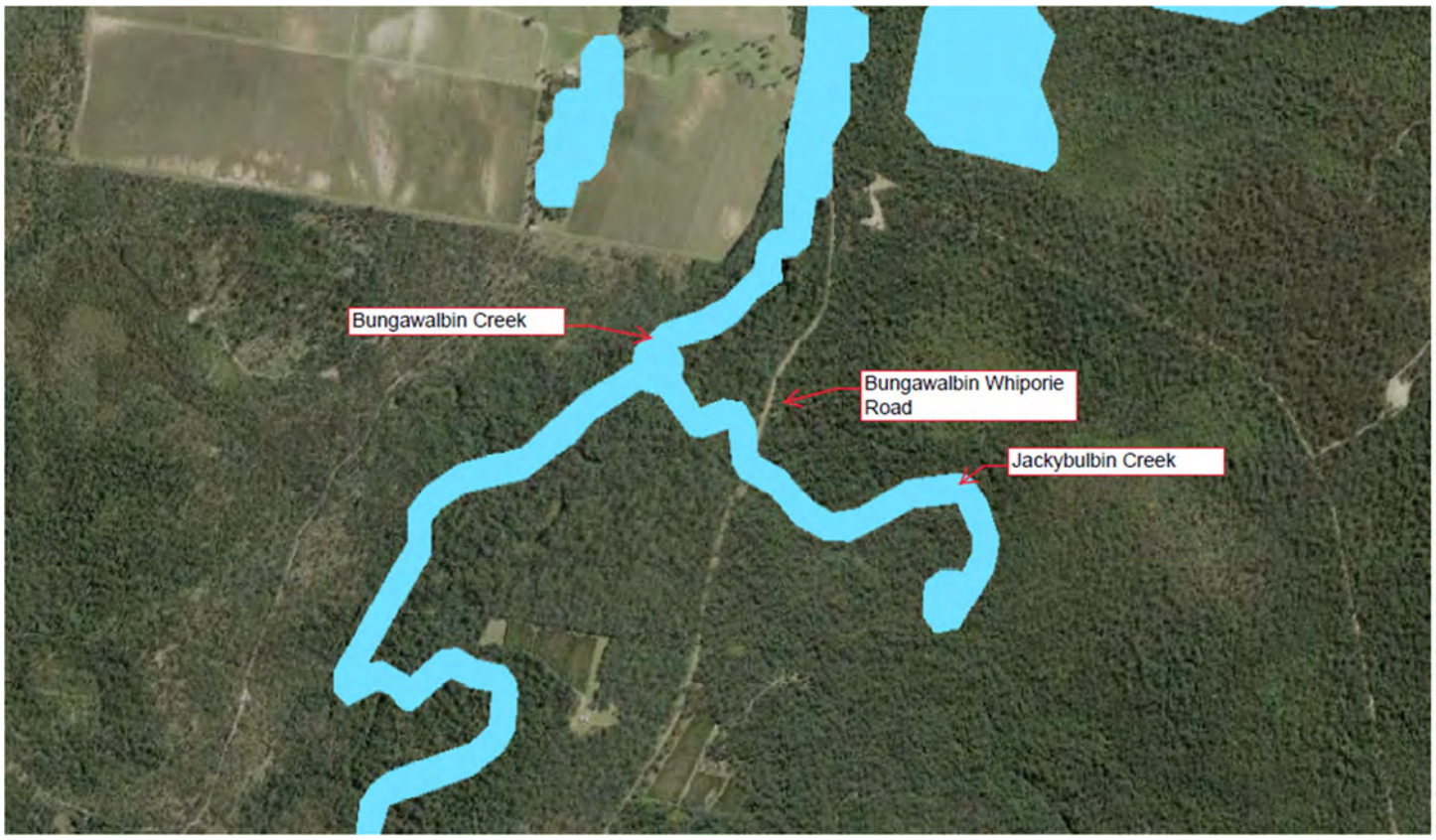


Figure 7 – Key Fish Habitat mapping (shown in Blue).

5.3 COMMONWEALTH LEGISLATION

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.

These are considered in Appendix B and are discussed further in Section 7.1 below.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Accordingly, the proposal has not been referred to the DCCEEW.

An EPBC Act (DCCEEW) Protected Matter Report is provided in the Biodiversity Assessment Report in Appendix B. The proposed works are unlikely to impact upon any item listed in this report.

5.4 FISHERIES MANAGEMENT ACT 1994

The Department of Primary Industries, Fisheries NSW Spatial Data Portal shows that JackyBulbin Creek, in the vicinity of the proposal site is mapped as Key Fish Habitat. JackyBulbin Creek is also mapped as “good” freshwater fish community status.

Under Division 3, Clause 200 of the Fisheries Management Act 1994 (FM Act) a local government authority must not carry out dredging or reclamation work except under authority of a permit used by the Minister. A Fisheries Permit for this activity will be required under this Clause, as well as consultation with the Department of Primary Industries.

Under Division 12, Clause 221ZU, Development, or an activity is likely to significantly affect threatened species if is it likely to significantly affect threatened species, populations or ecological communities, or their habitats, or is carried out in critical habitat. Although the site is mapped as Key Fish Habitat, the proposal will not impact on aquatic threatened species, populations of ecological communities or their habitats and is also not within critical habitat. Clause 221ZV includes provisions for determining if any activity will likely significantly impact threatened species, populations or ecological communities. The proposal will not trigger any of the determining factors provided in Clause 221ZV, therefore a Species Impact Statement under Clause 221ZX is not required.

The Policy and guidelines for fish habitat conservation and management (2013 update) include a new definition of “key fish habitats”. Key fish habitat is not defined in the FM Act, however it is the objective of the DPI to protect key fish habitats. Section 3.2.1 of the Guideline defines Type 1, 2 and 3 Key Fish Habitat. It is likely that Jackybulbin Creek is consistent with Type 3 key fish habitat.

5.5 ASSET OWNER APPROVALS

Richmond Valley Council is the asset owner of the bridge infrastructure and has engaged the services of ECC to design and construct the bridge replacement works subject to approval of REF and DPI Fisheries permit requirements.

5.6 CONFIRMATION OF STATUTORY POSITION

All relevant statutory planning instruments have been examined above and the proposal does not require approval under Part 4 of the EP&A Act. A species impact statement is also not required.

Therefore, assessment and determination in accordance with Part 5 of the Act is appropriate for the proposal.

6 Stakeholders and Community Consultation

6.1 CONSULTATION STRATEGY

RVC will manage the consultation with adjoining landholders in accordance with the “Addendum to Tender #1” document issued on the 27th July 2022 by RVC.

In accordance with the tender documents, Section 5.4 of “Part 3 – Specifications” requires ECC to seek advice from the Department of Primary Industries (DPI) to confirm if a Fisheries Permit is necessary and obtain the same if required. The result of this consultation and requirement for a permit is discussed in Section 5.4 above.

Section 12 of the “Part 3 – Specifications” tender document advises that the Principal (RVC) will advertise the Project in the local weekly paper or an alternative media format prior to the commencement of work. The Principal may also provide updated electronic notification on the Councils notification page or other media platform of regular program updates provided by ECC.

Where a property is likely to be impacted by the work (vehicular access, fence/tree removal, extended periods of noise, excavation, etc) or a business interrupted, the Contractor shall give that property at least 7 days notice in writing to the property owner or occupier, giving details of the estimated date of commencement and duration of the work, brief description of the works and impacts, hours of works that interruption may be experienced and ways the resident can assist during the nominated timeframe.

Such notices shall be additional to any prepared by RVC and shall state the duration of the work in the particular property and the name and telephone number of the Contractor's representative. Notice of entry as specified above shall also state which fences are to be temporarily removed or cut and, where such fences are on the property boundaries, shall be sent to both adjoining owners and occupiers. Council can assist with providing liaison with affected property owners.

It is unlikely that the Project will impact on Private Property and therefore, it is unlikely that notification to local landholders or business owners will be required. Access to Private property and/or business is also unlikely to be impacted by the works. There is no requirement to remove or relocate boundary fencing during the Project works.

ECC will be responsible for managing any community complaints received regarding the work, including providing an adequate and timely response to any issues raised in a courteous manner.

6.2 ABORIGINAL COMMUNITY INVOLVEMENT

The proposal site is located adjacent to State Forest Land on which the Native Title has not been extinguished. The Bandjalang People #2 have registered interest in the Double Duke State Forest Land. As stated in the tender documentation (and confirmed M.Stuart pers comm), RVC will be responsible for consulting with all relevant Indigenous communities in relation to this Project and any impacts it may have on a future Native Title claim.

6.3 STATE CONSULTATION

As identified in Section 5.4 above, a Fisheries Permit is required for dredging and reclamation works within the JackyBulbin Creek bed and banks. Consultation with the Department of Primary Industries is required to obtain the permit.

No further state government consultation is triggered by the SEPP's.

As the work is adjacent to State Forest land, RVC may seek to consult with Forestry Corporation of NSW regarding the works.

6.4 GOVERNMENT AGENCY AND STAKEHOLDER INVOLVEMENT

The NSW government has arranged financial support for communities undergoing recovery from the impacts of natural disasters under the Disaster Recovery Funding Arrangements. RVC has applied for funding under the NSW Natural Disaster Essential Public Asset Restoration Guidelines (Oct, 2018) to complete the JackyBulbin Bridge replacement works. RVC is responsible for undertaking consultation with the NSW government in relation to the Natural Disaster Recover Funding.

6.5 ONGOING OR FUTURE CONSULTATION

The Bungawalbin Whiporie Road is part of the Northern Rivers Buses school bus service route. Therefore, it is important for ECC to maintain access through the Bridge site, particularly during bus service times. Any impacts to the bus service would require extensive consultation with both RVC and Northern Rivers Buses to ensure school services are not impacted.

The Project site is located in the vicinity of private property to the south of the site. RVC may seek to consult with residents and landholders that are adjacent to the site to advise that the works are commencing. This is discussed further in Section 6.1 above.

7 Environmental Assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the Guidelines for Division 5.1 assessments (Department of Planning and Environment, NSW, June 2022) and Clause 170 and 171 of the Environmental Planning and Assessment Regulations 2021. The environmental factors considered from Table 1 of the Guidelines are summarized in Appendix E.

Site specific management and mitigation measures are provided to ameliorate the identified potential impacts.

7.1 ECOLOGY AND BIODIVERSITY

7.1.1 EXISTING ENVIRONMENT

A qualified Ecologist from Geolink Consulting Pty Ltd was engaged to undertake a Biodiversity Assessment of the proposal site. A full Biodiversity Assessment Report is provided in Appendix B which provides more detail on the aspects summarized below.

A field assessment was undertaken to determine the potential impacts of the Project on flora and fauna communities. The results of the field assessment are summarized below:

Results of field assessment are as follows:

- No threatened flora species were recorded at the site.
- Vegetation at the site is characteristic of Plant Community Type 3102 *Northern Lowland Swamp Turpentine Wet Forest* which is consistent with both the *Environment Protection and Biodiversity Conservation Act 1999* listed threatened ecological community (TEC) *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and the *Biodiversity Conservation Act 2016* listed *TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Approximately 0.1334 ha of this community will be affected by the Activity.
- Jacky Bulbin Bridge supports low-quality potential opportunistic microbat roost habitat. No microbats or evidence of use by microbats was recorded within the bridge.
- The site provides suitable habitat for a range of locally occurring fauna species including threatened fauna.

The presence of weeds throughout the groundcover of the site was also noted. No priority listed species under the Biosecurity Act 2015 were recorded at the site, however EEC has a General Biosecurity Duty to manage the weed species:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Occasional browse and refuge trees species suitable for Koala occur at the site. The preferred Koala feed tree, Forest Red Gum, occurs adjacent to the site but not within the site and no preferred Koala feed trees will be impacted by the Activity.

7.1.2 CRITERIA

The BC Act requires a test of significance (five-part test) when assessing whether an action, development or activity is likely to significantly affect threatened species, ecological communities or their habitats. Based on the potential for several threatened fauna species to occur at the site and that lowland rainforest is present, tests of significance have been completed (refer to Biodiversity Assessment Report provided in Appendix B). The tests of significance concluded that threatened species/ Subtropical Coastal Floodplain Forest TEC would be unlikely to be significantly affected by the Activity.

7.1.3 POTENTIAL IMPACTS

The following potential direct and indirect impacts on Biodiversity from the proposal include:

- Direct removal and trimming of branches of 0.1334 ha of native riparian vegetation from *PCT 3102 Northern Lowland Swamp Turpentine Wet Forest*, including removal of 23 native trees (refer to Figure 8 and Table 5.1 of Appendix B for detailed tree removal identification):
    - 9 x Swamp Turpentine
    - 5 x Weeping Lily Pily
    - 1 x Willow Bottlebrush
    - 1 x Blackwood
    - 2 x Water Gum
    - 2 x *Angophora woodsiana*
    - 3 x Grey Ironbark
- Direct removal of vegetation (approximately 0.1334 ha) including trimming of branches from EPBC Act listed TEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and BC Act listed TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Removal of 0.1334 ha represents ~ 0.0014 percent of the overall mapped area for this community within the locality (9,067 ha within 10 km radius of the site) as per NSW SVTM.
- The Activity will impact a small area (approximately 60 m2) of Jackybulbin Creek banks as part of bridge abutment construction works (as potential breeding and foraging habitat for Giant Barred Frog).

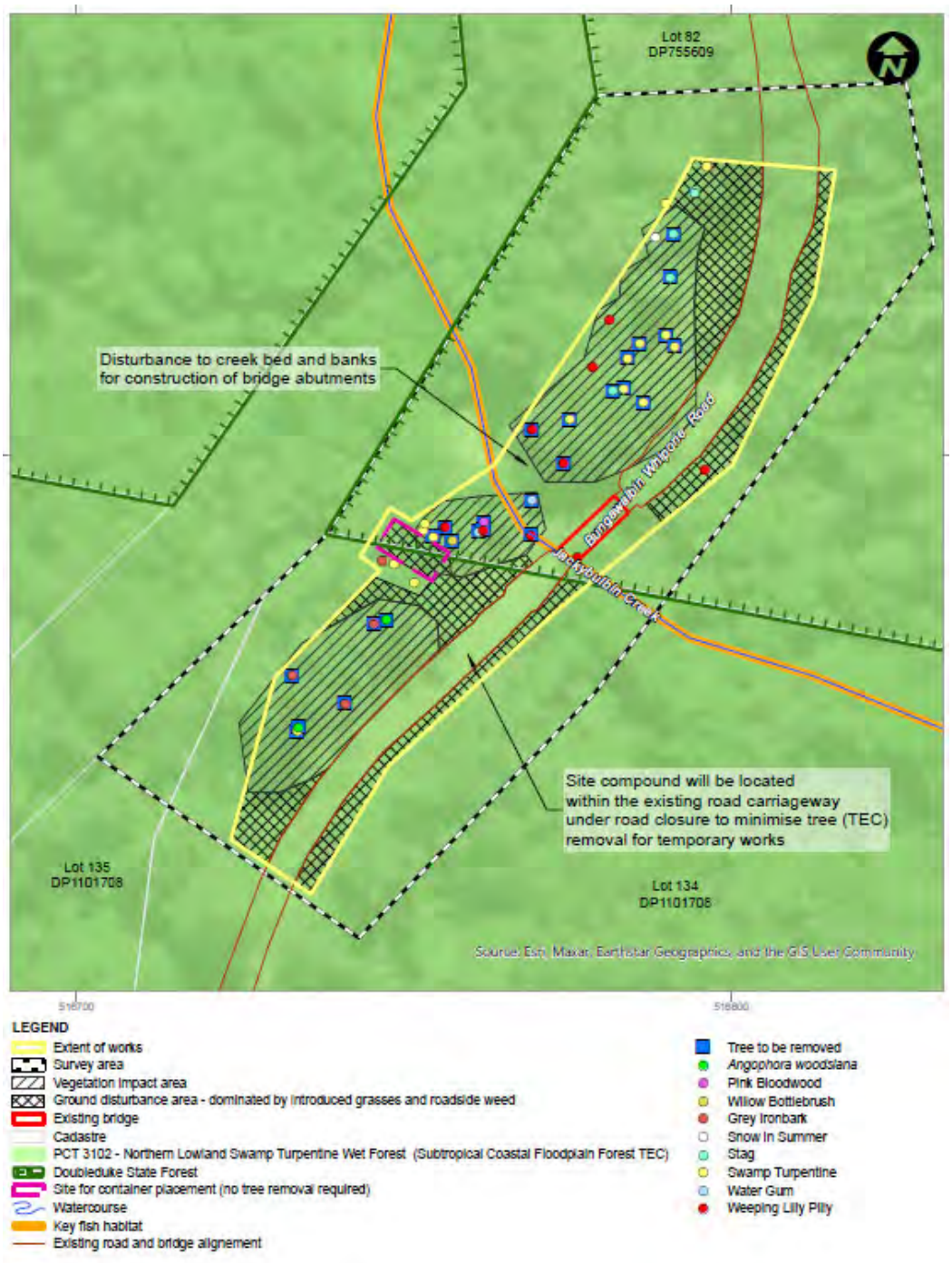


Figure 8 – ***Location of trees to be removed for the proposal.***

- Removal of the existing bridge structure directly impacts potential low-quality opportunistic threatened microbat habitat. However, due to the minimal roost opportunities (cracks, crevices), higher light levels, lack of evidence of use and absence of microbats, the bridge is not considered to be breeding or important habitat for microbats within the locality.

- No primary Koala feed trees as outlined in the Richmond Valley Koala Habitat Atlas will be impacted by the Activity. However, the site is part of the Banyabba Area of Regional Koala Significance (DPIE, 2020) and BioNet records show Koala activity within the locality. A Review of Koala Tree Use Across NSW (OEH, 2018) documents Grey Ironbark and Swamp Turpentine as 'documented irregular use' and Acacia species as 'documented low use' within the Richmond Valley LGA for the North Coast Koala Management Area. All other species are not recorded as use trees and no high or significant use trees for Koala will be impacted by the Activity.
- Direct mortality or injury to fauna during tree removal or ground disturbance.

Indirect impacts may include:

- Minor temporary impacts on water quality within the waterway from potential sediment runoff during installation of driven piles.
- The potential introduction or spread of pathogens (Chytrid) via introduction from plant and equipment.
- Habitat degradation of adjacent habitat due to potential clearing phase impacts (e.g. erosion and sedimentation impacts or chemical spills).
- Edge effects degrading habitat adjacent to the site. This impact is unlikely to be detrimental to the habitat value of adjacent habitat for a range of species given the location of the site within the road reserve (thus subject to existing edge effects).
- Unintentional damage to adjacent habitat during clearing.

Impacts are relatively low in a local context and may be managed with a relatively high confidence such that biodiversity impacts may be minimised with the implementation of management and mitigation measures provided in Section 7.1.4.

7.1.4 MANAGEMENT AND MITIGATION MEASURES

An experienced Ecologist has provided the following recommendations as management measures to minimise the impact this Proposal may have on Biodiversity including:

1. Removal of native vegetation will be kept to the minimum required to complete the Activity (refer to Figure 8 and Table 5.1 of Appendix B for indication of vegetation/ tree removal required).
2. Prior to works commencing and where it is safe to do so, the limit of work and clearing limits will be marked in the field, as per Figure 8 using flagging or similar.
3. Parking of vehicles and storage of plant/ equipment will occur on existing paved or compacted areas. Where this is not possible, vehicles and plant/ equipment will be kept away from environmentally sensitive areas (close to the river) and outside the dripline of trees to be retained.
4. A pre-clearing survey will be undertaken daily by a suitably experienced ecologist or appointed environmental representative for fauna (including Giant Barred Frog) or habitat features including Ringtail Possum dreys or active bird nests prior to vegetation (including branch) removal or disturbance to the river banks.
5. An experienced ecologist or spotter catcher will be present on site during the felling of habitat trees, including nests and dreys should they be detected during pre-clearing surveys.
6. In the event that threatened fauna (eg. microbats, Giant Barred Frog, Emu) are observed on site, stop work and notify the ECC environmental representative who will contact an experienced ecologist for further advice.
7. A suitably experienced ecologist or appointed environmental representative will undertake a survey of the existing Jacky Bulbin Bridge (using a torch) prior to commencement of works on the bridge structure. If microbats are **not** present, works may proceed without the need for any additional

measures. The ecologist or environmental representative will install exclusion measures (fill cavities with clean rags) within any unoccupied cavities to prevent later construction disruptions.
If microbats are present, the ecologist will be required to:
- Determine the species, number of bats and breeding status
- Determine in consultation with construction/ engineering personnel, the appropriate
- management pathway
- Should threatened microbats be present, review project statutory assessments and update if
- appropriate.

8. Daily inspections will be undertaken by the work crew of the existing concrete/ timber bridge for microbats:
   - On each day below deck bridge works are undertaken (eg. removal preparation)
   - On each day of bridge removal
   - The inspection will include actively looking for microbats and/ or signs of their presence using a torch below the bridge decking, within corners of the concrete or other cavities.
9. Consideration will be given to providing replacement microbat habitat beneath the new concrete bridge (refer to Section 4.2.2 of Appendix B). Should microbat habitat be installed at Jacky Bulbin Bridge the final design would be agreed on between RVC and an ecologist prior to construction.
10. Injured fauna will be taken to the nearest vet in Grafton or wildlife care organisation. The contact details of Grafton Veterinary Clinic (02 6642 3681) and WIRES (1300 094 737) will be known to the site supervisor and ecologist.
11. Any uninjured captured fauna will be released within 50 m of the site where the animal was captured, as far away as possible from threats such as clearing and road traffic. Timing of releases will coincide with dusk for nocturnal species.
12. If unexpected threatened fauna or flora species are discovered, stop work and contact the ecologist or RVC environmental representative for further advice.
13. Works within Jackybulbin Creek will be undertaken in accordance with conditions outlined within the approved Department of Primary Industries (Fisheries) Permit.
14. To minimise pollution and the spread of pathogens/ weeds; tools, machinery and plant will be cleaned, degreased and inspected for oil/ fuel leaks before commencing work on site. Soil, vegetation and/ or foreign material from other sites will be removed from plant before delivery to site.
15. Weeds will be managed according to requirements under the *Biosecurity Act 2015*. The duties under the act for weeds which occur at the site are: *'All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable'*.
16. Weeds will be sprayed with herbicide prior to clearing and mulching to help prevent regrowth, and no mulched vegetation potentially contaminated with weed material will be taken offsite other than to an appropriately licenced waste facility.
17. Pruning of mature trees will be in accordance with Part 5 of *Australian Standard 4373-2007 Pruning of amenity trees.*
18. All vegetation removal will be undertaken by an approved vegetation clearing contractor. Vegetation removed from the site will be mulched and taken off-site to an appropriately licenced waste facility.
19. There is to be no disturbance beyond the marked limits without prior approval from the EEC environmental representative.
20. Erosion and sediment control measures will be implemented (in accordance with the Landcom/ Department of Housing Managing Urban Stormwater; Soils and Construction Guidelines [the Blue Book]) and maintained to prevent sediment moving offsite and sediment laden water entering any water course during the construction process.

21. Environmental safeguards will be communicated to all construction personnel as part of an Environmental Site Induction and repeated where appropriate at Toolbox Sessions prior to commencement of relevant work components.

7.2 TRAFFIC AND ACCESS

7.2.1 EXISTING ENVIRONMENT

Bungawalbin Whiporie is a sealed and unsealed general access road running from Woodburn to Coraki and connects the local community to the Summerland Way. The Annual Average Daily Traffic (AADT) is around 250 vehicles per day, with 15% of that being Heavy Vehicles. Bungawalbin Whiporie Road services as a primary production, school bus, forestry, tourist, and local resident thoroughfare. JackyBulbin bridge is located approximately 25km south west of Coraki. The local road provides an important transport link between Whiporie and the Lower Mid Richmond. Northern Rivers Buses services the Bungawalbin Whiporie road each morning and afternoon during school terms.

7.2.2 CRITERIA

ECC will provide a Traffic Guidance Scheme outlining the proposed traffic management measures for works at the bridge site.

All signs, barriers, lights and other devices used on site for the purposes of this clause shall conform to the requirements of the current Transport for NSW “Traffic Control at Work Sites Technical Manual” version 6.0 2020. The Contractor is to ensure that the safety of the general public is maintained during the construction period.

7.2.3 POTENTIAL IMPACTS

Potential impacts that may occur during construction include the temporary and/or short-term delays to commuters or the bus service on the Bangawalbin Whiporie Road in the instance that the road is temporarily blocked during construction due to unforeseen circumstances. The temporary bridge is one lane wide, therefore traffic must contra-flow over the bridge. It is unlikely that temporary traffic delays will cause significant impacts to commuters or the bus service using Bangawalbin Whiporie Road.

Once the bridge is constructed, it will be of similar dimensions and functionality to the existing bridge. Therefore, it is unlikely that any additional traffic related impacts will occur as a result of the proposal.

7.2.4 MANAGEMENT AND MITIGATION MEASURES

A Traffic Guidance Scheme is to be prepared in accordance with relevant guidelines to control public vehicles within the works area.

1) Traffic management shall be in accordance with the TfNSW “Traffic Control at Work Sites Technical Manual” and "AS1742.3 Manual of Uniform Traffic Control Devices Part 3: Traffic control devices for works on roads".
2) Residents along Bangawalbin Whiporie Road should be notified of the works and delineation measures.
3) The design is to consider the permanent road geometry meets the requirements of vehicles that travel along Bangawalbin Whipore Road (i.e the bridge load rating is adequate to manage the required heavy vehicles and the road geometry is suitable for heavy vehicles as required by the relevant design scope and engineering specifications.)

4) Road safety barriers are installed as required by the design and relevant engineering specifications.

7.3 TOPOGRAPHY, GEOLOGY AND SOILS

7.3.1 EXISTING ENVIRONMENT

The proposal site is located over Jackybulbin Creek. The surrounding land is relatively flat to lightly undulating and subject to forestry. The creek appears to be permanently flowing and flows west towards Bangawalbin Creek.

According to the “Soil Landscapes of the Woodburn 1:1000 000 Sheet” (Morand, 2001), the soil present in the Bungawalbin landscape can be described as deep (>150 cm), poorly drained Grey Kurosols (Gleyed Podzolic Soils) and Grey Kandosols (Gleyed Podzolic Soils). Deep (>150 cm), poorly drained Vertosols and Kandosols (Humic Gleys; Gleyed Podzolic Soils) occur within oxbows and other very poorly drained areas. Deep (>150 cm), well-drained Tenosols (Earthy/Siliceous Sands) line channels and also occur in areas of prior streams. There is a risk of streambank and gully erosion.

The geology is described as Alluvium of unknown depth derived predominantly from rocks of the Grafton Formation (sandstone, siltstone, claystone, conglomerate) and the Kangaroo Creek Sandstone (quartz sandstone). Marine clays probably occur at depth within the boundary zone with the Dungarubba (du) soil landscape.

According to mapping provided by RVC online, there is no risk of Acid Sulphate Soil and there appears to be no presence of contamination or contaminating sources.

A geotechnical study was undertaken by RVC and provided to ECC. This has been included as Appendix F.

There are signs of scouring and erosion within the creek bank on the southern creek bank as shown in Plate 6 below.

Plate 6 – Photo showing southern creek bank with signs of erosion and scour. Scour rock has been placed to reduce erosion.

7.3.2 CRITERIA

Under Section 120 of the Protection of the Environment Operations Act 1997 (POEO Act) it is an offence to pollute or cause or permit pollution of waterways. Water pollution under the POEO Act includes introducing sediment or placing such material where it is likely to be washed or blown into waterways, stormwater systems or groundwater. It is also an offence, under Section 142 of the POEO Act, to pollute the land. Further, it is an offence to wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that is likely to harm the environment (S.116).

It is important that the proposal does not cause increase potential for scouring and erosion of the existing creek bed and banks and measures are put in place during construction to retain sediment from construction activities.

7.3.3 POTENTIAL IMPACTS

The work is unlikely the significantly alter the existing topography or terrain. As there are no contaminated soil or ASS present, this is unlikely to be a risk for the proposal.

There is a risk that, during construction activities, soil is exposed to stormwater run-off which causes sediment laden run-off to enter JackyBulbin Creek.

Also, there is a potential that, through the use of plant and equipment on site that the soil may become contaminated with hydrocarbons if plant and equipment maintenance and refueling is not appropriately managed.

7.3.4 MANAGEMENT AND MITIGATION MEASURES

The following management measures are to be implemented throughout the construction phase of the Project:

- Ensure the design incorporates measures to minimize erosion of the creek bed and banks, either through the incorporation of appropriate scour protection or similar.
- Prepare and implement an Erosion and Sediment Control Plan in accordance with the “Blue Book” (Managing Urban Stormwater: Soils and Construction [4th Edition, Landcom, 2004]). See Appendix A for prepared Erosion and Sediment Control Plan.
- Ensure erosion and sediment control measures are inspected regularly, particularly after rainfall events. Control measures are to be regularly maintained to ensure they remain adequate and effective at capturing sediment.
- Ensure fuels and chemicals are kept in an appropriately bunded area. The bund should be the capacity of the largest container (plus 10% contingency).
- Ensure there is a spill kit available and spills are cleaned immediately.
- Ensure exposed soils are stabilised as soon as practical with scour rock or similar to prevent ongoing erosion.

7.4 WATER QUALITY

7.4.1 EXISTING ENVIRONMENT

The proposal requires a new bridge to be constructed over JackyBulbin Creek which is likely to be a fresh to brackish, perennial stream. The creek supports a number of aquatic flora and fauna and appears to be of relatively good quality. The stream flows from east to west to Bungawalbin Creek through mostly forested land. The creek may receive flow from areas disturbed during forestry activities and may also receive run-off from unsealed forestry access roads. Plate 7 below shows the general quality of water in JackyBulbin Creek in the vicinity of the new bridge to be constructed.

Plate 7 – Photo of Jackybulbin Creek – general water quality

7.4.2 CRITERIA

Under Section 120 of the Protection of the Environment Operations Act 1997 (POEO Act) it is an offence to pollute or cause or permit pollution of waterways. Water pollution under the POEO Act includes introducing sediment or placing such material where it is likely to be washed or blown into waterways, stormwater systems or groundwater. It is also an offence, under Section 142 of the POEO Act, to pollute the land. Further, it is an offence to wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that is likely to harm the environment (S.116).

It is important that the Project does not cause any impacts to the water quality of Jackybulbin Creek during construction and operation.

7.4.3 POTENTIAL IMPACTS

There is a potential that, during construction, exposed soils become mobilized during storm events and sediment laden run-off enters Jackybulbin Creek. Also, the use of fuels and chemicals in close proximity to Jackybulbin Creek could also cause contaminated run-off to occur during construction activities.

Demolition of the existing Jackybulbin Bridge may cause debris to fall into the creek.

The concreting of bridge piles may cause water contaminated with concrete fines (and high pH) to enter the creek.

During operation, there is a potential that fuel and oil spills may cause ongoing contamination into Jackybulbin Creek, however, this is unlikely as the number of vehicles using this road is considered low.

7.4.4 MANAGEMENT AND MITIGATION MEASURES

The following management measures are to be implemented throughout the construction phase of the Project:

- Prepare and implement an Erosion and Sediment Control Plan in accordance with the “Blue Book” (Managing Urban Stormwater: Soils and Construction [4th Edition, Landcom, 2004]). See Appendix A for prepared Erosion and Sediment Control Plan.
- Ensure erosion and sediment control measures are inspected regularly, particularly after rainfall events. Control measures are to be regularly maintained to ensure they remain adequate and effective at capturing sediment.
- Ensure a hydrocarbon absorbent boom is placed downstream in JackyBulbin Creek prior to commencing works and is removed after completion of works.
- Ensure a silt curtain is placed into Jackybulbin Creek prior to the commencement of works. The silt curtain is to be removed if there are any delays in the work and/or when the risk of erosion is low, as the silt curtain will inhibit fish passage.
- Ensure fuels and chemicals are kept in an appropriately bunded area. The bund should be the capacity of the largest container (plus 10% contingency).
- Refuelling should be undertaken at least 20m from the edge of the creek line, use appropriate drip trays during refuelling activities.
- All plant and equipment to be appropriately maintained and are not to have visible leaks.
- Avoid working in the creek banks during heavy rainfall.
- Ensure that works to demolish the existing bridge is undertaken carefully to avoid debris entering the creek, use a geofabric catch if there is a risk that debris may enter the creek.
- During concrete piling works, ensure that all concrete washout occurs at least 20m from the creek edge in a sump that fully contains all concrete contaminated water.

- Piling works to be bunded to ensure that any concrete waste does not enter the creek.
- Waste water from piling activities to be pumped to a sump or turkeys nest at least 20m from the creek edge and tested by the EEC Environmental Representative prior to release.
- Ensure there is a spill kit available and spills are cleaned immediately.
- Ensure exposed soils are stabilised as soon as practical with scour rock or similar to prevent ongoing erosion.

7.5 AIR QUALITY

7.5.1 EXISTING ENVIRONMENT

The Project site is located within mainly forested land adjacent to rural farming land. Generally, the air quality would be considered good, however during dry periods, the farming land may become dusty and there are a number of unsealed roads within the state forest that would also be dusty.

There is also a risk of bushfire in the nearby forestry land that would cause significant impacts to air quality.

7.5.2 CRITERIA

Sections 124 to 126 of the POEO Act require businesses to maintain and operate equipment and deal with materials in a proper and efficient manner at all times to prevent the emission of impurities of any kind into the air. The most suitable performance criterion for air quality is to minimise air borne pollution at the site during works.

7.5.3 POTENTIAL IMPACTS

Due to the extent and nature of the proposed Project it is unlikely to cause air quality impacts over and above what is experienced from ambient influences.

Potential impacts may occur from dust emissions during construction from stockpiled soil and minor quantities of earthworks. During the re-alignment works for Bungawalbin to Whiporie Road, there may be some dust formed from the grading and shaping of the new roadway.

Vehicle and plant emissions will also be a source of air pollution during construction.

However, both of the above impacts will only occur during construction and therefore are considered short term and minor in nature. The nearest sensitive receptor is located 830 south west of the Project site and is therefore unlikely to be impacted by changes to air quality during construction.

Changes to air quality from permanent works is unlikely, as the new bridge will operate in the same capacity as the previous bridge.

7.5.4 MANAGEMENT AND MITIGATION MEASURES

The following measures are to be implemented to ensure that air quality impacts are minimized:

- Ensure that stockpiled soil is monitored for dust emissions and wet down with water sprays if required. If stockpiles are to be left for >28 days, consider using a cover crop seed to stabilize the stockpile
- Ensure plant and equipment are well maintained and in good working condition

- Use water sprays during construction activities that may generate dust, such as demolition of the existing bridge structure
- No burning of timber unless expressly directed by RVC
- If there is high wind that may cause dust impacts, especially during road re-alignment works, ensure a water cart is available to keep dust to a minimum
- Minimise clearing as much as practical.

7.6 NOISE AND VIBRATION

7.6.1 EXISTING ENVIRONMENT

Bungawalbin-Whiporie Road in this location is mainly through forestry land with some dwellings located on private property adjacent to the State Forest Land. The closest rural land is located 620m to the north west of the Project site.

There has been no specific noise monitoring undertaken for the Project site, however the existing environment is dominated by noise from Bungawalbin-Whiporie Road, which is the occasional vehicle passage and existing noise from the forest including birds and cicada's. Forestry equipment would also be a dominant noise source during logging events.

The closest sensitive receiver is located 830m south west of the Project site.

Figure 9 is an excerpt from the RTA Environmental Noise Management Manual (1999) and provides basic noise levels for various traffic levels. Based on the number of vehicles using Bungawalbin to Whiporie Road, the noise levels in the vicinity would be <51dB at the closest receiver. Noise from natural sources such as birds and cicada's would likely be the dominant noise source.

Example of $L_{eq(1\ hr)}$ noise levels for different traffic volumes and distances to the receiver, assuming a vehicle speed of 80 km/h and a level road with 10% heavy vehicles

Distance to assessment point over hard ground (m)	Traffic volume (vehicles per unit of time)			
	50	100	200	400
40	57 dB	60 dB	63 dB	66 dB
80	54 dB	57 dB	60 dB	63 dB
160	51 dB	54 dB	57 dB	60 dB

Figure 9 – Excerpt from RTA Environmental Noise Management Manual (1999)

7.6.2 CRITERIA

Noise from machinery is not expected to be significantly greater than normal noise levels from a vehicle (e.g. truck). Therefore, it is not considered that construction noise will exceed the background noise level as detailed above. The following noise criteria from the EPA *Environmental Noise Control Manual* (1999) is applicable to the proposal - Background plus 10dB (A) for a cumulative period of noise exposure between four weeks and 26 weeks.

7.6.3 POTENTIAL IMPACTS

It is unlikely that, with plant and equipment to be utilized to complete the construction of the new bridge that the above noise criteria would be exceeded. Also, it is unlikely that plant and equipment noise from the worksite would become the dominant noise source at the closest sensitive receiver. It is likely that the works will remain inaudible at the closest sensitive receiver.

As the new bridge is unlikely to generate higher capacity use of Bungawalbin to Whiporie Road, the Project is unlikely to impact on long term noise levels in the area.

7.6.4 MANAGEMENT AND MITIGATION MEASURES

The key management measure to reduce noise impacts is to ensure that works are undertaken during the following working hours:

Monday-Friday: 7am to 5pm. Saturday: 8am to 1pm. Sunday and Public Holidays: no work.

Works outside of these hours should only be undertaken if they will be inaudible at the closest sensitive receiver.

The following measures are to be implemented to reduce noise impacts:

- Ensure plant and equipment are well maintained and are operating in good working order
- Ensure that the number of vehicles, particularly heavy vehicles using Bungawalbin-Whipore Road outside of the working hours provided above is minimized as much as practical.

7.7 LANDSCAPE/VISUAL

7.7.1 EXISTING ENVIRONMENT

The existing landscape is a heavily forested rural roadway with an existing concrete bridge structure. There is no landscaping undertaken for the existing bridge structure.

Jackybulbin Creek has good natural visual amenity, it is also heavily forested with some disturbance visible from maintenance works and there is scour rock visible along the creek banks in the vicinity of the existing bridge.

The existing road and bridge has typical visual amenity for a rural road setting.

7.7.2 CRITERIA

The target for the proposal is no long-term effect on the existing visual landscape.

7.7.3 POTENTIAL IMPACTS

There will be temporary impacts to the visual amenity of the location during construction, due to the placement of the ancillary compound site, soil stockpiles and general construction works. However this is short term and not considered a major impact.

The long term visual amenity of the Project site will remain the same, as the old bridge will be replaced with the new bridge. The temporary bridge site and any disturbed areas will likely require permanent landscaping to stabilize the disturbed ground after the temporary bridge has been removed.

7.7.4 MANAGEMENT AND MITIGATION MEASURES

During construction, the site is to be kept clean and tidy, with general housekeeping of the site a high priority.

After the temporary bridge has been removed, stabilization of the disturbed ground and bridge abutments should be undertaken to ensure that this area is not a visual impact. Stabilisation may be ripping of the ground, addition of topsoil and application of a cover crop seed to encourage grass growth.

7.8 ABORIGINAL HERITAGE

7.8.1 EXISTING ENVIRONMENT

An experienced Cultural Heritage consultant, Heritage Management and Planning Pty Ltd was engaged to undertake an Aboriginal Heritage (Due Diligence) Assessment of the Proposal site. A copy of the Assessment report is provided in Appendix C.

Based on a preliminary review of the local environment, and specifically the relative availability of food resources that would increase the likelihood the Proposal site was subject to intensive use which would result in the deposition of Aboriginal archaeological sites, it is not considered that the Jackybulbin Creek has an elevated potential to contain Aboriginal sites. Jackybulbin Creek is in low lying alluvial floodplain environment and it is considered that the seasonally inundated swamps and forests of the floodplain downstream would be more suitable for hunting and food gathering. However, the low-lying swamps and billabongs would not necessarily be preferred landforms for larger occupation sites that would be conducive to the deposition of stone artefacts and organic remains.

The archaeological site inspection was undertaken on 23 January 2022 by Tim Hill. The following statements summarise the outcomes of site inspection:

- no Aboriginal objects were identified during the site inspection either within the marked alignment of the proposed new bridge or the bushland immediately adjacent to the proposed new bridge
- while grass and vegetation cover was relatively sparse the creek has been subject to the deposition of a significant amount of sand and small gravels which reduce the potential to identify archaeological sites, should they occur within the Study Area
- the creek bed is located below two small rises, the most significant being the rise to the south, and it is expected that the more elevated landforms would have the greater potential for Aboriginal archaeological sites
- there were no large trees which have the potential for anthropogenic modification (scarred or carved trees)
- it is not likely that burials would survive in the floodplain due to the increase rates of soil erosion and deposition, and
- there is visible ground disturbance from the road and road drains which would reduce the potential for intact topsoils containing archaeological sites.

Based on the outcomes of the AHIMS database search, the review of environmental considerations and the archaeological site inspection it is not considered that there is a high likelihood that the proposed replacement of Jacky Bulbin Bridge or the adjacent road surface will impact archaeological sites. As such, additional archaeological test excavation is not required prior to undertaking the works and the works can be approved using the ‘Due Diligence’ approval pathway.

It is noted that, the Project site is located adjacent to Doubleduke State Forest. There is still Native Title which is not extinguished within the State Forest. Therefore, it is important that works occur within the Road Reserve only, or RVC provides further information on the requirement to undertake consultation with the impacted parties.

7.8.2 CRITERIA

To comply with the requirements of the Native Title Act 1993 and ensure that works occur within the road reserve and/or the appropriate impacted parties have been adequately consulted with.

No impacts to cultural heritage items or areas of significance throughout construction or operation.

7.8.3 POTENTIAL IMPACTS

There is a potential that there may be archaeological finds within the site that are not identified that may be impacted by the Construction works.

Works outside of the Road Reserve will potentially trigger requirements to consult with Aboriginal Parties under the Native Title Act 1993.

7.8.4 MANAGEMENT AND MITIGATION MEASURES

The following management and mitigation measures have been recommended by an experienced and qualified Archaeologist and Cultural Heritage consultant:

<u>Recommendation 1: Aboriginal Objects Find Procedure</u>

It is recommended that if it is suspected that Aboriginal objects have been uncovered during the bridge and road upgrades:

- work in the surrounding area is to stop immediately and records are made of the finds via project incident reporting procedures
- a temporary fence is to be erected around the site and appropriate controls put in place to ensure that no additional ground disturbance happens in the vicinity of the find
- an appropriately qualified archaeological consultant is engaged to identify the material and provide an initial assessment of the significance of the object and the likely nature and extent of any associated archaeological sites
- if the material is found to be of Aboriginal origin, the find must be reported on the AHIMS database
- In the event that the Aboriginal objects are considered to have been damaged or disturbed, the incident must be reported through the NSW Enviro Hotline, and
- Works may only recommence after advice from Heritage NSW on the requirement for an AHIP or where design, engineer or construction measures are identified to mitigate further damage to the Aboriginal site.

<u>Recommendation 2: Aboriginal Human Remains</u>

Although it is unlikely that Human Remains will be located at any stage during earthworks within the Study Area, should this event arise it is recommended that all works must halt in the immediate area to prevent any further impacts to the remains. The site should be cordoned off and the remains themselves should be left untouched. The nearest police station (Coraki) and the Heritage NSW (Parramatta) are all to be notified as soon as possible. If the remains are found to be of Aboriginal origin and the police do not wish to investigate the site for criminal activities, the Aboriginal community and the Heritage NSW should be consulted as to how the remains should be dealt with. Work may only resume after agreement is reached between all parties, provided it is in accordance with all parties' statutory

obligations.

7.9 NON-ABORIGINAL HERITAGE

7.9.1 EXISTING ENVIRONMENT

An experienced Cultural Heritage consultant, Heritage Management and Planning Pty Ltd was engaged to prepare a Statement of Heritage Impact (SoHI) for the Proposal site. A detailed SoHI report is provided in Appendix D which provides further detail to the summary provided below.

A site inspection was undertaken by Tim Hill on 24 January 2023. The following statements are provided to inform the heritage assessment:

- the bridge comprises a concrete deck on top of treated log girders and has a concrete abutment
- remains of an older timber girder bridge are visible in front of the existing concrete abutments and comprise four hardwood logs piles recessed for timber bearings/ capwale (bearers are retained on northern piles) and hardwood sheet (sleeper) abutments
- hardwood logs are located on either side of the abutments indicting that the original bridge had timber wingwalls, however they could also be cast off piles that were not removed
- the original timber abutment is not visible from the road pavement however will be visible from the proposed new bridge alignment should it be retained
- there are no timber deck, rails or kerbing from the original bridge retained at the crossing
- no historic structures or moveable heritage is visible in the area marked out for the new bridge alignment which comprises riparian vegetation and sand deposits, and
- the road pavement is gravel and there is no indication that the a former / older road has been located within the alignment of the proposed replacement bridge.

Based on the significance assessment (provided in the SoHI in Appendix D) and having consideration of the nature of bridges which have been listed as items of local heritage significance in the Richmond Valley, it is concluded that the Jacky Bulbin Bridge does not meet the criteria of local heritage significance.

7.9.2 CRITERIA

Ensure that no non-Aboriginal heritage items or structures are impacted from the proposed works.

7.9.3 POTENTIAL IMPACTS

As discussed in Section 7.9.1 above, there are no Non-aboriginal heritage impacts associated with the proposal.

7.9.4 MANAGEMENT AND MITIGATION MEASURES

In the event that heritage items are located during the works all works will cease immediately and Council's Heritage Adviser or Heritage Council shall be contacted.

7.10 SOCIO-ECONOMIC

7.10.1 EXISTING ENVIRONMENT

The surrounding land use is mostly forestry undertaken by Forestry Corporation or rural farms that are mostly small hold or hobby farms.

Bungawalbin to Whiporie Road is an important thoroughfare for the region and is an important connection for vehicles which is discussed further in Section 7.2.1 above. It is an important connection for local businesses including farmers and forestry.

7.10.2 CRITERIA

The most suitable criteria is that socio-economic value of the area is maintained and/or enhanced. The nature of the proposal is such that the socio-economic values will be maintained.

7.10.3 POTENTIAL IMPACTS

There is a potential that the access along Bungawalbin to Whiporie Road may be hindered for a short period of time during construction to allow the new bridge alignment to be “tied in” to the existing road. This may cause delays for heavy and light vehicles which could temporarily impact on business.

The alignment of the new bridge and approaches will ensure that the capacity of the existing road and bridge is maintained and does not limit access by heavy vehicles or buses that currently use the existing bridge.

7.10.4 MANAGEMENT AND MITIGATION MEASURES

The following management and mitigation measures are to be implemented to reduce the potential for impacts:

- Ensure that the new road geometry adopted maintains access for heavy vehicles and buses in a similar fashion to the existing bridge and approaches
- Ensure that access is maintained along Bungawalbin Whiporie Road during construction and a Traffic Management Plan is in place where required.

7.11 WASTE

7.11.1 EXISTING ENVIRONMENT

There is no visible waste or litter currently within or adjacent to the proposal site.

During the construction works, waste material will be generated such as:

- Cardboard and plastic packaging
- Green waste such as timber and vegetation
- Concrete wastage
- Steel off cuts
- Silt and sediment from sediment controls
- Discarded sediment control materials
- Spoil
- Used spill kit material.

7.11.2 CRITERIA

The most suitable performance criteria are that any waste generated as a result of the Proposal is minimized and recycled where possible.

7.11.3 POTENTIAL IMPACTS

There is a potential that waste generated from the construction activities could be inappropriately disposed as litter on the worksite, or to the incorrect waste disposal facility.

Excess waste such as concrete waste or silt could be discarded inappropriately where it may seep or flow into the creek.

Spoil may be inappropriately managed by taking the material offsite for reuse without the appropriate management measures in place to ensure the receival site can lawfully accept the material.

Cardboard and plastic may be inappropriately disposed and not recycled.

Green waste may be inappropriately managed and burnt, rather than reused.

7.11.4 MANAGEMENT AND MITIGATION MEASURES

The following management and mitigation measures should be employed to reduce potential waste materials and to comply with statutory requirements:

- Ensure that resource consumption is minimized as much as practical – i.e ensure concrete is ordered to avoid wastage, ensure plant and equipment is turned off when not in use
- Ensure recycling bins are available and that recycleable materials are segregated from general waste
- Ensure that all general waste is disposed at the appropriate landfill
- Ensure contaminated wastes are segregated for appropriate disposal (ie waste oils, spill kit material with free liquid)
- Ensure that any spoil from site that is to be removed and reused outside of the Road Reserve is undertaken in accordance with the relevant Resource Recovery Exemption and Order for the particular material type. It is noted that a Section 143 notice (POEO Act) is also required. It is noted that testing of the material may be required PRIOR to removal from site to ensure the material meets the requirements of the Resource Recovery Exemption.

7.12 CLIMATE CHANGE

7.12.1 EXISTING ENVIRONMENT

The closest weather station to the proposal site is the Whiporie Post Office (58099) (Daily Rainfall - 058099 - Bureau of Meteorology (bom.gov.au) however this only measures rainfall. The closest weather station that measures temperature is the Grafton Research Station (058077) (Daily Maximum Temperature - 058077 - Bureau of Meteorology (bom.gov.au) station located 37.9km away. The mean temperature ranges from 20.4 degrees Celsius in July to 30.3 degrees Celsius in January. Generally, this is described as mild winters and hot summers. The highest daily temperature was recorded in February 2017 as 46.3 degrees Celsius.

7.12.2 CRITERIA

The relevant criteria for this proposal is discernible input to the progress of climate change from the project.

7.12.3 POTENTIAL IMPACTS

Due to the nature and extent of the proposed works, it is unlikely to cause any long term impacts to the potential for climate change and the impacts associated with climate change in the region.

There will be short term increases in the use of machinery, vehicles and equipment which will contribute to greenhouse gas emissions, however the overall quantity during construction is considered negligible.

The design of the proposal utilized pre-fabricated bridge components that allow for quick installation. Therefore, the overall quantity of greenhouse gas emissions is reduced as the overall works program is reduced.

7.12.4 MANAGEMENT AND MITIGATION MEASURES

The following management measures are to be implemented to reduce the potential for greenhouse gas emissions:

- Ensure plant and equipment are well maintained and are in good working order.
- Ensure that, where practical, sustainable/recycled material are sought for use on the Project.
- Where practical, seek to use locally made and produced materials and components to reduce the need for transportation.
- Where practical, encourage workforce and personnel to car pool and minimize vehicles travelling to and from the worksite.

7.13 CUMULATIVE IMPACTS

7.13.1 SUMMARY OF BENEFICIAL EFFECTS

The existing JackyBulbin Bridge has been significantly damaged during the recent flood events in March 2021. It has been identified by RVC that the existing bridge cannot be repaired and therefore a new bridge must be constructed. Bungawalbin-Whiporie Road is a significant regional connection road that connects Woodburn to Coraki and also to the Summerland Way. It is an important bus route and detour when Summerland Way is blocked. The proposal will seek to improve the thoroughfare by increasing the load limit of the bridge from 5 tonnes. This will create a positive impact on the socio-economics of the local area and greater region.

The proposal will therefore create a new and safe bridge structure for Bungawalbin to Whiporie Road, which is an important road network for the community.

7.13.2 SUMMARY OF ADVERSE EFFECTS

The Project requires impacts to local biodiversity, including vegetation removal of Plant Community Type 3102 Northern Lowland Swamp Turpentine Wet Forest which is consistent with both the Environment Protection and Biodiversity Conservation Act 1999 listed threatened ecological community (TEC) Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions and the Biodiversity Conservation Act 2016 listed TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion. Approximately 0.1334 ha of this community will be affected by the Proposal.

There may also be short term impacts to water quality in Jackybulbin Creek during construction which is Key Fish Habitat.

There may also be short term impacts to access along Bungawalbin-Whiporie Road whilst the temporary bridge is in use, however this is considered a temporary impact only.

There will be short term impacts during construction including noise, air quality and visual amenity.

8 Environmental Management

8.1 ENVIRONMENTAL MANAGEMENT PLAN (OR SYSTEM)

In accordance with Section 5.4 of “Part 3 – Specifications” of the tender documentation, ECC are required to prepare an Environmental Management Plan to inform this document. The plan must contain a reference to the best practice industry sediment and environment controls relating to bridge works. The Environmental Management Plan will need to be sent to the Principal.

ECC has Integrated Management Plan that incorporates all of the requirements pertaining to Environmental Management in accordance with the ISO14001 accreditation. ECC maintains accreditation to ISO14001 standards. The Integrated Management Plan including a site specific Construction Environmental Management Plan will be provided to RVC for approval prior to commencing works on site.

An Erosion and Sediment Control Plan has been prepared (see Appendix A) and must be implemented in accordance with the “Blue Book”, Managing Urban Stormwater : Soils and Construction (Landcom, 2004).

8.2 LICENSING AND APPROVALS

For works within Jackybulbin Creek, a permit under the Fisheries Management Act 1994 is required.

Works within Jackybulbin Creek will be undertaken in accordance with conditions outlined within the approved Department of Primary Industries (Fisheries) Permit.

9 Conclusion

9.1 JUSTIFICATION

The Project proposal is justified as the bridge is an integral part of Bungawalbin Whiporie Road which is an important connection for the community. Without this proposal, the existing bridge is at risk of catastrophic failure and is therefore a key community safety concern. Therefore, a new bridge is required to ensure community safety and connectivity and to ensure the socio-economic continuity of the region.

9.2 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

9.2.1 PRECAUTIONARY PRINCIPLE

A range of options were evaluated for the bridge replacement. The evaluation of options and the assessment of the preferred option have concentrated on avoiding irreversible impacts on the environment wherever possible. Conservative, worst-case scenarios have been addressed in this REF to ensure a precautionary approach has been taken in the environmental assessment. The environmental impacts of the proposal would be minimal due to the extensive mitigation measures identified in **Section 7.**

9.2.2 INTERGENERATIONAL EQUITY

Clause 193 of the *Environmental Planning and Assessment Regulation 2021* defines inter-generational equity as *"the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations".*

The Proposal would not significantly impact upon threatened species and TECs, therefore the local biodiversity values will not be adversely impacted upon. The proposal would provide long term improvements in road safety and safeguards against flooding impacts. The economic and social disruption resulting during the Proposal would be temporary in nature.

The Proposal will result in protecting the longevity of the road asset. Issues that have potential long-term implications, such as consumption of resources, waste disposal, impacts of visual amenity and water quality have been avoided and minimised as much as possible through development and design of the proposal and the application of best practice management measures.

9.2.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

Clause 193 of the Environmental Planning and Assessment Regulation 2021 states that that *"conservation of biological diversity and ecological integrity should be a fundamental consideration"*.

The proposal has been developed with regard to the potential impacts on the ecology of the local area and has sought to avoid and minimise biodiversity impacts as much as possible by reducing the construction footprint. Safeguards and management measures outlined in this REF have been designed specifically to ensure any adverse impacts associated with the construction of the proposal are minimised and incorporate best practice principles.

9.2.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

Clause 193 of the Environmental Planning and Assessment Regulation 2021 lists the following principles for improved valuation, pricing and incentive mechanisms that were considered as part of this REF:
"(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
(iii) environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems."

Environmental and social factors were a key consideration in establishing the need for the project and preferred option selection and the value placed on these factors is evident in the environmental assessment included in this REF. Functional and economic considerations were also important in option selection and during the development of the proposal and although dollar value cost remained a key consideration, all design decisions and proposed safeguards were based on an appropriate balance of environmental, social, functional and cost criteria.

9.3 CONCLUSION

This REF has assessed the potential environmental impacts of the proposed Project – Jackybulbin Bridge Replacement. The document has determined that the Project will be assessed under Part 5 of the EP&A Act with RVC as the Proponent and Determining Authority for the activity.

The Project is necessary, as the existing Jackybulbin Bridge is at risk of catastrophic failure and represents a safety concern for the local community. Bungawalbin-Whiporie Road is a key connection road for the

community and allows access from Woodburn to Coraki and the Summerland Way. The existing bridge is currently load limited. A new bridge is required, as the existing bridge cannot be repaired.

Section 7 above provides an environmental assessment of the proposed Project. The outcomes of the assessment have demonstrated that, through the implementation of management and mitigation measures, the overall environmental impacts of the Project can be minimized and the impact is therefore considered low.

The key environmental impacts are summarized as:

- Removal of vegetation at the site which is characteristic of Plant Community Type 3102 *Northern Lowland Swamp Turpentine Wet Forest* which is consistent with both the *Environment Protection and Biodiversity Conservation Act 1999* listed threatened ecological community (TEC) *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and the *Biodiversity Conservation Act 2016* listed *TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Approximately 0.1334 ha of this community will be affected by the Activity.
- Impacts to habitat that potentially supports threatened fauna species
- Short term impacts to water quality in JackyBulbin Creek during construction
- Short term increase in noise and dust during construction
- Short term impact to visual amenity.

These key environmental impacts can be managed using the following:

- Removal of vegetation to be minimised as far as practical, use of flagging to delineate the project boundary to reduce the risk of inadvertent clearing is required
- Pre-clearing requirements to be undertaken by a qualified Ecologist to ensure threatened fauna is not at risk
- An Erosion and Sediment Control Plan in accordance with the Blue Book (Managing Urban Stormwater: Soils and Construction, Landcom) has been prepared (see Appendix A) and must be implemented
- Ensure works remain within the approved working hours or are justified to occur outside of working hours.
- Ensure water sprays are used to control dust
- Ensure the work site is kept clean and free of litter, with good housekeeping.

10 References

AS5100.1:2017 Bridge Design (Australian Standards)

Mahar, Baker (Oct, 2021) Jacky Bulbin Bridge Concept Criteria Report, Bridge Knowledge.

Campbell, et al (Aug, 2011) Richmond River Estuary Management Study and Coastal Zone Management Plan, Hydrosphere Consulting.

Department of Planning and Environment (June 2022), Guidelines for Division 5.1 Assessments, NSW Government.

Landcom (Marc 2004), Managing Urban Stormwater: Soils and Construction, NSW Government.

NSW Government (Oct 2018) NSW Natural Disaster Essential Public Asset Restoration Guidelines.

Fisheries NSW (2013 Update) Policy and Guidelines for Fish Habitat Conservation and Management

RTA (2001) Environmental Noise Management Manual, NSW Government.

- **Limitations and Usage**

Appendix A – Concept Design Drawings and Erosion and Sediment Control Plan

Appendix B – Biodiversity Assessment Report

Appendix C – Aboriginal Cultural Heritage (Due Diligence) Assessment

Appendix D – Statement of Heritage Impact

Appendix E – Summary of Table 1 Environmental Factors

Appendix F – Geotechnical Study

Appendix A – Concept Design Drawings and ERSED Plan

BUNGAWALBIN-WHIPORIE ROAD

RICHMOND VALLEY COUNCIL

BRIDGE OVER JACKYBULBIN CREEK

AT 5.2km SOUTH OF BUNGAWALBIN

SCHEDULE OF DRAWINGS

DESIGN REPORT

BRIDGE KNOWLEDGE REPORT BKP311-01.R001.V1.1

GEOTECHNICAL INVESTIGATION REPORT

No. RGS33185.1-AC-REGIONAL GEOTECHNICAL SOLUTION-DATE 4 JULY 2022

SURVEY

PLAN SHOWING JACKYBULBIN CREEK BRIDGE, BUNGAWALBIN-WHIPORIE ROAD, DRAWING No. 23002A.DWG - THOMAS SEARLES REGISTERED SURVEYOR - DATED 16/01/2023

DESIGN STANDARDS

AS 5100:20017 AND AS 2159:2009

ROAD TRAFFIC LOADING: SM1600

NUMBER OF DESIGN LANES: 1
DESIGN TRAFFIC SPEED: 40km/h

WIND LOADING

WIND TERRAIN CATEGORY: 3
WIND REGION: B
WIND VELOCITY ULS: 63m/s
WIND VELOCITY SLS: 38m/s
AVERAGE RECURRENCE INTERVAL (ARI) ULS = 2000 YEARS
AVERAGE RECURRENCE INTERVAL (ARI) SLS = 20 YEARS

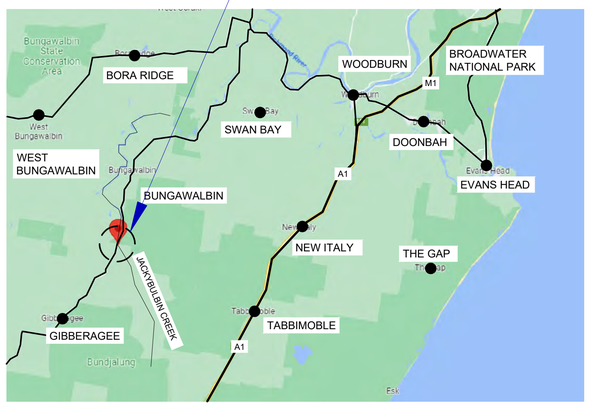
EARTHQUAKE LOADING

DESIGN CATEGORY: BEDC1

FLOOD DATA

ARI	FLOW (m^3/s)	VELOCITY (m/s)	FLOOD LEVEL (m ADH)
1:2	151	1.4	6.8
1:5	319	1.4	7.9
1:10	418	1.5	8.5
1:20 (SLS)	683	1.6	9.2
1:50	1020	1.5	10.4
1:100	1350	1.1	11.6
1:200	1680	1.0	12.6
1:500	2116	0.9	13.7
1:1000	2446	0.9	14.5
1:2000 (ULS)	2776	0.9	15.2

SITE OF WORK



LOCALITY PLAN
THIS BRIDGE IS APPROXIMATELY
5.2 km SOUTH BY ROAD FROM BUNGAWALBIN
(NOT TO SCALE)

NOT FOR CONSTRUCTION

							PREPARED	CHECKED
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM	DESIGN	AS	CR
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM			
ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH	DRAWING	JR	CR

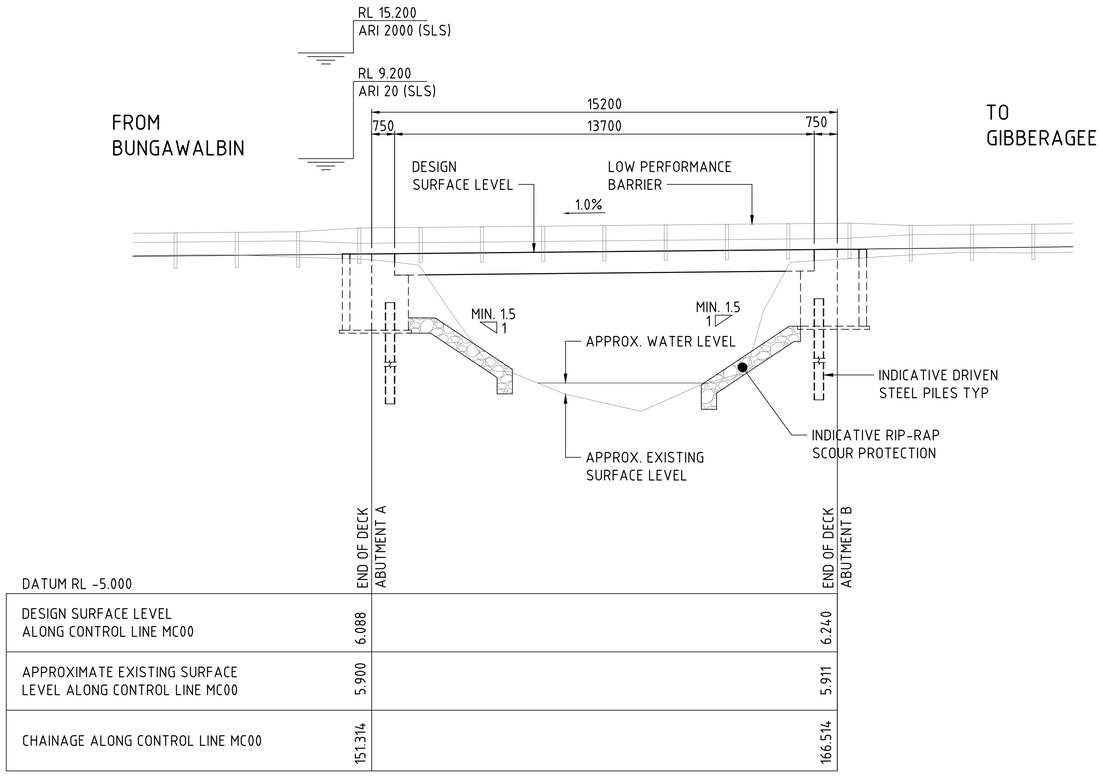
PREPARED BY
bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
C. RILEY
BRIDGE ENGINEER

RICHMOND VALLEY COUNCIL

BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN
COVER SHEET

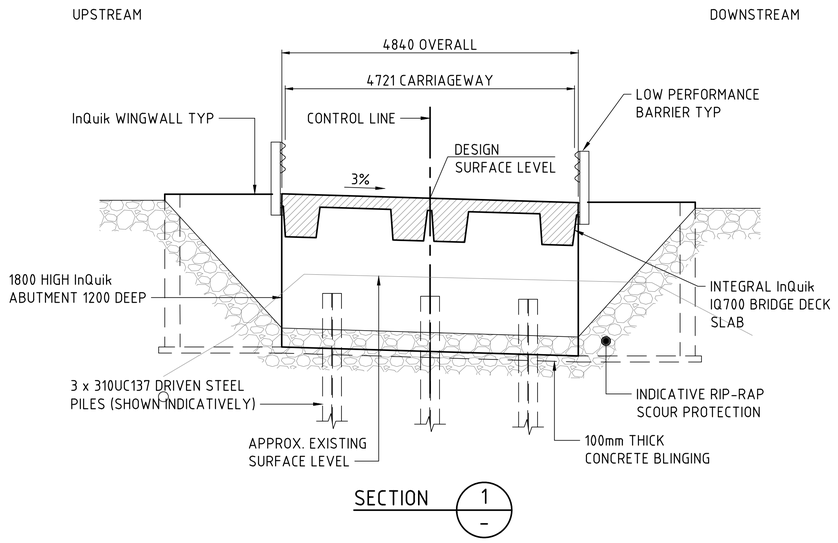
DRAWING SET No BKP311-RVC
BRIDGE No DRG-001
ISSUE STATUS DETAIL DESIGN
ISSUE 2 | No SHEETS 8 | SHEET No 01

Document Set ID: 1843311
Version: 1, Version Date: 02/05/2023

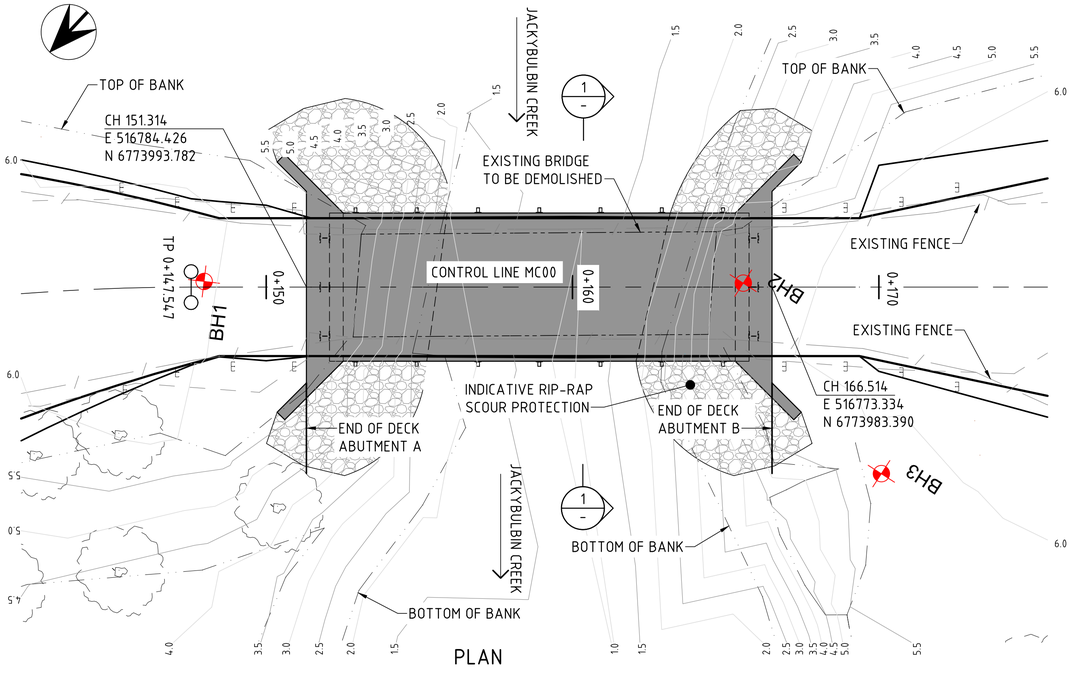


DATUM RL -5.000	END OF DECK ABUTMENT A	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG CONTROL LINE MC00	6.088	6.240
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC00	5.900	5.911
CHAINAGE ALONG CONTROL LINE MC00	151.314	166.514

ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY



SECTION 1/-



PLAN

GENERAL NOTES

SCALE 0 500 1000 2000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56 AND GDA94.
ALL LEVELS AND SET OUT TO BE CONFIRMED ON SITEL
DENOTES APPROX. BOREHOLE LOCATION.

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

PREPARED BY
bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
C. RILEY
BRIDGE ENGINEER

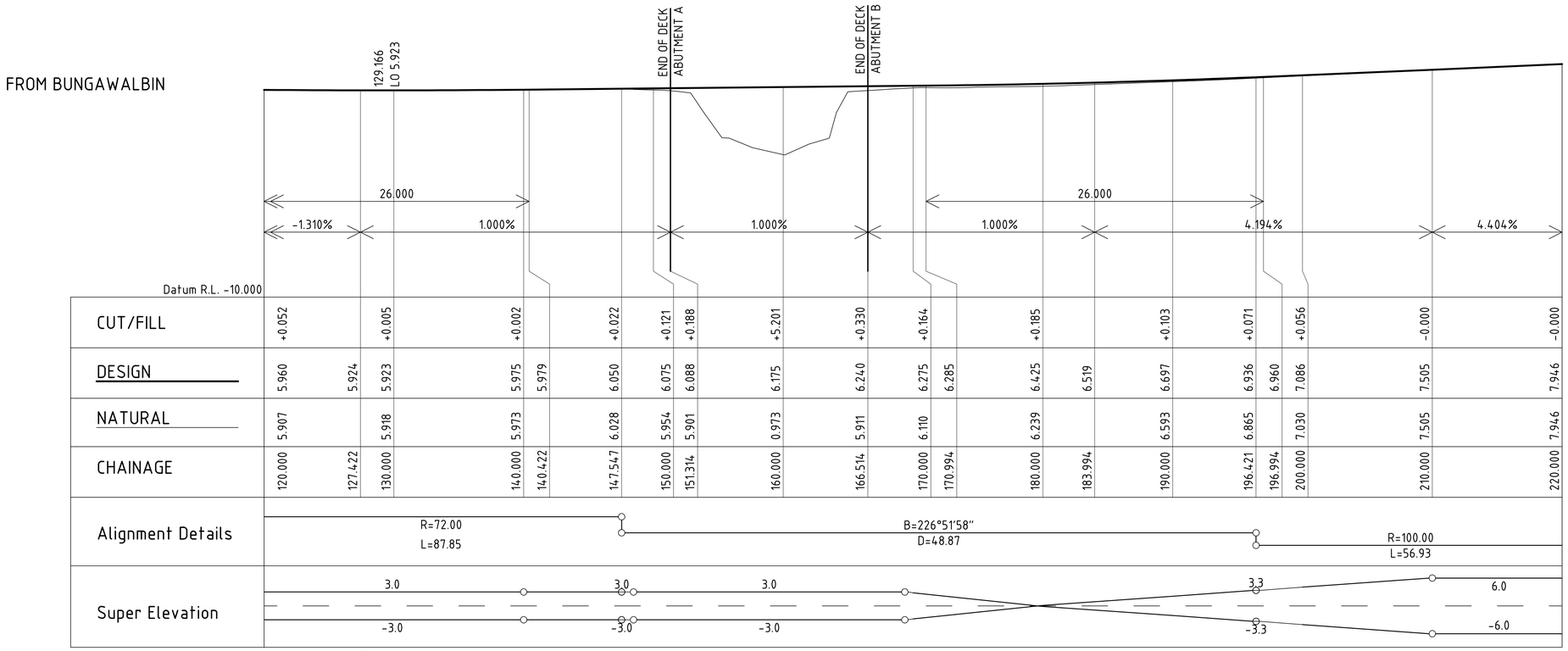
Richmond Valley Council
RICHMOND VALLEY COUNCIL

BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN

GENERAL ARRANGEMENT

DRAWING SET No	BKP311-RVC
BRIDGE No	DRG-04
ISSUE STATUS	DETAIL DESIGN
ISSUE 2	No SHEETS 8 SHEET No 02

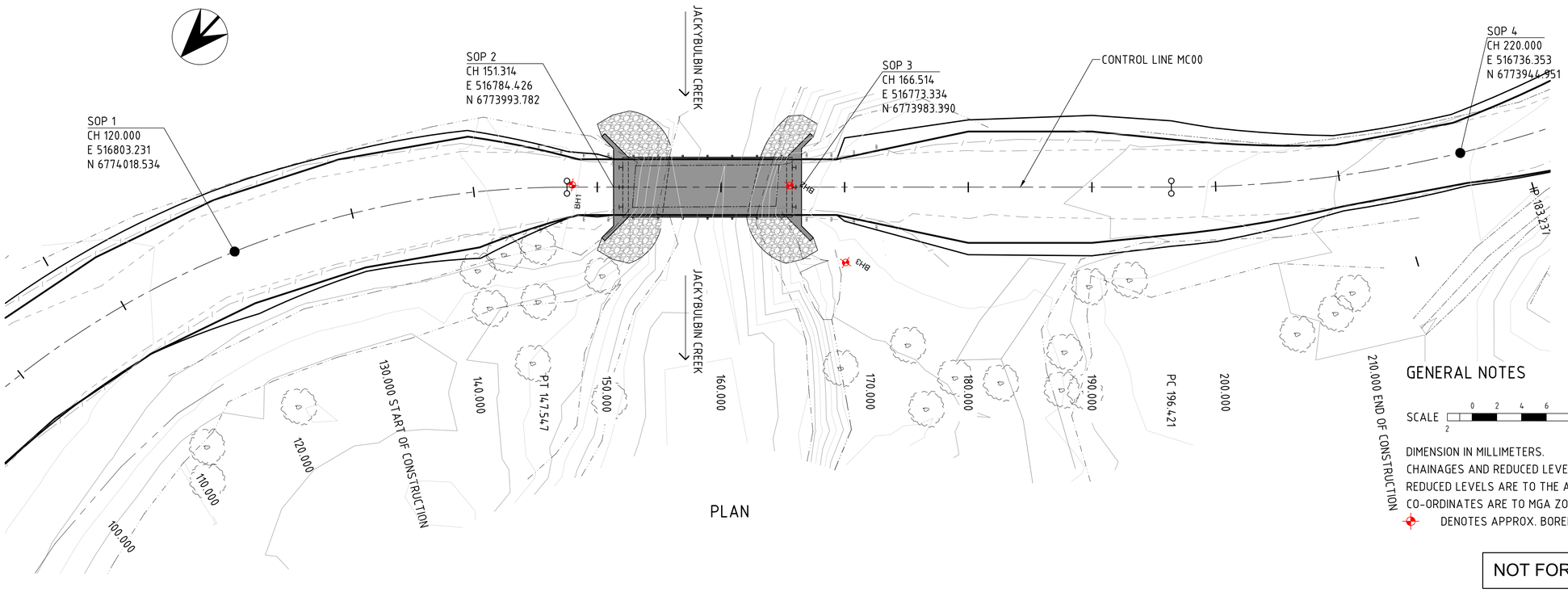
Document Set ID: 1843311
Version: 1, Version Date: 02/05/2023



CUT/FILL	+0.052		+0.005		+0.002		+0.022	+0.121	+0.188	+5.201	+0.330	+0.164		+0.185		+0.103	+0.071	+0.056	-0.000	-0.000
DESIGN	5.960	5.924	5.923		5.975	5.979	6.050	6.075	6.088	6.175	6.240	6.275	6.285	6.425	6.519	6.697	6.936	6.960	7.086	7.505	7.946
NATURAL	5.907		5.918		5.973		6.028	5.954	5.901	0.973	5.911	6.110		6.239		6.593	6.865		7.030	7.505	7.946
CHAINAGE	120.000	127.422	130.000		140.000	140.422	147.547	150.000	151.314	160.000	166.514	170.000	170.994	180.000	183.994	190.000	196.421	196.994	200.000	210.000	220.000

Scale Horizontal 1:200 Vertical 1:200

LONG SECTION - ALONG MC00



PLAN

GENERAL NOTES

SCALE 0 2 4 6 8 10m (2) OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES APPROX. BOREHOLE LOCATION.

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

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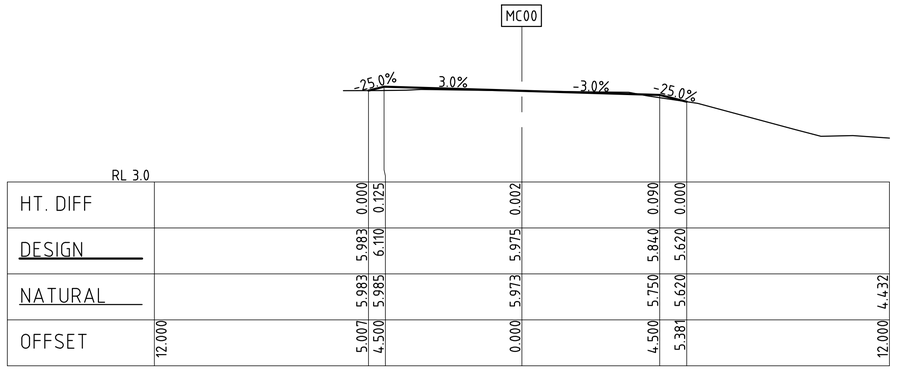
Richmond Valley Council
RICHMOND VALLEY COUNCIL

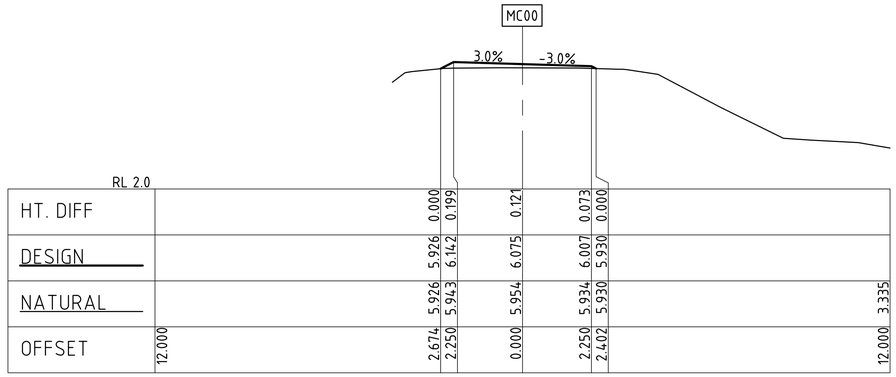
BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN
ROAD DESIGN-LONG SECTION AND PLAN

DRAWING SET No	BKP311-RVC
BRIDGE No	DRG-03
ISSUE STATUS	DETAIL DESIGN
ISSUE 2	No SHEETS 8
SHEET No	03



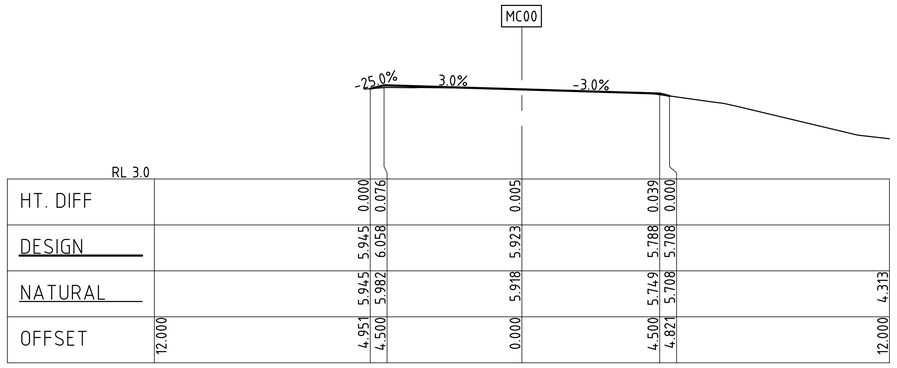
RL 3.0						
HT. DIFF		0.000	0.125	0.002	0.090	0.000
DESIGN		5.983	6.110	5.975	5.840	5.620
NATURAL		5.983	5.985	5.973	5.750	5.620	4.432
OFFSET	12.000	5.007	4.500	0.000	4.500	5.381	12.000

140.000



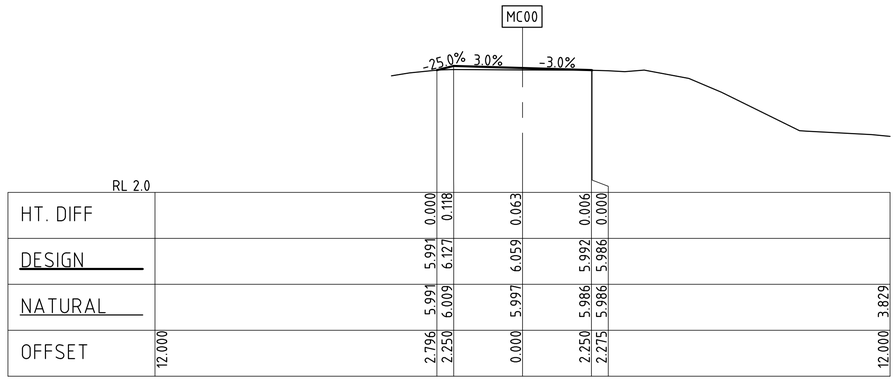
RL 2.0						
HT. DIFF		0.000	0.199	0.121	0.073	0.000
DESIGN		5.926	6.142	6.075	6.007	5.930
NATURAL		5.926	5.943	5.954	5.934	5.930	3.335
OFFSET	12.000	2.674	2.250	0.000	2.250	2.402	12.000

150.000



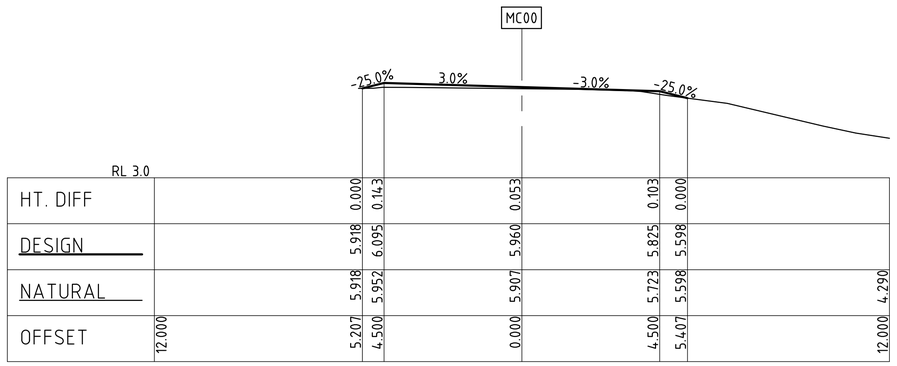
RL 3.0						
HT. DIFF		0.000	0.076	0.005	0.039	0.000
DESIGN		5.945	6.058	5.923	5.788	5.708
NATURAL		5.945	5.982	5.918	5.749	5.708	4.313
OFFSET	12.000	4.951	4.500	0.000	4.500	4.821	12.000

130.000



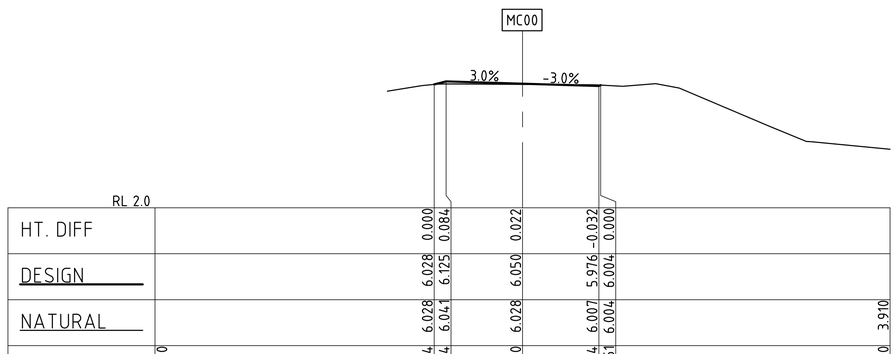
RL 2.0						
HT. DIFF		0.000	0.118	0.063	0.006	0.000
DESIGN		5.991	6.127	6.059	5.992	5.986
NATURAL		5.991	6.009	5.997	5.986	5.986	3.829
OFFSET	12.000	2.796	2.250	0.000	2.250	2.275	12.000

148.464



RL 3.0						
HT. DIFF		0.000	0.143	0.053	0.103	0.000
DESIGN		5.918	6.095	5.960	5.825	5.598
NATURAL		5.918	5.952	5.907	5.723	5.598	4.290
OFFSET	12.000	5.207	4.500	0.000	4.500	5.407	12.000

120.000



RL 2.0						
HT. DIFF		0.000	0.084	0.022	-0.032	0.000
DESIGN		6.028	6.125	6.050	5.976	6.004
NATURAL		6.028	6.041	6.028	6.007	6.004	3.910
OFFSET	12.000	2.884	2.494	0.000	2.494	2.551	12.000

147.547

GENERAL NOTES

SCALE 1000 0 2500 5000mm OR AS SHOWN.

DIMENSION IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
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NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

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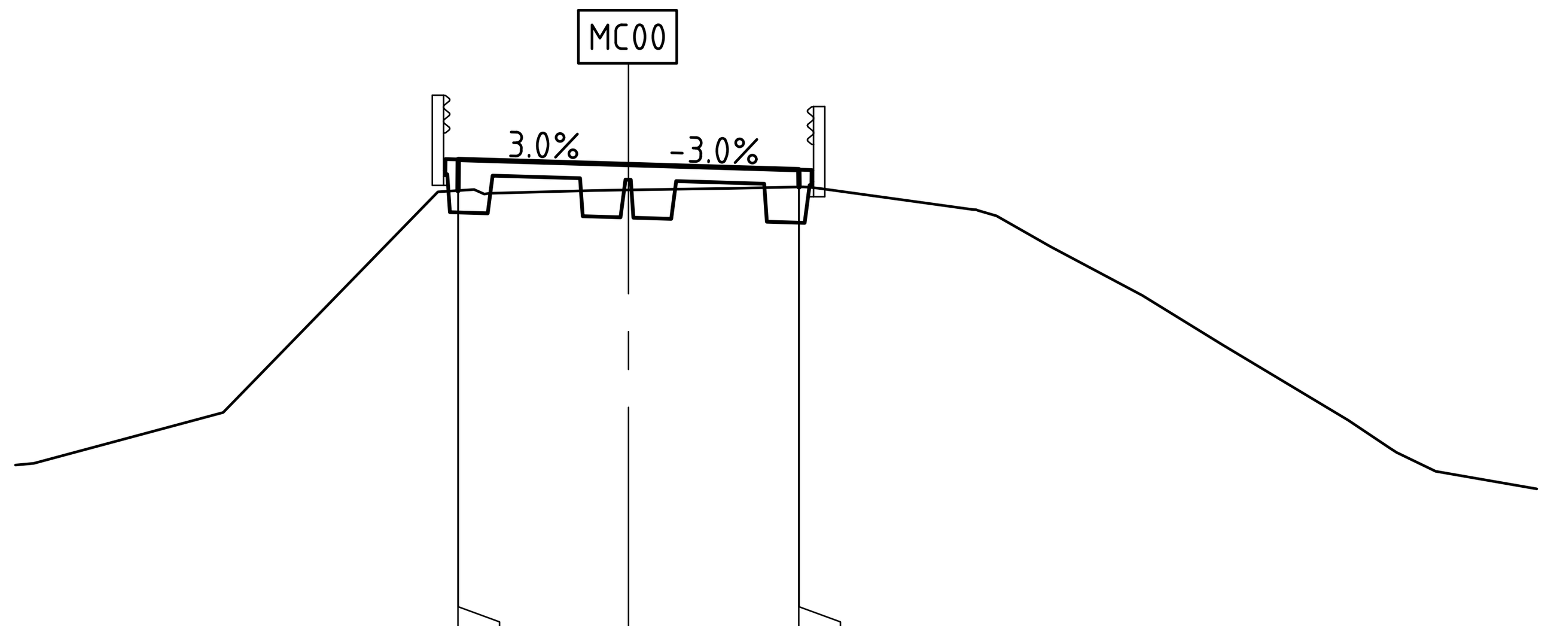
RICHMOND VALLEY COUNCIL

BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN

ROAD DESIGN-CROSS SECTIONS SHEET A

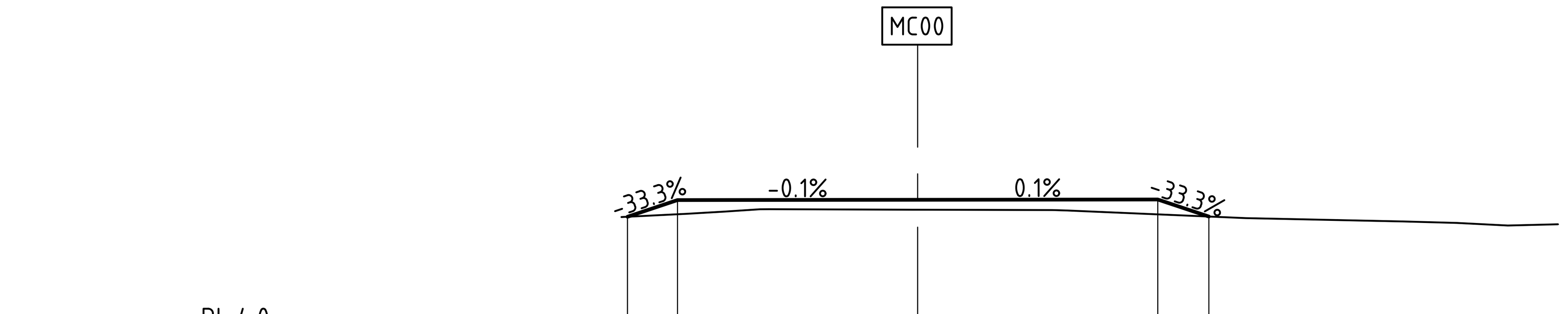
DRAWING SET No	BKP311-RVC
BRIDGE No	DRG-04
ISSUE STATUS	DETAIL DESIGN
ISSUE 2	No SHEETS 8	SHEET No 04

Document Set ID: 1843311
Version: 1, Version Date: 02/05/2023



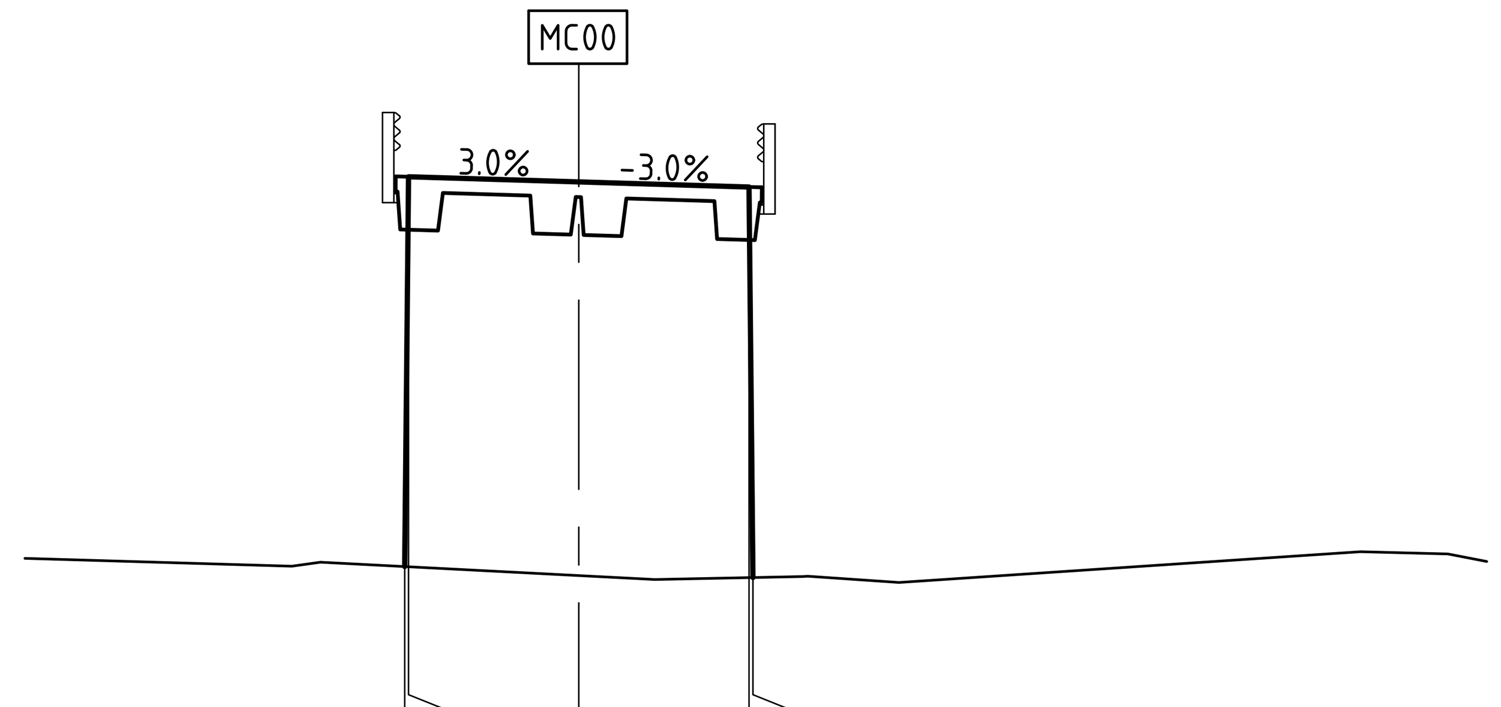
HT. DIFF		0.000	0.411	0.335	0.229	0.000	
DESIGN		5.895	6.306	6.238	6.171	5.942	
NATURAL		5.895	5.895	5.903	5.942	5.942	1.956
OFFSET	12.000	2.254	2.250	0.000	2.250	2.252	12.000

166.364



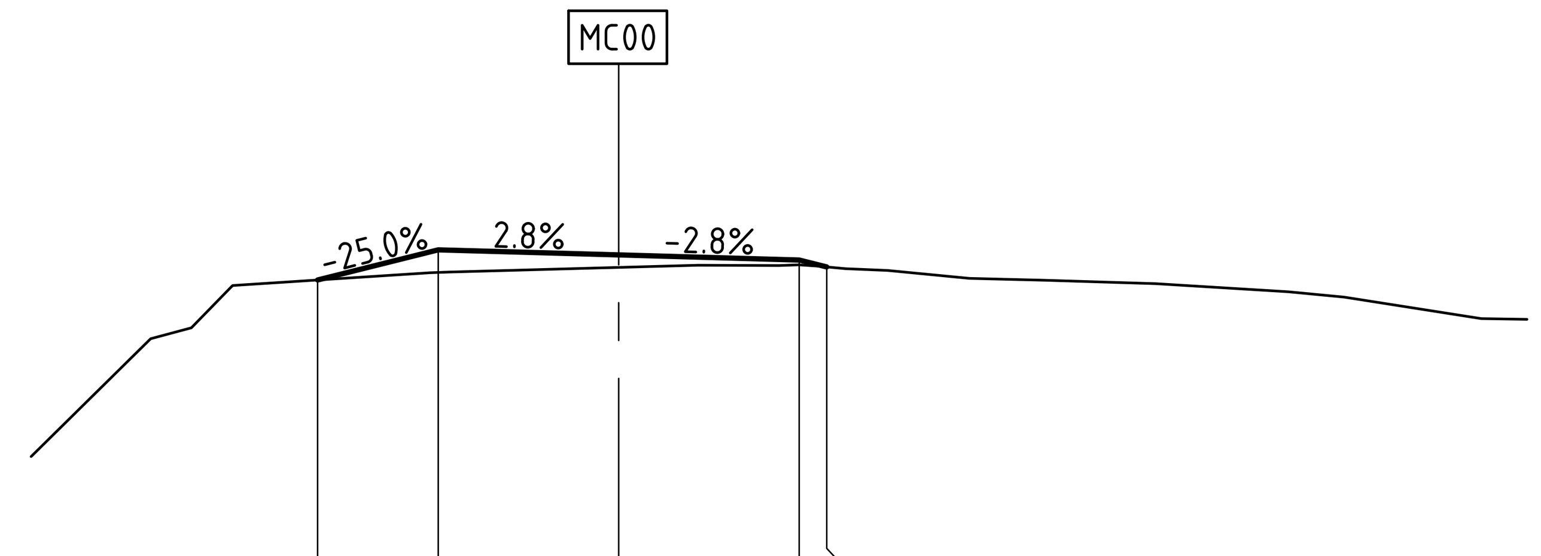
HT. DIFF		0.000	0.266	0.186	0.278	0.000	
DESIGN		6.107	6.419	6.425	6.430	6.111	
NATURAL		6.107	6.153	6.239	6.152	6.111	5.965
OFFSET	12.000	5.438	4.500	0.000	4.500	5.458	12.000

180.000



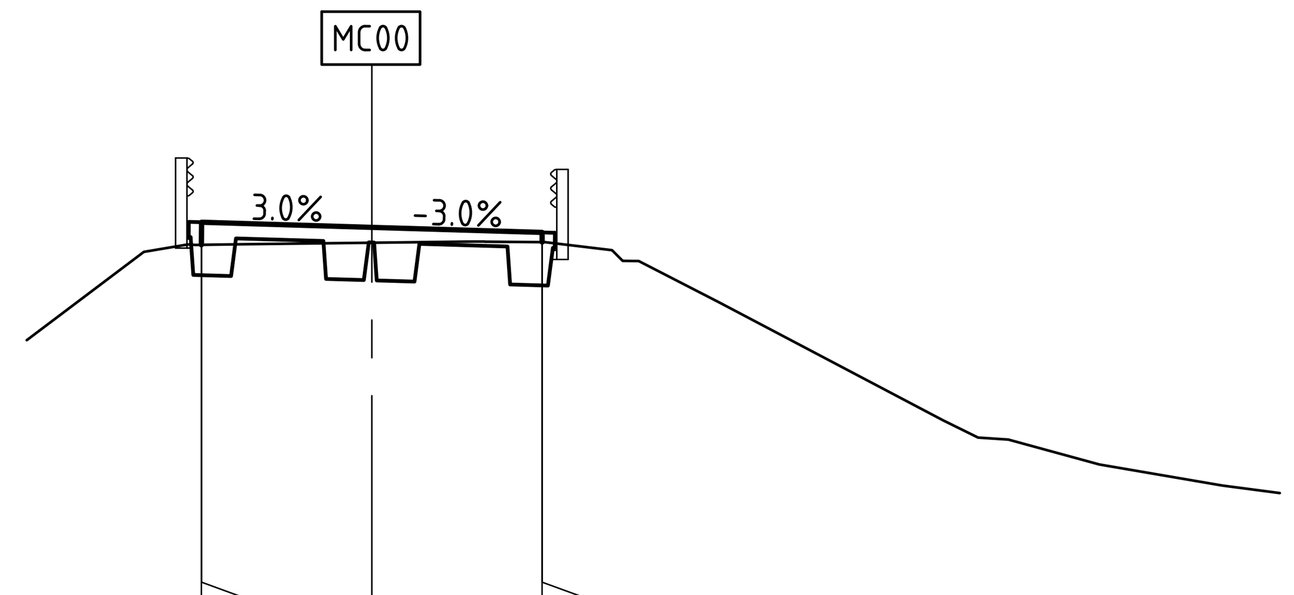
HT. DIFF		0.000	5.153	5.202	5.161	0.000	
DESIGN		1.092	6.242	6.175	6.107	0.947	
NATURAL		1.092	1.090	0.973	0.946	0.947	1.160
OFFSET	12.000	2.301	2.250	0.000	2.250	2.302	12.000

160.000



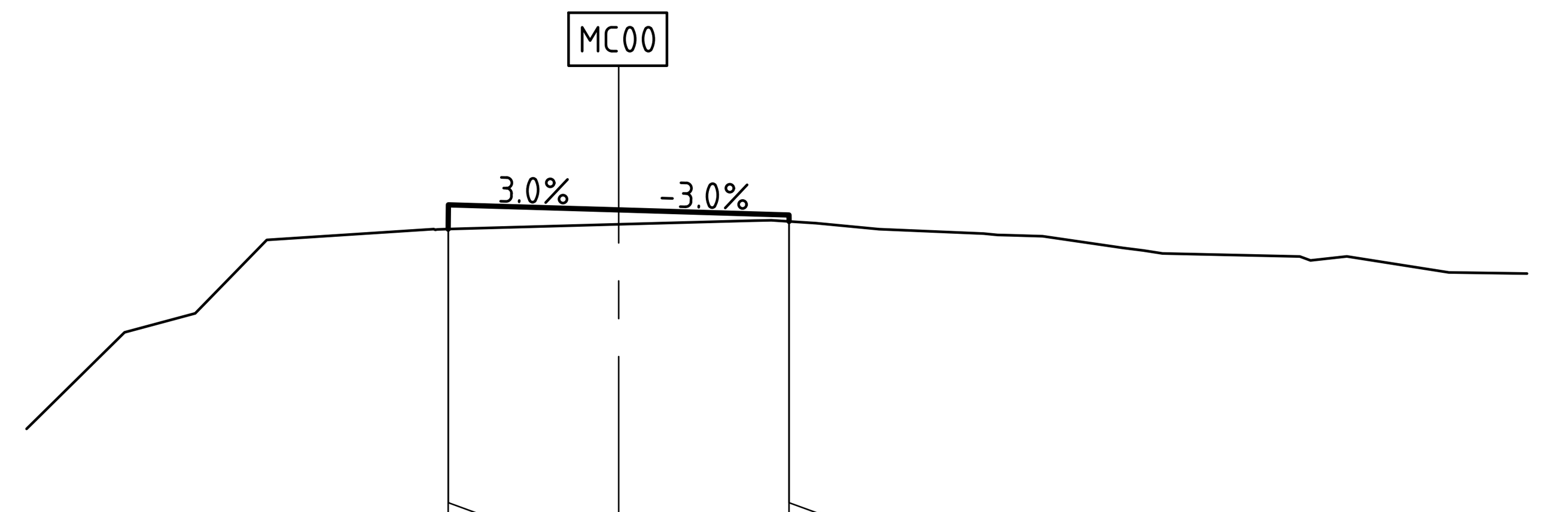
HT. DIFF		0.000	0.298	0.165	0.064	0.000	
DESIGN		5.943	6.342	6.275	6.208	6.117	
NATURAL		5.943	6.044	6.110	6.143	6.117	5.425
OFFSET	12.000	3.978	2.385	0.000	2.385	2.749	12.000

170.000



HT. DIFF		0.000	0.299	0.204	0.128	0.000	
DESIGN		5.858	6.157	6.089	6.022	5.894	
NATURAL		5.858	5.858	5.886	5.894	5.894	2.577
OFFSET	12.000	2.253	2.250	0.000	2.250	2.251	12.000

151.464



HT. DIFF		0.000	0.321	0.191	0.085	0.000	
DESIGN		6.015	6.336	6.268	6.201	6.116	
NATURAL		6.015	6.015	6.078	6.116	6.116	5.427
OFFSET	12.000	2.253	2.250	0.000	2.250	2.251	12.000

169.364

GENERAL NOTES

SCALE 0 2500 5000mm 1000 OR AS SHOWN.

DIMENSION IN MILLIMETRES.
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NOT FOR CONSTRUCTION

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2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

PREPARED BY bk. bridge knowledge. ENGINEERING CONSULTING SERVICES

C. RILEY
BRIDGE ENGINEER

Richmond Valley Council
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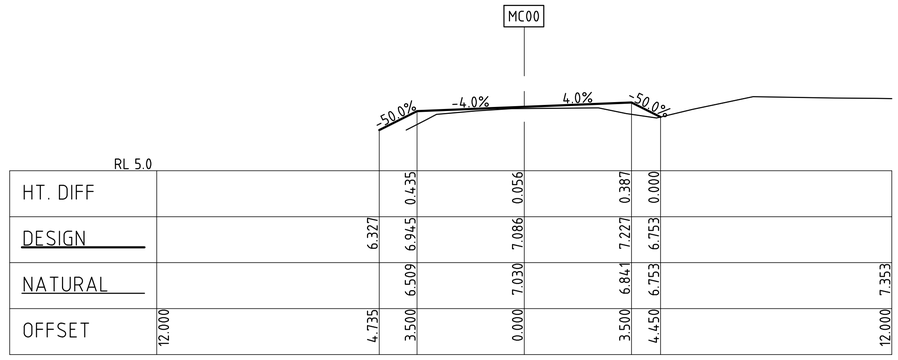
BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN

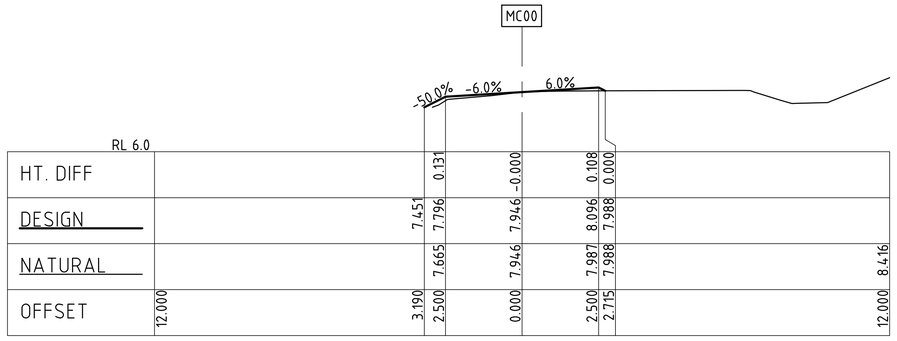
ROAD DESIGN-CROSS SECTIONS SHEET B

DRAWING SET No BKP311-RVC
BRIDGE No DRG-05
ISSUE STATUS DETAIL DESIGN
ISSUE 2 No SHEETS 8 SHEET No 05



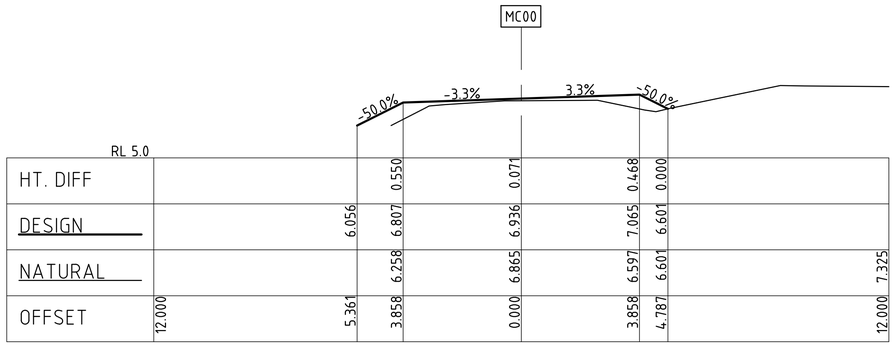
RL 5.0										
HT. DIFF			0.435		0.056		0.387	0.000		
DESIGN		6.327	6.945		7.086		7.227	6.753		
NATURAL			6.509		7.030		6.841	6.753		7.353
OFFSET	12.000	4.735	3.500		0.000		3.500	4.450		12.000

200.000



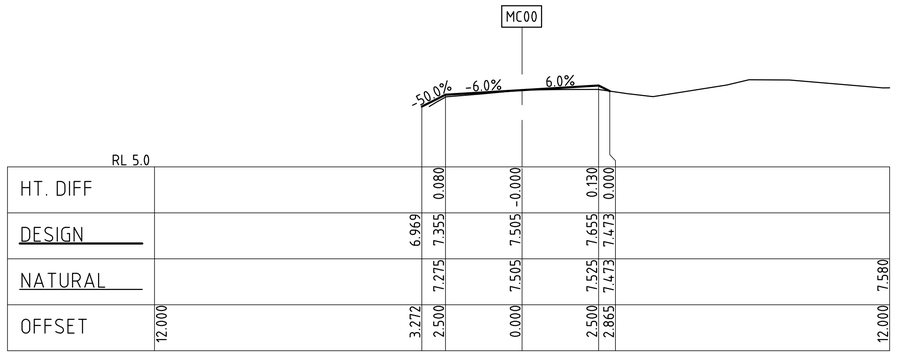
RL 6.0										
HT. DIFF			0.131		-0.000		0.108	0.000		
DESIGN		7.451	7.796		7.946		8.096	7.988		
NATURAL			7.665		7.946		7.987	7.988		8.416
OFFSET	12.000	3.190	2.500		0.000		2.500	2.715		12.000

220.000



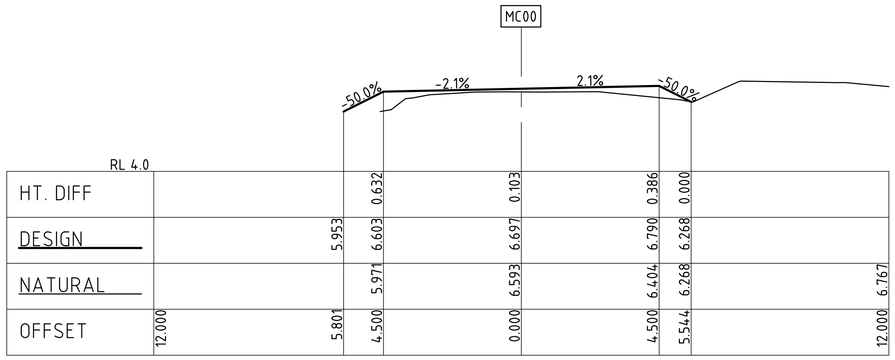
RL 5.0										
HT. DIFF			0.550		0.071		0.468	0.000		
DESIGN		6.056	6.807		6.936		7.065	6.601		
NATURAL			6.258		6.865		6.597	6.601		7.325
OFFSET	12.000	5.361	3.858		0.000		3.858	4.787		12.000

196.421



RL 5.0										
HT. DIFF			0.080		-0.000		0.130	0.000		
DESIGN		6.969	7.355		7.505		7.655	7.473		
NATURAL			7.275		7.505		7.525	7.473		7.580
OFFSET	12.000	3.272	2.500		0.000		2.500	2.865		12.000

210.000



RL 4.0										
HT. DIFF			0.632		0.103		0.386	0.000		
DESIGN		5.953	6.603		6.697		6.790	6.268		
NATURAL			5.971		6.593		6.404	6.268		6.767
OFFSET	12.000	5.801	4.500		0.000		4.500	5.544		12.000

190.000

GENERAL NOTES

SCALE 0 2500 5000mm (1000) OR AS SHOWN.

DIMENSION IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

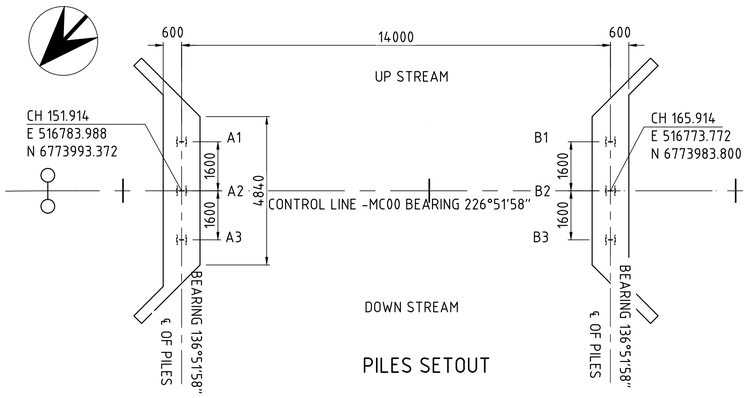
	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

PREPARED BY
bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
C. RILEY
BRIDGE ENGINEER

Richmond Valley Council
RICHMOND VALLEY COUNCIL

BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN
ROAD DESIGN-CROSS SECTIONS SHEET C

DRAWING SET No	BKP311-RVC
BRIDGE No	DRG-06
ISSUE STATUS	DETAIL DESIGN
ISSUE 2	No SHEETS 8 SHEET No 06



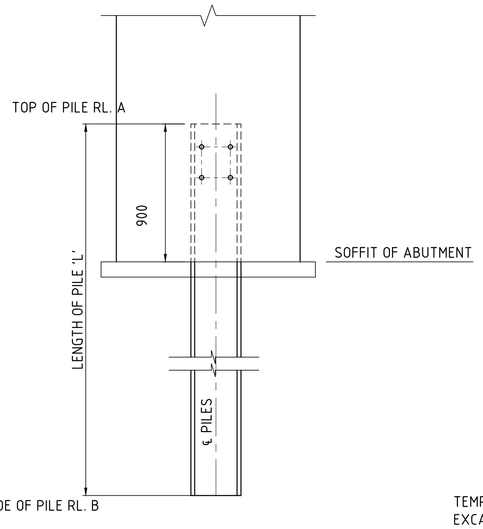
PILES SETOUT

TABLE 1 - PILE DATA

BOREHOLE	PILE No	APPROXIMATE PILE LEVELS		ESTIMATE LENGTH (m)	MINIMUM PILE LENGTH L (m)	MAXIMUM DESIGN AXIAL LOAD (KN)		MAXIMUM DESIGN BENDING MOMENT (kNm)	PILE SIZE
		TOP OF PILE LEVEL RL. A(m)	PILE TOE LEVEL RL. B(m)			ULS	SLS		
BH1 (N)	A-1	4.536	-14.0	18.536	7.8	969	621	326	310UC137
	A-2	4.488	-14.0	18.488	7.8				
	A-3	4.440	-14.0	18.440	7.8				
BH2 (S)	B-1	4.688	-13.0	17.688	7.8	969	621	326	310UC137
	B-2	4.640	-13.0	17.640	7.8				
	B-3	4.592	-13.0	17.592	7.8				

TABLE 2 - FOUNDING MATERIAL

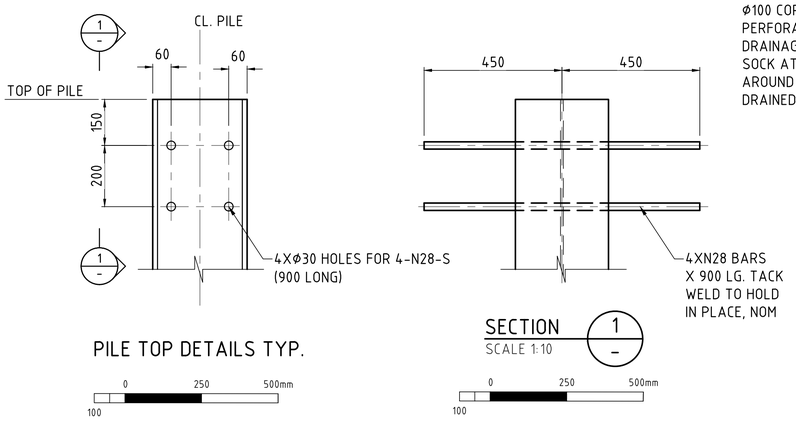
LOCATION	LAYER DESCRIPTION	THICKNESS (mm)	DESIGN PARAMETERS	
			ULTIMATE SHAFT ADHESION (kPa)	ULTIMATE END BEARING (kPa)
BH1 (N)	FILL	2600	10	-
	SAND AND CLAY SAND LOOSE TO MEDIUM DENSE	4800	25	-
	SANDY CLAY FIRM	2600	20	-
	SAND, DENSE TO VERY DENSE	10400	50	4000
	SANDY CLAY, STIFF TO VERY STIFF	>550	35	900
BH2 (S)	FILL	1800	10	-
	SAND AND CLAY SAND LOOSE TO MEDIUM DENSE	5500	25	-
	SANDY CLAY FIRM	1200	20	-
	SAND, DENSE TO VERY DENSE	>10450	50	4000



TYPICAL ELEVATION OF ABUTMENT PILE

FOR VALUES 'L' RL. A & RL. B - REFER TABLE 1

0 500 1000mm
200

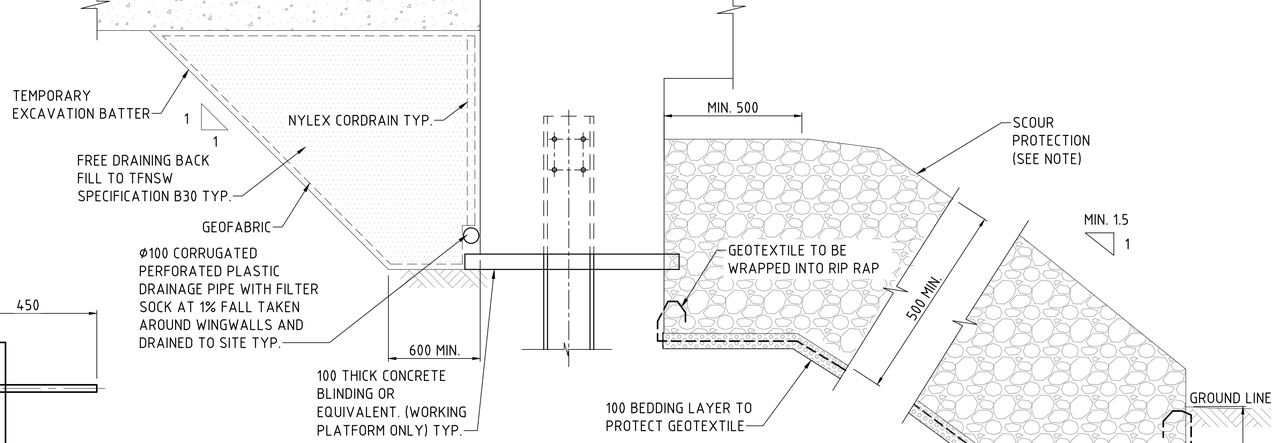


PILE TOP DETAILS TYP.

0 250 500mm
100

SECTION 1 - SCALE 1:10

0 250 500mm
100



TYPICAL EARTH WORKS SECTION

NOT TO SCALE

GENERAL NOTES

SCALE 0 1 2 3 4 5m (1) OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.

PILE NOTES

DIMENSION IN MILLIMETERS
CHAINAGES & REDUCED LEVELS ARE IN METERS AND BASED ON PROVIDED SURVEY
ALL PILES ARE TO CONFORM TO TFNSW SPECIFICATION B53.
ALL PILES SHALL BE DRIVEN TO REFUSAL ON DENSE TO VERY DENSE SAND LAYER, PDA TEST TO VERIFY RESISTANCE AND SHAFT FRICTION.
PILE DETAILS AND FOUNDING MATERIAL PROPERTIES HAVE UTILIZED INFORMATION PROVIDED IN GEOTECHNICAL INVESTIGATION REPORT.
PDA TESTING SHALL BE UNDERTAKEN AND CONDUCTED ON THE NOMINATED TEST PILE FOR EACH ABUTMENT AND PIER. AN INCREASED GEOTECHNICAL REDUCTION FACTOR OF 0.78 HAS BEEN ADOPTED.
THE PILE TOE LEVEL SHALL BE AS INDICATED ON THE DRAWING OR AS DETERMINED FROM THE REPRESENTATIVE PILE, WHICHEVER IS LOWER.
IF THE REPRESENTATIVE PILE INDICATES THAT THE TOE OF THE PILE COULD BE LIFTED, THE DESIGNER SHALL BE CONSULTED WITH PRIOR TO LIFTING TOE LEVEL.
PILES SHALL BE CONSTRUCTED WITHIN +/- 75MM IN PLAN FROM THE DESIGN POSITION.
CONTRACTOR SHALL UNDERTAKE THEIR OWN DRIVEABILITY ANALYSIS PRIOR TO PILE DRIVING.
BUTT WELDS SHALL BE FULL PENETRATION, SP CATEGORY, AND CONFORM TO AS/NZS 1554.1 AND RMS SPECIFICATION B204.
HOLES FOR WEB REINFORCEMENT TO BE DRILLED OR FLAME CUT ON SITE.
DRIVING STRESSES SHALL NOT EXCEED 0.9 FSY (OR 0.8 FSY DURING SUSTAINED HARD DRIVING)
STEEL UC PILES SHALL BE GRADE 300 TO AS/NZS 3679.1.
FABRICATION OF STEELWORK SHALL BE IN ACCORDANCE WITH TfNSW SPECIFICATION B201.
GEOTECHNICAL SUBSURFACE LAYERS AT PIER LOCATION HAVE BEEN ESTIMATED BY INTERPOLATING BETWEEN BOREHOLES. THE ESTIMATED LAYERS AND DEPTHS MAY VARY.

SCOUR PROTECTION NOTES

SCOUR PROTECTION TO BE RIP RAP ROCK FACING AT ABUTMENT EMBANKMENTS AND TO MEET THE FOLLOWING REQUIREMENTS AS A MINIMUM:

- BE HARD, DENSE, DURABLE, ANGULAR, AND RESISTANT TO WEATHERING
- EXTEND IN WIDTH TO BE AT LEAST 2m FROM ABUTMENT EDGES AND TO BOTTOM OF EMBANKMENT
- BE PLACED IN A LAYER OF MINIMUM 500mm THICKNESS
- ROCK TO HAVE A MIN. D50 OF 300mm
- ROCK TO BE WELL GRADED THROUGHOUT THE RIP RAP LAYER. STONE SIZES ARE DEPENDENT ON THE D50 SIZE WITH D90 EQUAL TO 1.4xD50, AND D10 EQUAL TO 0.5xD50. D10 ROCK NOT TO EXCEED 20% OF WEIGHT OF EACH LOAD.
- GEOTEXTILE FABRIC SHALL BE PLACED UNDER ROCK IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION AND BE BIDIM A39 OR APPROVED EQUIVALENT.
- DURING CONSTRUCTION OF THE SCOUR PROTECTION, GEOTEXTILE SHALL BE FOLDED OVER EDGE OF ROCK TO MAXIMISE THE CONTACT AREA BETWEEN ROCK AND THE GEOTEXTILE.

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

PREPARED BY
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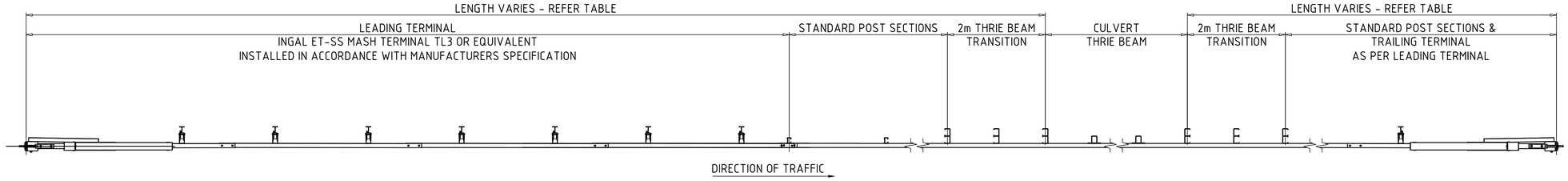
Richmond Valley Council
RICHMOND VALLEY COUNCIL

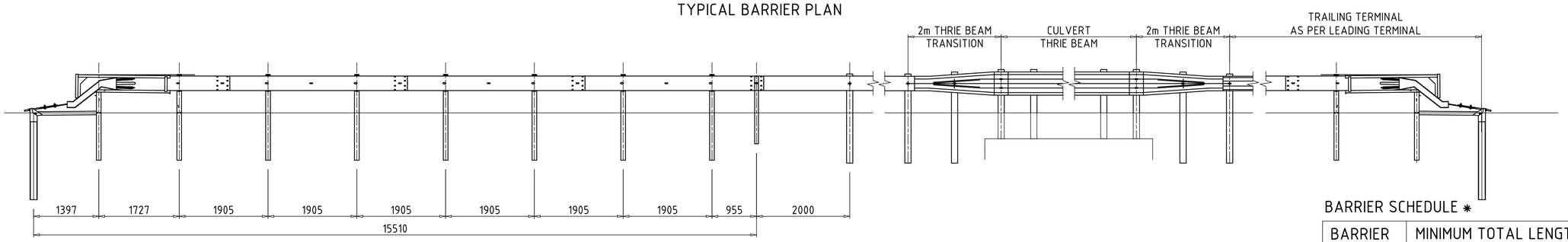
BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN

PILES AND SCOUR PROTECTION DETAILS

DRAWING SET No	BKP311-RVC
BRIDGE No	DRG-007
ISSUE STATUS	DETAIL DESIGN
ISSUE	2
No SHEETS	8
SHEET No	07



TYPICAL BARRIER PLAN

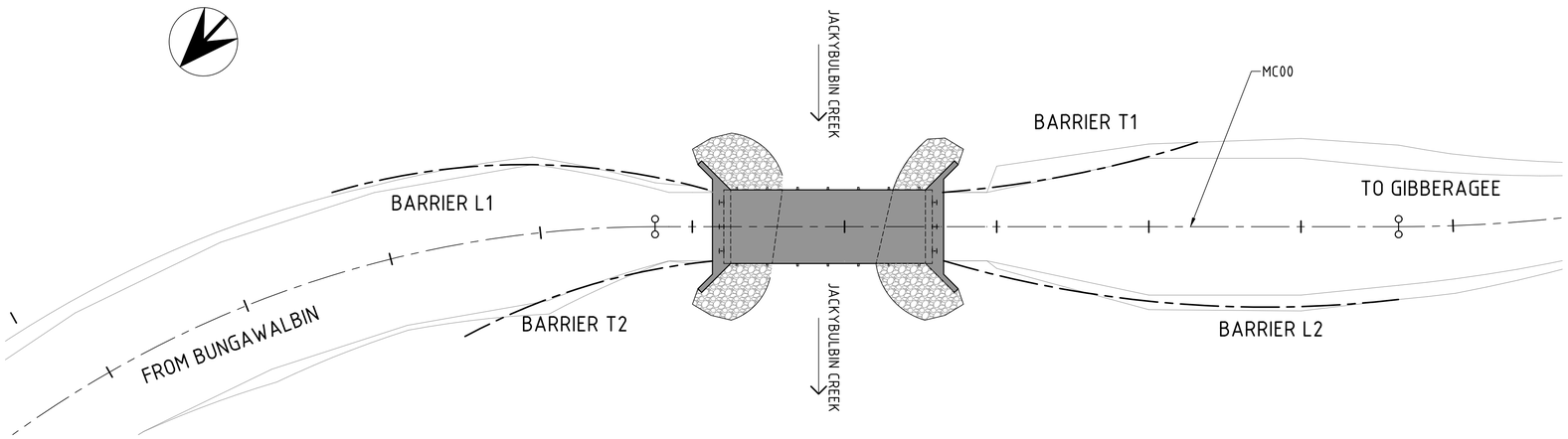


TYPICAL BARRIER ELEVATION

0 1000 2000mm
500

BARRIER SCHEDULE *

BARRIER	MINIMUM TOTAL LENGTH OF BARRIER (mm)
L1	30
T1	17
L2	30
T2	17



BARRIER PLAN

GENERAL NOTES

SCALE 0 5000 10000mm (2000) UNLESS SPECIFIED OTHERWISE.

DIMENSION IN MILLIMETRES
CHAINAGES AND REDUCED LEVELS ARE IN METERS AND BASED ON PROVIDED SURVEY.

NOTES

1. SAFETY BARRIER APPROACH AND DEPARTURE TERMINALS TO BE IN ACCORDANCE WITH INGAL ET-SS MASH TERMINAL TL3 PRODUCT AND INSTALLATION MANUAL.
2. SAFETY BARRIER W BEAM TO THRIE BEAM TRANSITION REFER STD. DRG. R0710-07 SHEET 2.
3. REFER RMS STD. DRG. R710-01 FOR STANDARD POST LENGTHS.
4. UNDER THE CIRCUMSTANCES OF HARD DRIVING CONDITIONS, POST HOLES TO MIN. DEPTH OF 1.2m MAY BE BORED AS PER RMS STD. R0710-24.
5. FACE OF BARRIERS SHALL BE OFFSET TO EDGE OF TRAVEL LANE BY A MINIMUM 610mm
6. TWO WAY REFLECTORS ARE REQUIRED ON GUARD RAILS AT A MINIMUM SPACING OF 10m TYPICALLY.
7. BARRIER LENGTHS BASED ON 40 km/h DESIGN SPEEDAND INGAL ET-SS MASH TERMINAL TL3 LEADING AND TRAILING TERMINALS, HOWEVER OTHER BARRIERS MAY BE USED WITH APPROVAL OF PRINCIPAL.

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
2	15/03/2022	50% DESIGN - REALIGNED FROM CONCEPT	JR	CR	PM
1	24/02/2022	CONCEPT DESIGN	FC	CR	PM

	PREPARED	CHECKED
DESIGN	AS	CR
DRAWING	JR	CR

PREPARED BY
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C. RILEY
BRIDGE ENGINEER

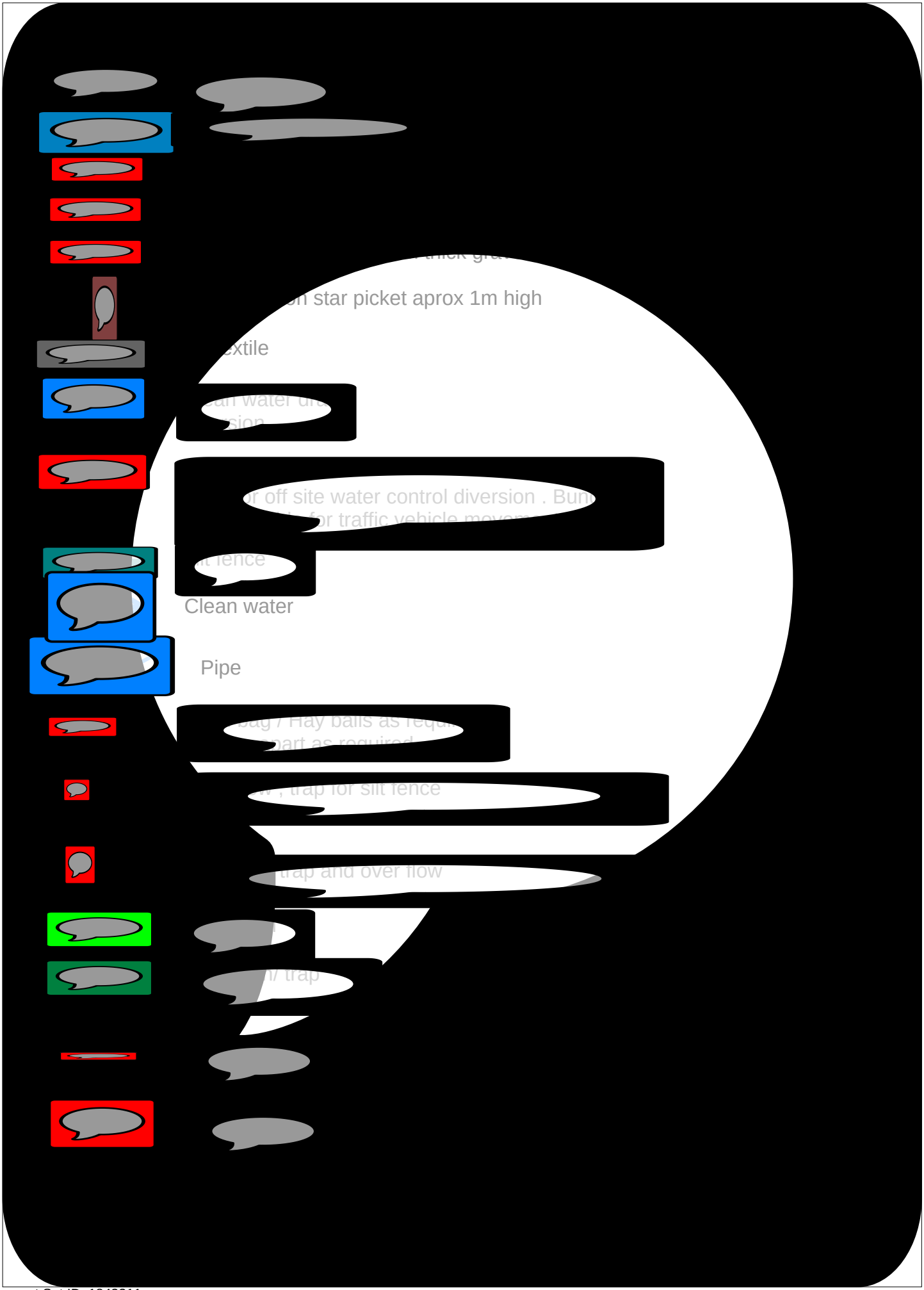
Richmond Valley Council
RICHMOND VALLEY COUNCIL

BUNGAWALBIN-WHIPORIE ROAD RICHMOND VALLEY COUNCIL
BRIDGE OVER JACKYBULBIN CREEK
AT 5.2km SOUTH OF BUNGAWALBIN

BARRIER DETAILS

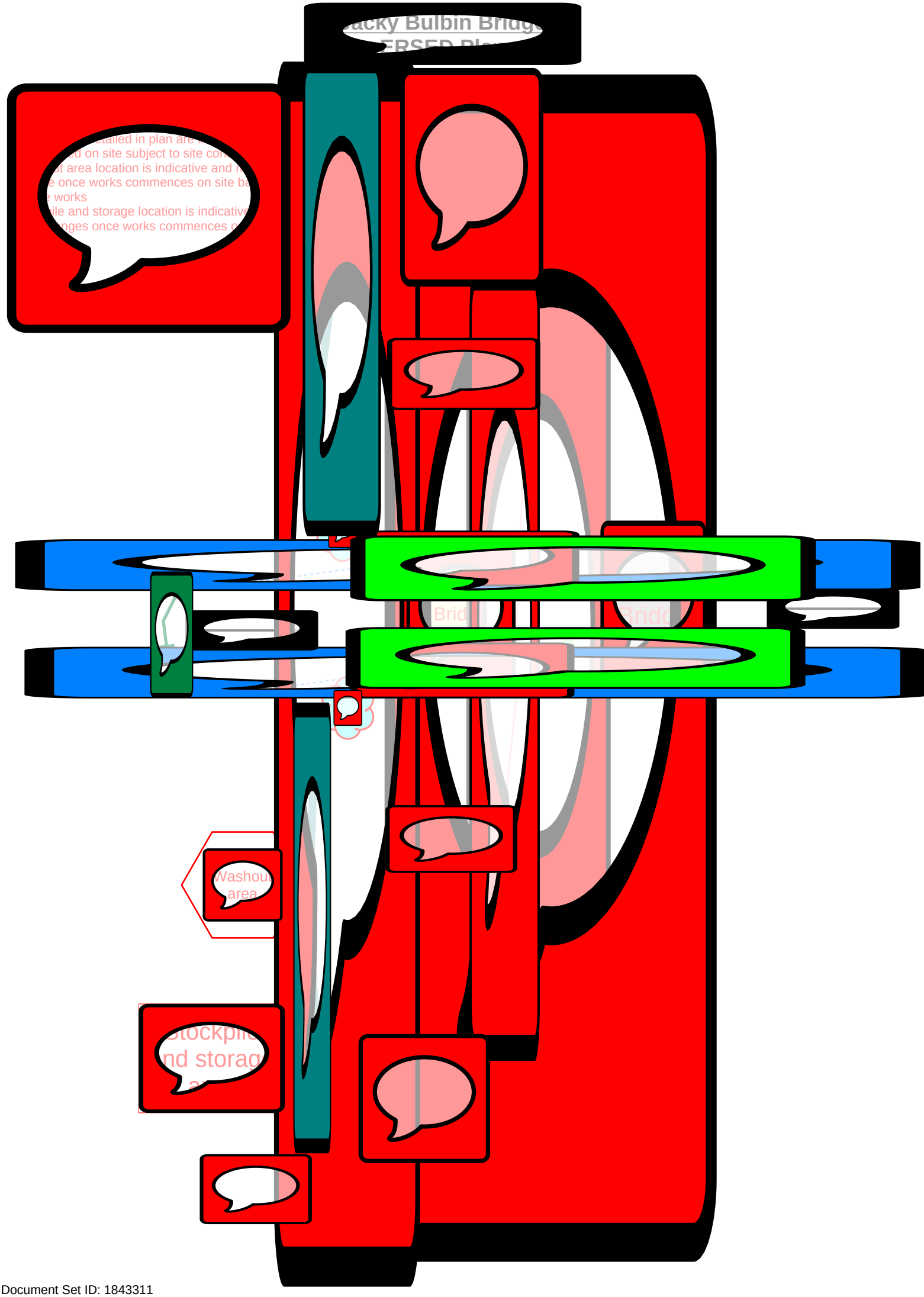
DRAWING SET No BKP311-RVC
BRIDGE No DRG-08
ISSUE STATUS DETAIL DESIGN
ISSUE 2 | No SHEETS 8 | SHEET No 08

Document Set ID: 1843311
Version: 1, Version Date: 02/05/2023



Ge

per Blue Book Standard
range and vary subject to water flow
o be used for construction of the crossing
d and fenced. (eg. flagging)
g to be constructed as per temporary design
ry controls include but not limited to:
diversion bunds
, sediment traps
drow sediment traps.
unds or mitre drains off access track
sediment fences
fabric linings, silt fence / surface protection (as required).
rty' water catch drains - clear, grub and strip topsoil prior to full mainline ac
es to be contained and bunded as required
nd oil boom installed in cause ways
e available on site
ds, sandbags can be used as part of sediment controls
atchment areas are not possible to be managed of installed, Ge
m 11 can be used as a temporary control measure

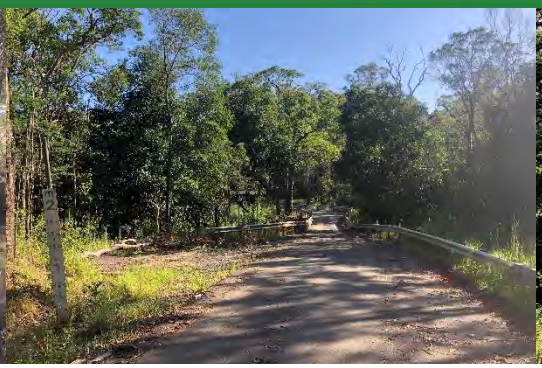
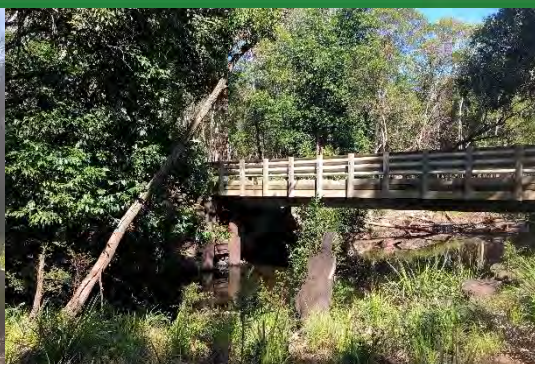


Appendix B – Biodiversity Assessment Report

Biodiversity Assessment Report

Jacky Bulbin Bridge Replacement

Quality solutions. Sustainable future.

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Prepared for: Envirocivil Consultants Pty Ltd

UPR	Description	Issued By	Date Issued
4491-1003	Version 1	Jessica O'Leary	10/02/2023
4491-1004	Version 2	Jessica O'Leary	16/02/2023

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Executive Summary

This Biodiversity Assessment was completed to assess the potential biodiversity impacts of proposed bridge construction, removal of Jacky Bulbin Bridge, road construction and road re-alignment. These works are to be located within the road reserve of Bungawalbin-Whiporie Road within the Richmond Valley Council (RVC) Local Government Area. Should any works be required within State Forest land tenure, this will be managed by RVC. This assessment will support a Review of Environmental Factors prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* to be prepared by EnviroCivil Consultants on behalf of Engineering and Civil Contractors.

Results of field assessment are as follows:

- No threatened flora species were recorded at the site.
- Vegetation at the site is characteristic of Plant Community Type 3102 *Northern Lowland Swamp Turpentine Wet Forest* which is consistent with both the *Environment Protection and Biodiversity Conservation Act 1999* listed threatened ecological community (TEC) *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and the *Biodiversity Conservation Act 2016* listed *TEC Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Approximately 0.1334 ha of this community will be affected by the Activity.
- Jacky Bulbin Bridge supports low-quality potential opportunistic microbat roost habitat. No microbats or evidence of use by microbats was recorded within the bridge.
- The site provides suitable habitat for a range of locally occurring fauna species including threatened fauna.

Review of statutory instruments relevant to the Activity was completed as follows:

- ***Biodiversity Conservation Act 2016*:** The works (as proposed) are unlikely to significantly affect threatened species, their habitat or TECs listed in the BC Act.
- ***Environment Protection and Biodiversity Conservation Act 1999*:** The works are unlikely to significantly affect threatened species or communities listed in the EPBC Act.
- **State Environmental Planning Policy (Biodiversity Conservation) 2021: Chapter 3: Koala Habitat Protection:** Chapter 3 of SEPP (Biodiversity & Conservation) 2021 only applies to Part 4 development applications under the *Environmental Planning and Assessment Act 1979* (EP&A Act). As the proposal is an Activity under Part 5 of the EP&A Act, the Policy does not technically apply. It is Council's responsibility however, to consider environmental issues relating to their works to the fullest extent possible, including impacts on Koalas. An assessment of the impacts of the Activity on biodiversity (including Koalas) is provided in **Section 5.1**. Safeguards to minimise impacts on fauna, including the Koala, are provided in **Section 5.2.** No significant impact to Koala habitat is likely to result from the Activity. No primary or preferred Koala feed trees will be impacted by the Activity.
- ***Fisheries Management Act 1994*:** Department of Primary Industries (Fisheries) mapping identifies the Jackybulbin Creek as Key Fish Habitat, however it is not identified as threatened fish habitat. In accordance with Section 200 of the *Fisheries Management Act 1994*, A DPI Fisheries Permit is required when carrying out dredging and reclamation work on water land. The contractor will obtain a permit for dredge and reclamation work on water land/ key fish habitat prior to works commencing.

1. Introduction

1.1 The Site and Background

GeoLINK has been engaged to prepare a Biodiversity Assessment to assess the biodiversity values of the area associated with Jacky Bulbin Bridge Replacement works (the Activity). The site is within the existing road reserve of Bungawalbin-Whiporie Road (refer to **Plate 1.1** and **Illustration 1.1**). The site is located within Richmond Valley Council (RVC) Local Government Area (LGA). Should any works be required within State Forest land tenure, this will be managed by RVC. The Biodiversity Assessment has been completed to support a Review of Environmental Factors (REF) to be prepared by EnviroCivil Consultants for upcoming bridge replacement works. The works comprise:

- Establishment of a site compound and material laydown areas within the road corridor (refer to **Plate 1.2**). A shipping container will be placed west of the road within an existing clearing.
- Removal of native vegetation and trimming of overhanging branches to facilitate crane movements, bridge construction and earthworks for the new road tie-in and removal of the old road and bridge.
- The new bridge constructed off-line from the existing bridge.

Construction of the new bridge will comprise:

- Installation of erosion and sediment controls (silt curtains parallel to both abutments/ banks) and oil booms.
- Slip remediation on the south-western side of the existing bridge (to be the new southern bridge abutment).
- Installation of driven sheet piles and construction of abutments and rock pads.
- Install of 'in-quick' pre-form bridge deck and cast concrete in-situ once deck is placed on abutments
- Remove existing bridge deck once new bridge is complete.
- Retain existing scour rock and place additional scour rock along the creek banks.
- Remove and remediate existing road approaches.
- Remove erosion and sediment controls and oil boom at completion of works.

The bridge and road replacement works are expected to take four months to complete.

This assessment has been prepared to:

- Identify removal of native vegetation/ habitat required for the Activity including any significant trees or fauna habitat features of biodiversity importance.
- Identify if habitat for threatened species or communities listed in the *Biodiversity Conservation Act 2016* (BC Act), *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Fisheries Management Act 1994* (FM Act) is present at the site, and whether it will be impacted by the Activity.
- Examine the Activity against relevant statutory requirements.

The bridge concept design supplied by Engineering and Civil Contractors is provided in **Appendix A**.

0 4 km

Site Locality - Illustration 1.2

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: JOL
Source of base data: Department of Customer Service
Date: 2/02/2023

Plate 1.1 View north of Jacky Bulbin Bridge over Jackybulbin Creek

Plate 1.2 View west of the proposed site compound location and material laydown area (yellow polygon) south of Jacky Bulbin Bridge

2. Methodology

2.1 Desktop Review

The following desktop review was completed on 13 January 2023 within a 10 km radius from the site:

- A search of the BioNet Wildlife Atlas.
- A search of the Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES).
- Review of Key Fish Habitat mapping and data in the Fisheries Spatial Data Portal.

Results of database searches are attached at **Appendix B**.

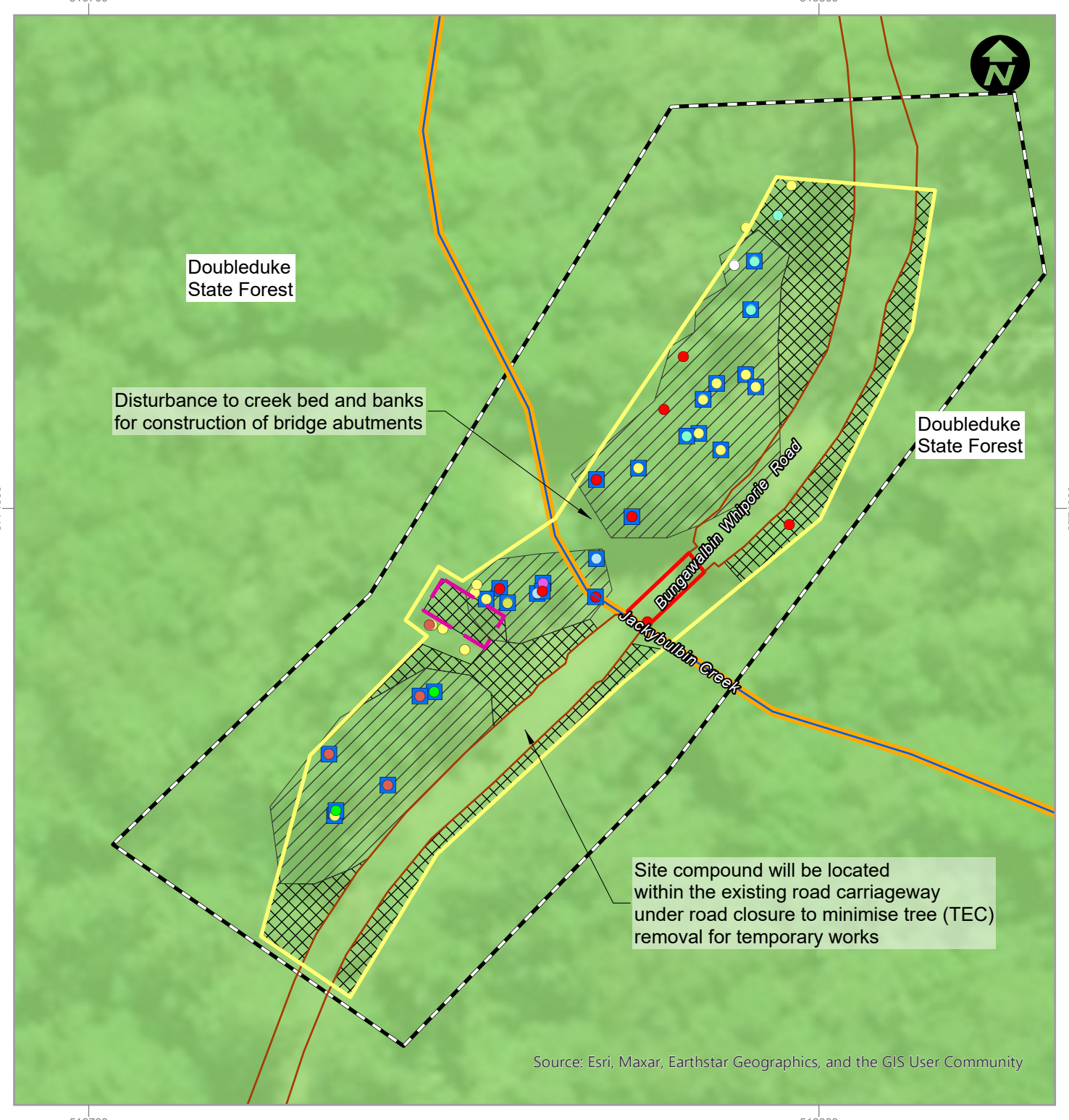
2.2 Field Assessment

Field assessment was completed by GeoLINK ecologist Jessica O'Leary on 19 January 2023 (for a total of 2.5 person hours of survey effort). Survey methodology included:

- Random meander to identify vegetation types and habitat for threatened flora or communities listed in the BC Act or EPBC Act.
- Identification of hollow-bearing trees (or other significant habitat features).
- Inspection of the bridge structure for the presence of, or evidence of use by microbats.
- Koala scat searches beneath feed trees generally in accordance with the Spot Assessment Technique (Philips & Callaghan, 2011).
- Identification of native vegetation requiring removal for the works.
- Recording significant features and trees to be removed with GPS.

The survey footprint comprised:

- The bridge and road replacement footprint plus a 20 m buffer around this area.
- Areas nominated for site compound or material laydown and plant parking (refer to **Illustration 2.1**).



LEGEND

- Extent of works
- Survey area
- Vegetation impact area
- Ground disturbance area - dominated by introduced grasses and roadside weed
- Existing bridge
- PCT 3102 - Northern Lowland Swamp Turpentine Wet Forest (Subtropical Coastal Floodplain Forest TEC)
- Site for container placement (no tree removal required)
- Watercourse
- Key fish habitat
- Existing road and bridge alignement

- Tree to be removed
- *Angophora woodsiana*
- Pink Bloodwood
- Willow Bottlebrush
- Grey Ironbark
- Snow in Summer
- Stag
- Swamp Turpentine
- Water Gum
- Weeping Lilly Pilly

0 10 Metres

Biodiversity Features - Illustration 2.1

GeoLINK environment | engineering | planning | design

Jacky Bulbin Bridge Replacement Biodiversity Assessment Report
4491-1002

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: JOL
Source of base data: ESRI World Imagery
Date: 16/02/2023

3. Vegetation

3.1 Desktop Analysis

3.1.1 Database Search Results

BioNet search results identified records of eight threatened flora species and potential habitat for 12 threatened ecological communities listed under the BC Act within the search area. PMST results identified potential habitat for 23 threatened flora species and four threatened ecological communities (TECs) within the search area. Search results are provided at **Appendix B**.

3.1.2 Vegetation Mapping

NSW State Vegetation Type Map (SVTM) maps the vegetation at the site as Plant Community Type (PCT) 3102 *Northern Lowland Swamp Turpentine Wet Forest* (refer to **Illustration 2.1**). Vegetation at the site is part of a broader mapped area of PCT 3102 which extends over 1,242 ha within a 10 km radius of the site.

3.2 Site Features

3.2.1 Vegetation Communities

Field assessment confirms vegetation within and adjacent to the site is consistent with the SVTM PCT 3102 *Northern Lowland Swamp Turpentine Wet Forest*.

Vegetation at the site and immediately adjacent to the survey area comprises riparian forest dominated by Swamp Turpentine (*Lophostemon suaveolens*), Weeping Lilly Pilly (*Waterhousea floribunda*), Water Gum (*Tristaniopsis laurina*), Snow-in-Summer (*Melaleuca linariifolia*), Cheese Tree (*Glochidion ferdinandi*), Willow Bottlebrush (*Callistemon salignus*), Blackwood (*Acacia melanoxylon*), Red Ash (*Alphitonia excelsa*) with occasional Forest Oak (*Allocasuarina torulosa*) and Creek Sandpaper Fig (*Ficus coronata*). Grey Ironbark (*Eucalyptus siderophloia*), *Angophora woodsiana*, Pink Bloodwood (*Corymbia intermedia*) and Forest Red Gum (*Eucalyptus tereticornis*) occur at greater abundance at higher elevation from the creek. Mid-storey species comprise Rose Walnut (*Endiandra discolor*), Rough Fruit Pittosporum (*Pittosporum revolutum*) and Green Wattle (*Acacia irrorata*). Native groundcover and vines comprise Creek Mat-rush (*Lomandra hystrix*), Pale Knotweed (*Persicaria lapathifolia*), Couch Grass (*Cynodon dactylon*), Wiry Panic (*Entolasia stricta*), Scrambling Lily (*Geitonoplesium cymosum*), Snake Vine (*Stephania japonica*), Blady Grass (*Imperata cylindrica*) and Lawyer Vine (*Smilax australis*). While the abovementioned native species occur within the groundcover, the groundcover stratum is dominated by exotic species including Pigeon Grass (*Setaria sphacelata*), Annual Ragweed (*Ambrosia artemisiifolia*), Fleabane (*Conzya* spp.), Farmers Friends (*Bidens pilosa*), Purpletop (*Verbena bonariensis*), Paddy's Lucerne (*Sida rhombifolia*), Broad-leaved Paspalum (*Paspalum mandiocanum*) and Columbian Waxweed (*Cuphea carthagenensis*).

The site compound is proposed within a previously cleared area within the road reserve and an adjacent cleared area where the majority of native groundcover has been previously disturbed or is absent.

Photographs of vegetation at site are shown in **Plates**Plate 3.1 to **Plate** 3.4.

Plate 3.1 View north of Jacky Bulbin Bridge and riparian vegetation west of bridge to be removed (yellow polygons)

Plate 3.2 View east of riparian vegetation upstream of Jacky Bulbin Bridge (blue polygon indicates new bridge alignment)

Plate 3.3 View south of Jacky Bulbin Bridge and vegetation west of bridge to be removed (vegetation in yellow polygons to be pruned)

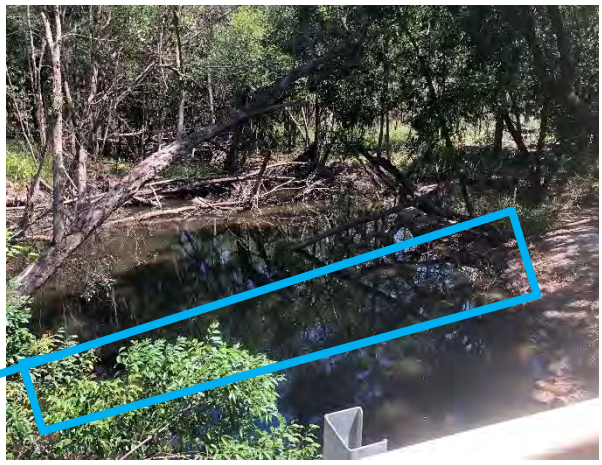


Plate 3.4 View west (upstream) of Jacky Bulbin Bridge (blue polygon indicates new bridge alignment)

3.2.2 Vegetation Condition

The site has been previously disturbed as part of the existing Jacky Bulbin Bridge and road construction, off road parking bay and routine maintenance activities. The site is located within a forested landscape which has been historically/ selectively logged and borders Doubleduke State Forest. Vegetation within and adjacent to the site is part of a riparian corridor which comprises moderate native species diversity and is dominated by mature native vegetation. The canopy and mid-storey strata are dominated by native trees and shrubs however the groundcover is dominated by introduced pasture grasses and roadside weed species. No large old growth hollow-bearing trees occur within or immediately adjacent to the site.

3.2.3 Threatened Flora

No threatened flora species listed under the BC Act and/ or EPBC Act were recorded at the site.

Marginal habitat for *Paspalidium grandispiculatum* occurs at the site however, due to the large number of local records of *Paspalidium grandispiculatum* within 1 km from the site and dense groundcover of introduced pasture grasses, the potential for the species to occur at the site undetected is low but possible. Refer to threatened flora potential occurrence assessment in **Appendix C**.

A test of significance (as per Section 7.3 of the BC Act) has been completed for this species on a precautionary basis (refer to **Appendix E**). The test of significance concluded that the population and habitat for this species would be unlikely to be significantly affected by the Activity.

3.2.4 Threatened Ecological Communities

Vegetation at the site is consistent with both the EPBC Act listed TEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and the BC Act listed TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*.

Based on the SVTM, this community is locally common. The SVTM maps the following PCTs characteristic of Subtropical Coastal Floodplain Forest and recorded as associated with this TEC, within a 10 km radius of the site:

- PCT 3102 - Northern Lowland Swamp Turpentine Wet Forest - 1,242 ha
- PCT 3428 - Northern Lowland Red Gum-Swamp Turpentine Grassy Forest - 3,796 ha
- PCT 4045 - Northern Lowland Swamp Turpentine-Paperbark Forest - 859 ha
- PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest – 3,170 ha.

The combined area of PCTs characteristic of the TEC extends over 9,067 ha within a 10 km radius of the site. The proposed bridge replacement and road construction works require removal of 23 trees (or 0.1334 ha) from this TEC equating to removal of 0.0014 percent of the mapped TEC within the locality.

Minor trimming of overhanging branches over the existing road will also be required to facilitate crane movements when the existing bridge deck is removed.

A test of significance (as per Section 7.3 of the BC Act) has been completed for Subtropical Coastal Floodplain Forest TEC (refer to **Appendix E**). The test of significance concluded that Subtropical Coastal Floodplain Forest would be unlikely to be significantly affected by the Activity.

3.2.5 Priority Weeds

As described in **Section 3.2.1** the groundcover at the site comprises both native and introduced species. No priority listed species under the *Biosecurity Act 2015* were recorded at the site. All abovementioned weed species have a General Biosecurity duty under the *Biosecurity Act:*

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

4. Fauna Habitat

4.1 Desktop Analysis

4.1.1 Database Search Results

BioNet search results identified records of 31 threatened fauna species listed under the BC Act within the search area. PMST search results identified potential habitat for 28 threatened fauna species and seven terrestrial migratory species within the search area. Search results are provided at **Appendix B**.

Department of Primary Industries (Fisheries) mapping identifies the Jackybulbin Creek as Key Fish Habitat, however it is not identified as threatened fish habitat.

In accordance with Section 200 of the *Fisheries Management Act 1994*, A DPI Fisheries Permit is required when carrying out dredging and reclamation work on water land. The contractor would obtain a permit for dredge and reclamation work on water land/ key fish habitat prior to works commencing.

4.2 Site Features

4.2.1 Significant Habitat Features

The vegetation on site forms part of a continuous riparian corridor along Jackybulbin Creek within a forested floodplain landscape. The riparian forest and aquatic habitat at the site provides habitat for a range of fauna species, including but not limited to:

- Flowering and fruiting species provide nectar and fruit resources for birds, flying-foxes, arboreal mammal species and invertebrates.
- The vegetation structure provides aerial foraging resources for insectivorous microbats and birds.
- Occasional browse and refuge trees species suitable for Koala occur at the site. The preferred Koala feed tree, Forest Red Gum, occurs adjacent to the site but not within the site and no preferred Koala feed trees will be impacted by the Activity.
- Leaf litter, loose topsoil and fallen timber provide habitat for a range of ground dwelling species including reptiles, amphibians, birds and small mammals.
- Aquatic habitat associated with the waterway provides potential foraging habitat for Southern Myotis (*Myotis macropus*).
- Aquatic habitat associated with the waterway provides potential breeding and foraging habitat for frogs and reptiles.
- The bridge structure provides only low-quality opportunistic roosting habitat for microbats.
- No hollow-bearing trees occur at the site.
- No bird or raptor nests, Ringtail Possum dreys or termitaria were observed at the site.

4.2.2 Microbat Habitat

Jacky Bulbin Bridge comprises potential low-quality opportunistic roosting habitat for threatened microbat species including Southern Myotis, Little Bent-winged Bat and Large Bent-winged Bat which are known to roost in timber/ concrete bridge structures.

The bridge habitat can be categorised as low-quality on the following basis:

- The bridge provides few roosting opportunities; rotten timber poles beneath the southern abutment provide low quality cavities <50 mm deep and are exposed to rain and light, offering limited potential for breeding or over-wintering colonies of microbats.
- No microbats were recorded at the bridge during the site assessment. Important Southern Myotis roosts in bridge and culvert structures are occupied permanently.
- Lack of obvious signs of recent use such as guano or staining.

Despite the current bridge habitat being categorised as low-quality, consideration should be given to providing replacement microbat habitat within the new concrete bridge. In the context of the broader 'Fixing Country Bridges' and flood and disaster recovery projects and the replacement of a number of aging timber bridges in the locality, finding opportunities to improve the biodiversity value of the landscape is important in offsetting the cumulative loss of (potential and known) microbat roosting habitat within the LGA. Examples of permanent microbat habitat design features are provided in **Appendix F**. Should microbat habitat be installed in the replacement Jacky Bulbin Bridge, the final design would be agreed on between RVC and an ecologist with microbat experience prior to construction/ installation.

4.2.3 Connectivity and Key Habitat

The site does not occur within any regional or subregional wildlife corridors as per Scotts (2003). However, the site occurs within contiguous vegetation adjacent to the following two corridors (refer to **Figure 4.1**):

- Doubleduke State Forest Regional
- Bung-Bundj Regional (major east-west link) – focal species Brush-tailed Phascogale and Yellow-bellied Glider

The site offers connectivity values for a range of fauna species moving through the riparian vegetation as part of their home range. Good quality connectivity will be retained in surrounding vegetation at the site. The site contributes to local connectivity for fauna across the landscape however the relatively small area of vegetation to be removed will not significantly impact the connectivity values of the retained vegetation adjacent to the site.

The site is mapped as 'Key Habitat' as per Scotts (2003) (refer to **Figure 4.1**). Areas of Key Habitat are predicted as high conservation value fauna habitat and focal areas for habitat protection. Vegetation to be impacted as part of the Activity will be minor relative to the larger area of mapped Key Habitat beyond the site which will not be affected. Better-quality areas of habitat occur more broadly at the site and would comprise higher value habitat features such as hollow-bearing trees which do not occur at the site and will not be affected by the Activity. Vegetation removal will be kept to the minimal amount required to construct the new bridge and road alignment. No trees are to be removed for temporary works such as site compound or material laydown etc.

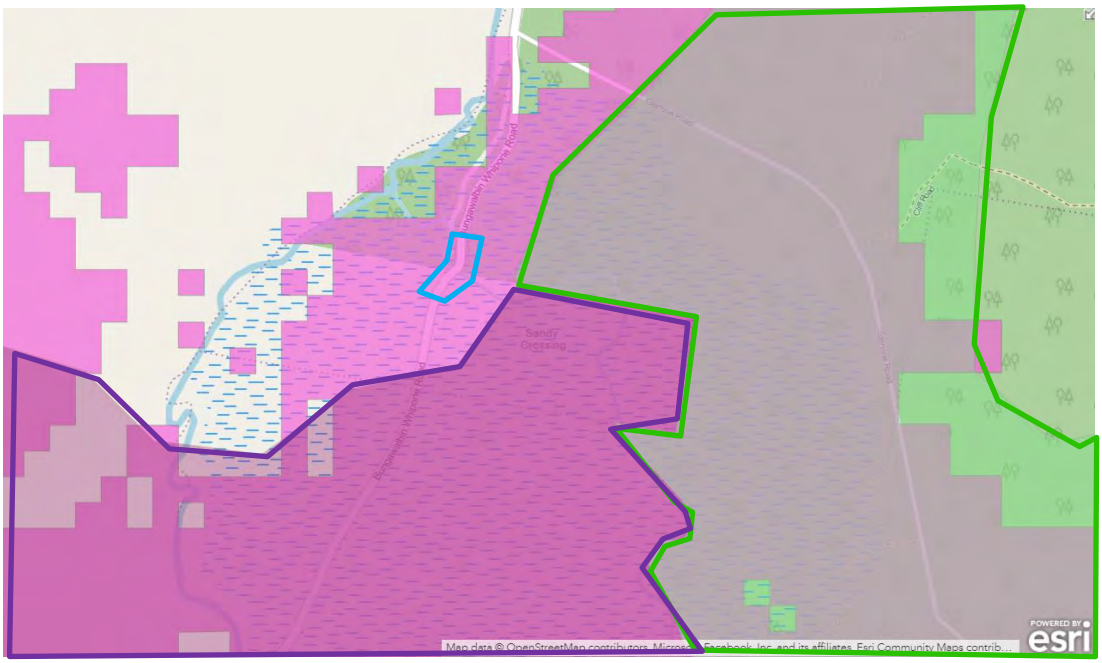


Figure 4.1 The site is shown in blue, NSW Key Fauna Habitat indicated in pink, Bung-Bundj Regional fauna corridor (purple polygon), Doubleduke State Forest Regional fauna corridor (green polygon)

4.2.4 Threatened Fauna

No threatened fauna species listed under the BC Act and/or EPBC Act were recorded at the site.

4.2.5 Potential for Threatened Species Occurrence

The site provides habitat features (eg. aquatic habitat, key foraging resources, low-quality roost habitat) that could be utilised by potentially occurring threatened fauna species listed either under the BC Act or the EPBC Act, or used opportunistically as foraging and/ or breeding habitat by several threatened fauna species (refer to **Appendix D**), including the following species:

Frogs

- Giant Barred Frog (*Mixophyes iteratus*)

Birds

- Bush Stone-curlew (*Burhinus grallarius*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA (*Dromaius novaehollandiae*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Square-tailed Kite (*Lophoictinia isura*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)

Mammals

- Hoary Wattled Bat (*Chalinolobus nigrogriseus*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*)
- Eastern Long-eared Bat (*Nyctophilus bifax*)
- Greater Glider (*Petauroides Volans*)
- Yellow-bellied Glider (*Petaurus australis australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Koala (*Phascolarctos cinereus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

Assessments of significance (five-part tests) were undertaken for these species in accordance with Section 7.3 of the BC Act (refer to **Appendix E**). Due to the relatively small quantity of mostly potential foraging habitat for the aforementioned species, the habitat removal/ disturbance associated with the Activity is not likely to result in a significant impact to the local population of these species.

Photographs of fauna habitat features are provided at **Plates Plate** 4.1 to **Plate** 4.4.

Plate 4.1 View beneath Jacky Bulbin Bridge of low-quality opportunistic microbat roost habitat

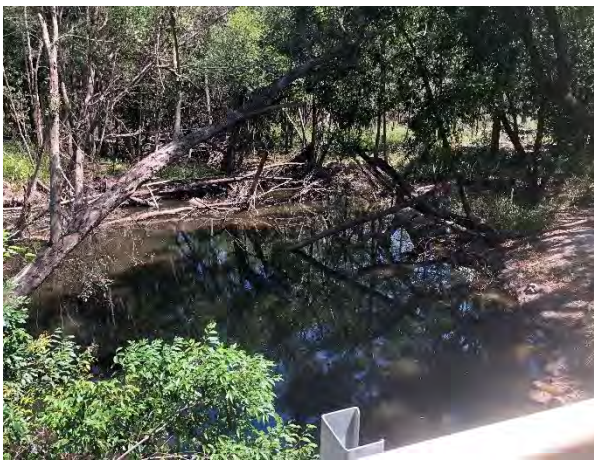


Plate 4.2 View east of Jacky Bulbin Bridge and potential foraging habitat for Southern Myotis

Plate 4.3 View west of potential Giant Barred Frog habitat - leaf litter habitat beneath vegetated riparian zone

Plate 4.4 View south of vegetation that provides foraging habitat for a range of threatened fauna species

5. Impacts and Mitigation

5.1 Potential Impacts of the Activity

Potential direct and indirect impacts from the Activity include:

- Direct removal and trimming of branches of 0.1334 ha of native riparian vegetation from *PCT 3102 - Northern Lowland Swamp Turpentine Wet Forest*, including removal of 23 native trees (refer to **Illustration 2.1** and **Table 5.1**):
    - 9 x Swamp Turpentine
    - 5 x Weeping Lily Pily
    - 1 x Willow Bottlebrush
    - 1 x Blackwood
    - 2 x Water Gum
    - 2 x *Angophora woodsiana*
    - 3 x Grey Ironbark
- Direct removal of vegetation (approximately 0.1334 ha) including trimming of branches from EPBC Act listed TEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and BC Act listed TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Removal of 0.1334 ha represents ~ 0.0014 percent of the overall mapped area for this community within the locality (9,067 ha within 10 km radius of the site) as per NSW SVTM.
- The Activity will impact a small area (approximately 60 m^2) of Jackybulbin Creek banks as part of bridge abutment construction works (as potential breeding and foraging habitat for Giant Barred Frog).
- Removal of the existing bridge structure directly impacts potential low-quality opportunistic threatened microbat habitat. However, due to the minimal roost opportunities (cracks, crevices), higher light levels, lack of evidence of use and absence of microbats, the bridge is not considered to be breeding or important habitat for microbats within the locality.
- No primary Koala feed trees as outlined in the Richmond Valley Koala Habitat Atlas will be impacted by the Activity. However, the site is part of the Banyabba Area of Regional Koala Significance (DPIE, 2020) and BioNet records show Koala activity within the locality. A Review of Koala Tree Use Across NSW (OEH, 2018) documents Grey Ironbark and Swamp Turpentine as 'documented irregular use' and Acacia species as 'documented low use' within the Richmond Valley LGA for the North Coast Koala Management Area. All other species are not recorded as use trees and no high or significant use trees for Koala will be impacted by the Activity.
- Direct mortality or injury to fauna during tree removal or ground disturbance.

Indirect impacts may include:

- Minor temporary impacts on water quality within the waterway from potential sediment runoff during installation of driven piles.
- The potential introduction or spread of pathogens (Chytrid) via introduction from plant and equipment.
- Habitat degradation of adjacent habitat due to potential clearing phase impacts (e.g. erosion and sedimentation impacts or chemical spills).

- Edge effects degrading habitat adjacent to the site. This impact is unlikely to be detrimental to the habitat value of adjacent habitat for a range of species given the location of the site within the road reserve (thus subject to existing edge effects).
- Unintentional damage to adjacent habitat during clearing.

Impacts are relatively low in a local context and may be managed with a relatively high confidence such that biodiversity impacts may be minimised with the implementation of safeguards.

Table 5.1 Tree Data

Tree ID Number	Common Name	Scientific Name	Diameter at Breast Height DBH (cm)	Remove or Retain	Easting	Northing	Comments
1	Swamp Turpentine	*Lophostemon suaveolens*	50	Remove	516787	6774008	
2	Swamp Turpentine	*Lophostemon suaveolens*	30	Remove	516790	6774018	
3	Swamp Turpentine	*Lophostemon suaveolens*	35	Remove	516786	6774017	
4	Swamp Turpentine	*Lophostemon suaveolens*	60	Remove	516784	6774015	
5	Swamp Turpentine	*Lophostemon suaveolens*	40	Remove	516784	6774010	
6	Stag	*n/a*	20	Remove	516782	6774010	
7	Swamp Turpentine	*Lophostemon suaveolens*	20	Remove	516791	6774017	
8	Swamp Turpentine	*Lophostemon suaveolens*	35	Remove	516775	6774006	
9	Weeping Lily Pily	*Waterhousia floribunda*	35	Remove	516770	6774004	
10	Weeping Lily Pily	*Waterhousia floribunda*	40	Remove	516774	6773999	
11	Stag	*n/a*	25	Remove	516791	6774027	
12	Stag	*n/a*	20	Remove	516791	6774034	
13	Snow in Summer	*Melaleuca linariifolia*	25	Retain	516792	6774033	
14	Swamp Turpentine	*Lophostemon suaveolens*	30	Retain	516790	6774039	
15	Stag	*n/a*	20	Retain	516794	6774040	
16	Swamp Turpentine	*Lophostemon suaveolens*	45	Retain	516796	6774044	
17	Weeping Lily Pily	*Waterhousia floribunda*	25	Retain	516779	6774014	Multi stem
18	Weeping Lily Pily	*Waterhousia floribunda*	30	Retain	516781	6774021	Multi stem
19	Weeping Lily Pily	*Waterhousia floribunda*	20	Retain	516793	6774000	Tree 19 represents three separate trees 1 x Weeping Lily Pily, 1 x Blackwood and 1 x Red Ash - all <20 cm dbh.
20	Weeping Lily Pily	*Waterhousia floribunda*	20	Retain	516777	6773984	Retain with trimming of overhanging branches required.
21	Weeping Lily Pily	*Waterhousia floribunda*	10	Remove	516769	6773988	

Tree ID Number	Common Name	Scientific Name	Diameter at Breast Height DBH (cm)	Remove or Retain	Easting	Northing	Comments
22	Water Gum	*Tristaniopsis laurina*	30	Remove	516770	6773993	
23	Water Gum	*Tristaniopsis laurina*	10	Remove	516761	6773988	
24	Blackwood	*Acacia melanoxylon*	15	Remove	516762	6773990	
25	Weeping Lily Pily	*Waterhousia floribunda*	25	Remove	516762	6773989	
26	Weeping Lily Pily	*Waterhousia floribunda*	10	Remove	516756	6773989	
27	Willow Bottlebrush	*Callistemon saligna*	10	Remove	516757	6773987	
28	Swamp Turpentine	*Lophostemon suaveolens*	15	Remove	516754	6773988	
29	Swamp Turpentine	*Lophostemon suaveolens*	18	Retain	516753	6773988	
30	Swamp Turpentine	*Lophostemon suaveolens*	30	Retain	516753	6773990	
31	Swamp Turpentine	*Lophostemon suaveolens*	30	Retain	516749	6773983	Edge of laydown area
32	Swamp Turpentine	*Lophostemon suaveolens*	15	Retain	516747	6773984	Edge of laydown area
33	Grey Ironbark	*Eucalyptus siderophloia*	45	Retain	516747	6773984	Edge of laydown area
34	Swamp Turpentine	*Lophostemon suaveolens*	30	Retain	516752	6773981	Edge of laydown area
35	Angophora	*Angophora woodsiana*	45	Remove	516747	6773975	
36	Grey Ironbark	*Eucalyptus siderophloia*	45	Remove	516745	6773974	
37	Grey Ironbark	*Eucalyptus siderophloia*	40	Remove	516741	6773962	
38	Swamp Turpentine	*Lophostemon suaveolens*	25	Remove	516734	6773958	
39	Angophora	*Angophora woodsiana*	35	Remove	516734	6773959	
40	Grey Ironbark	*Eucalyptus siderophloia*	50	Remove	516733	6773966	

5.2 Mitigation

The following safeguards would be implemented in order to prevent adverse impacts relating to biodiversity:

1. Removal of native vegetation will be kept to the minimum required to complete the Activity (refer to **Illustration 2.1** and **Table 5.1** for indication of vegetation/ tree removal required).
2. Prior to works commencing and where it is safe to do so, the limit of work and clearing limits will be marked in the field, as per **Illustration 2.1**.
3. Parking of vehicles and storage of plant/ equipment will occur on existing paved or compacted areas. Where this is not possible, vehicles and plant/ equipment will be kept away from environmentally sensitive areas (close to the river) and outside the dripline of trees to be retained.
4. A pre-clearing survey will be undertaken daily by a suitably experienced ecologist or appointed environmental representative for fauna (including Giant Barred Frog) or habitat features including Ringtail Possum dreys or active bird nests prior to vegetation (including branch) removal or disturbance to the river banks.
5. An experienced ecologist or spotter catcher will be present on site during the felling of habitat trees, including nests and dreys should they be detected during pre-clearing surveys.
6. In the event that threatened fauna (eg. microbats, Giant Barred Frog, Emu) are observed on site, stop work and notify the Engineering and Civil Contractors (EEC) environmental representative who will contact an experienced ecologist for further advice.
7. A suitably experienced ecologist or appointed environmental representative will undertake a survey of the existing Jacky Bulbin Bridge (using a torch) prior to commencement of works on the bridge structure. If microbats are **not** present, works may proceed without the need for any additional measures. The ecologist or environmental representative will install exclusion measures (fill cavities with clean rags) within any unoccupied cavities to prevent later construction disruptions.

   If microbats are present, the ecologist will be required to:

   - Determine the species, number of bats and breeding status
   - Determine in consultation with construction/ engineering personnel, the appropriate management pathway
   - Should threatened microbats be present, review project statutory assessments and update if appropriate.

   Daily inspections will be undertaken by the work crew of the existing concrete/ timber bridge for microbats:

   - On each day below deck bridge works are undertaken (eg. removal preparation)
   - On each day of bridge removal
   - The inspection will include actively looking for microbats and/ or signs of their presence using a torch below the bridge decking, within corners of the concrete or other cavities.

8. Consideration will be given to providing replacement microbat habitat beneath the new concrete bridge (refer to **Section 4.2.2** and **Appendix F**). Should microbat habitat be installed at Jacky Bulbin Bridge the final design would be agreed on between RVC and an ecologist prior to construction.
9. Injured fauna will be taken to the nearest vet in Grafton or wildlife care organisation. The contact details of Grafton Veterinary Clinic (02 6642 3681) and WIRES (1300 094 737) will be known to the site supervisor and ecologist.

10. Any uninjured captured fauna will be released within 50 m of the site where the animal was captured, as far away as possible from threats such as clearing and road traffic. Timing of releases will coincide with dusk for nocturnal species.
11. If unexpected threatened fauna or flora species are discovered, stop work and contact the ecologist or RVC environmental representative for further advice.
12. Works within Jackybulbin Creek will be undertaken in accordance with conditions outlined within the approved Department of Primary Industries (Fisheries) Permit.
13. To minimise pollution and the spread of pathogens/ weeds; tools, machinery and plant will be cleaned, degreased and inspected for oil/ fuel leaks before commencing work on site. Soil, vegetation and/ or foreign material from other sites will be removed from plant before delivery to site.
14. Weeds will be managed according to requirements under the *Biosecurity Act 2015*. The duties under the act for weeds which occur at the site are: *'All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable'*.
15. Weeds will be sprayed with herbicide prior to clearing and mulching to help prevent regrowth, and no mulched vegetation potentially contaminated with weed material will be taken offsite other than to an appropriately licenced waste facility.
16. Pruning of mature trees will be in accordance with Part 5 of *Australian Standard 4373-2007 Pruning of amenity trees.*
17. All vegetation removal will be undertaken by an approved vegetation clearing contractor. Vegetation removed from the site will be mulched and taken off-site to an appropriately licenced waste facility.
18. There is to be no disturbance beyond the marked limits without prior approval from the EEC environmental representative.
19. Erosion and sediment control measures will be implemented (in accordance with the Landcom/ Department of Housing Managing Urban Stormwater; Soils and Construction Guidelines [the Blue Book]) and maintained to prevent sediment moving offsite and sediment laden water entering any water course during the construction process.
20. Environmental safeguards will be communicated to all construction personnel as part of an Environmental Site Induction and repeated where appropriate at Toolbox Sessions prior to commencement of relevant work components.

6. Statutory Requirements

The following sections examine the findings of the site assessment with regard to relevant statutory requirements which require consideration for the proposed Activity.

6.1 Richmond Valley Local Environmental Plan 2012

The proposed Activity is located within the RVC LGA, in an area covered by the Richmond Valley Local Environmental Plan 2012. The site is within the designated road reserve within an area partly zoned RU1 Primary Production and part zoned RU3 Forestry (within Doubleduke State Forest). The Activity does not conflict with or hinder achievement of these zone objectives.

6.1.1 Koala Habitat

While no Koala habitat mapping exists for Richmond Valley, the site is part of the Banyabba Area of Regional Koala Significance. A Review of Koala Tree Use Across NSW (2018) documents Grey Ironbark and Swamp Turpentine as 'documented irregular use' and Acacia species as 'documented low use' within the Richmond Valley LGA for the North Coast Koala Management Area. All other species are not recorded as use trees and no high or significant use trees will be impacted by the Activity.

6.1.2 Richmond Valley Council Development Control Plan 2021

The RVC Development Control Plan only applies to Part 4 developments under the *Environmental Planning and Assessment Act 1979* (EP&A Act). As the proposed Activity would be completed under Part 5 of the EP&A Act, the Plan does not apply.

6.2 State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 came into force on 1 March 2022 and incorporated the repealed provisions of SEPP (Koala Habitat Protection) 2020, SEPP (Koala Habitat Protection) 2021, and the Vegetation in non-rural areas SEPP, amongst others.

Chapter 3 of State Environmental Planning Policy (Biodiversity & Conservation) 2021 applies to land zoned RU1 in 83 Local Government Areas (LGA) in NSW, including the Richmond Valley LGA.

The principles of the Koala Habitat Protection SEPP are to:

- Help reverse the decline of Koala populations by ensuring Koala habitat is properly considered during the development assessment process.
- Provide a process for councils to strategically manage Koala habitat through the development of Koala plans of management.

Chapter 3 of SEPP (Biodiversity & Conservation) 2021 only applies to Part 4 development applications under the EP&A Act. As the proposal is an Activity under Part 5 of the EP&A Act, the Policy does not technically apply. It is Council's responsibility however, to consider environmental issues relating to their works to the fullest extent possible, including impacts on Koalas. An assessment of the impacts

of the Activity on biodiversity (including Koalas) is provided in **Section 5.1**. Safeguards to minimise impacts on fauna, including the Koala, are provided in **Section 5.2.**

6.3 Biodiversity Conservation Act 2016

The BC Act requires a test of significance (five-part test) when assessing whether an action, development or activity is likely to significantly affect threatened species, ecological communities or their habitats. Based on the potential for several threatened fauna species to occur at the site and that lowland rainforest is present, tests of significance have been completed (refer to **Appendix E**).

The tests of significance concluded that threatened species/ Subtropical Coastal Floodplain Forest TEC would be unlikely to be significantly affected by the Activity.

6.4 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects/ regulates matters of national environmental significance (MNES), including:

- World heritage properties
- National heritage places
- Wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

Based on the search results and site assessment, significant impacts to any MNES would be likely to result from the Activity (refer to **Table 6.1**).

Table 6.1 Assessment of MNES

Matter	Potential impact
Any impact on a World Heritage property?	
No World Heritage properties occur within 10 km of the site.	Nil
Any impact on a National Heritage place?	
No National Heritage places occur within 10 km of the site.	Nil
Any impact on a Wetland of International Importance?	
No wetlands of international importance (Ramsar sites) occur within 10 km of the site.	Nil
Any impact on the Great Barrier Reef Marine Park?	
The Great Barrier Reef Marine park is distant from the site.	Nil
Any impact on a Commonwealth marine area?	
No Commonwealth marine areas occur within 10 km of the site.	Nil
Any impact on nationally threatened species and ecological communities?	
Habitat for four TECs and 54 threatened species (23 flora and 31 fauna species) is identified within 10 km of the site. No listed threatened fauna or flora species were recorded. One TEC occurs at the site (*Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland*	Minor

Matter	Potential impact
bioregions) however a minor amount (0.1334 ha) of this community will be impacted by the Activity. Riparian vegetation at the site has been previously modified and is likely to have been subject to historical selective logging within the State Forest and for road and bridge construction and maintenance purposes. Given that relatively minor impacts to vegetation or threatened species habitat is anticipated, the Activity would unlikely result in the removal of habitat important to any threatened fauna species or community in a local context and would not contribute significantly to any listed key threatening processes.	
Any impact on Migratory species?	
Habitat for seven migratory species is identified within 10 km of the site. Given that better-quality intact vegetation and forests occur extensively adjacent to the site, migratory species are unlikely to be significantly affected by the Activity.	Minor
Does the Activity involve a nuclear action (including uranium mining)?	
The Activity does not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	
No Commonwealth Land would be directly or indirectly affected by the Activity.	Nil

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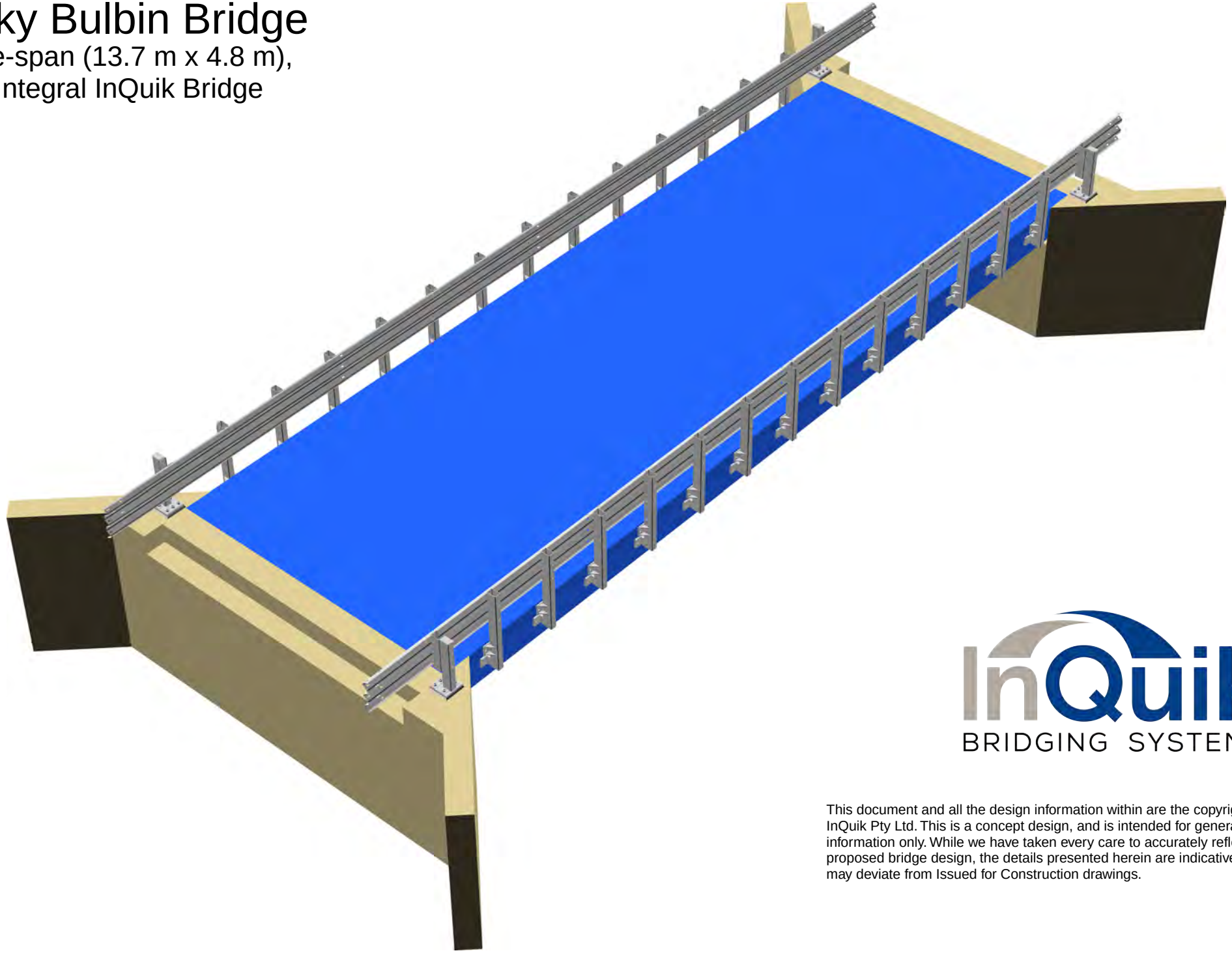
Appendix A

Concept Bridge Design

Jacky Bulbin Bridge

Single-span (13.7 m x 4.8 m),
Fully Integral InQuik Bridge



InQuik
BRIDGING SYSTEMS

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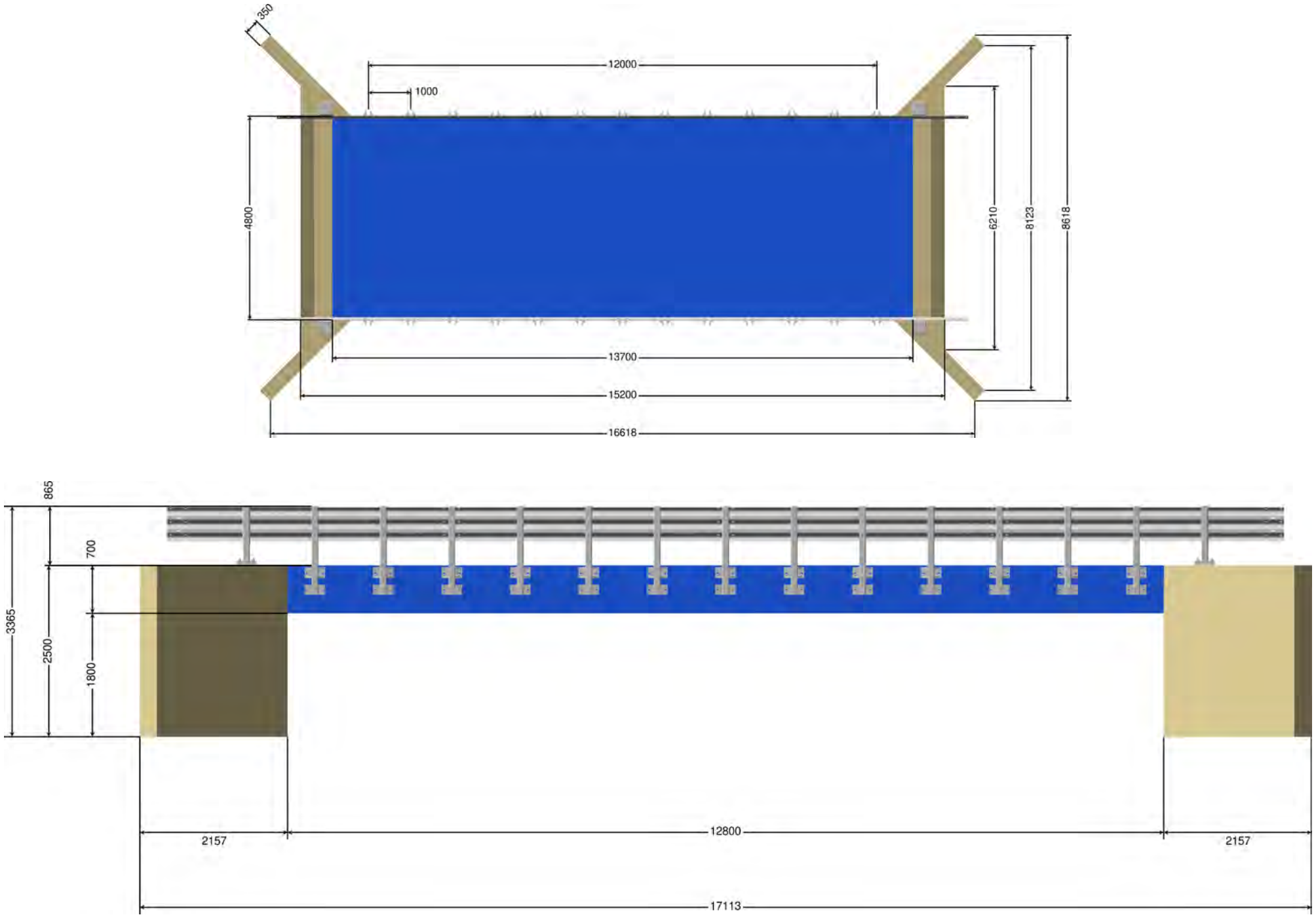
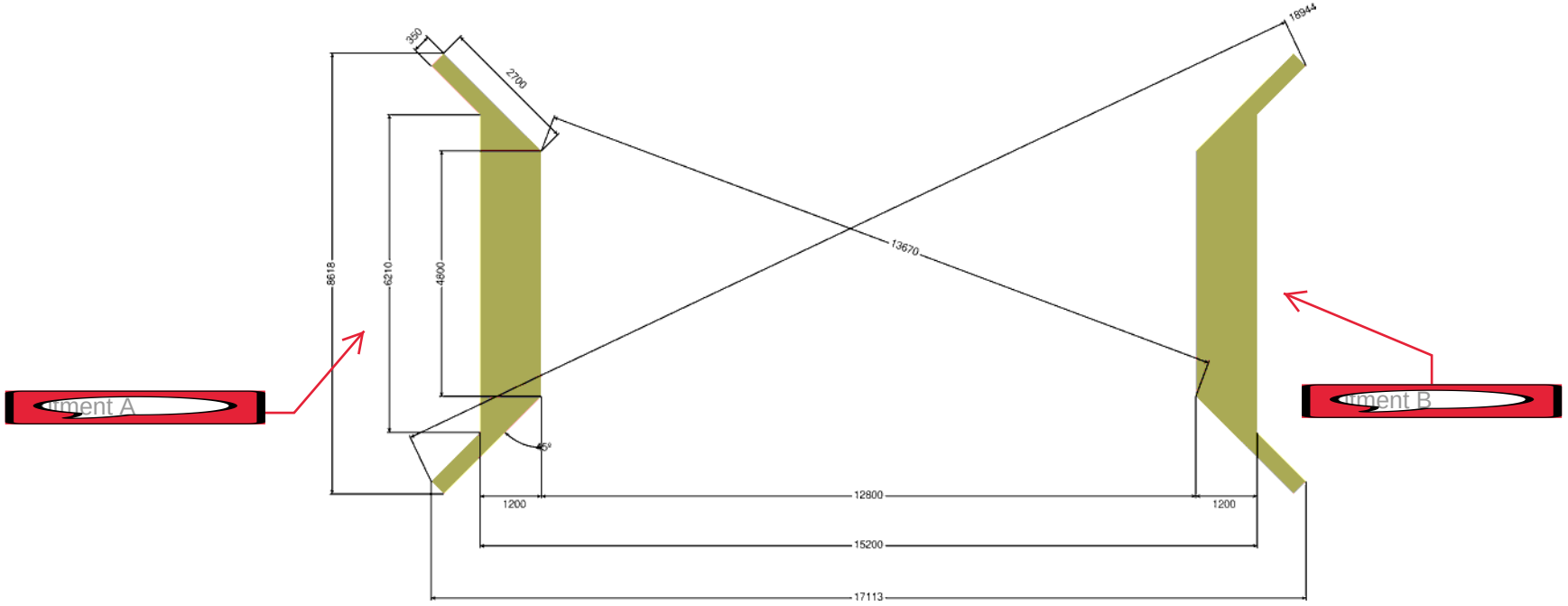
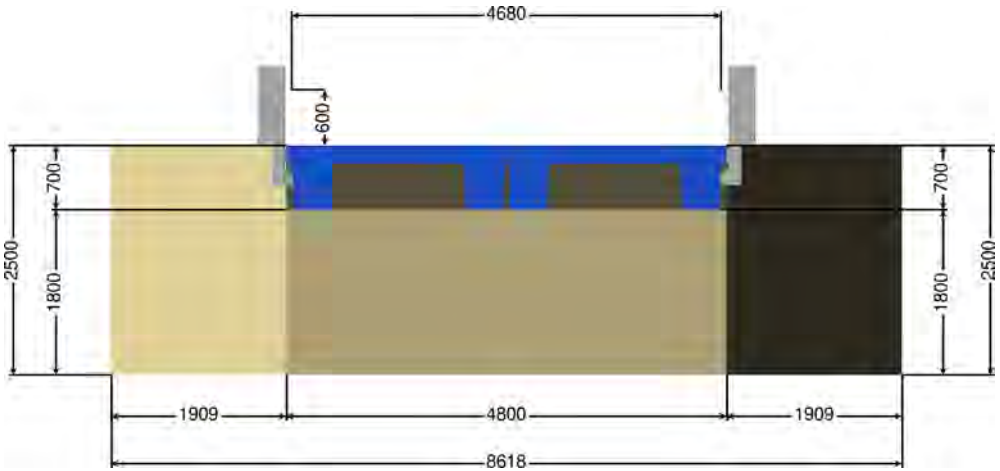
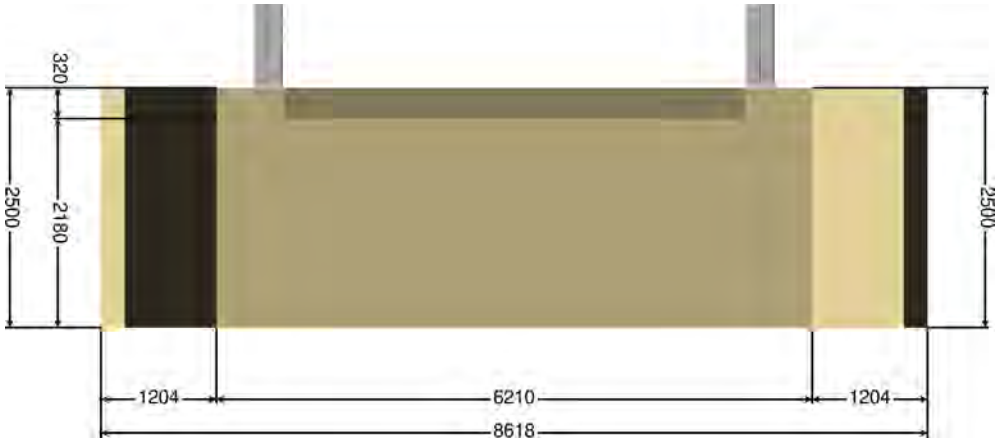
Version: 1, Version Date: 02/05/2023









Appendix B

Database Search Results

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -29.11 West: 153.13 East: 153.23 South: -29.21] returned a total of 822 records of 39 species.
Report generated on 13/01/2023 3:42 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3137	*Crinia tinnula*		Wallum Froglet	V,P		4	
Animalia	Amphibia	Myobatrachidae	3075	^^*Mixophyes iteratus*		Giant Barred Frog	E1,P,2	E	4	
Animalia	Amphibia	Hylidae	3169	*Litoria brevipalmata*		Green-thighed Frog	V,P		2	
Animalia	Reptilia	Elapidae	2677	*Hoplocephalus stephensii*		Stephens' Banded Snake	V,P		2	
Animalia	Aves	Casuariidae	0001	*Dromaius novaehollandiae*		Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P		283	
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificus*		Wompoo Fruit-Dove	V,P		1	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		1	
Animalia	Aves	Accipitridae	0218	*Circus assimilis*		Spotted Harrier	V,P		1	
Animalia	Aves	Accipitridae	0230	*Lophoictinia isura*		Square-tailed Kite	V,P,3		1	
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*		Bush Stone-curlew	E1,P		1	
Animalia	Aves	Cacatuidae	0265	^^*Calyptorhynchus lathami*		Glossy Black-Cockatoo	V,P,2	V	6	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*		Little Lorikeet	V,P		23	
Animalia	Aves	Strigidae	0246	*Ninox connivens*		Barking Owl	V,P,3		19	
Animalia	Aves	Strigidae	0248	*Ninox strenua*		Powerful Owl	V,P,3		12	
Animalia	Aves	Tytonidae	0250	*Tyto novaehollandiae*		Masked Owl	V,P,3		9	
Animalia	Aves	Climacteridae	8127	*Climacteris picumnus victoriae*		Brown Treecreeper (eastern subspecies)	V,P		1	
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*		Varied Sittella	V,P		2	
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*		Dusky Woodswallow	V,P		1	
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*		Spotted-tailed Quoll	V,P	E	1	
Animalia	Mammalia	Dasyuridae	1017	*Phascogale tapoatafa*		Brush-tailed Phascogale	V,P		13	
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	E1,P	E	13	
Animalia	Mammalia	Petauridae	1136	*Petaurus australis*		Yellow-bellied Glider	V,P	V	39	
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*		Squirrel Glider	V,P		26	

Animalia	Mammalia	Pseudocheiridae	1133	*Petauroides volans*	Greater Glider	E1,P	E	14
Animalia	Mammalia	Macropodidae	1260	*Macropus dorsalis*	Black-striped Wallaby	E1,P		4
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	25
Animalia	Mammalia	Vespertilionidae	1354	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	V,P		2
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		8
Animalia	Mammalia	Vespertilionidae	1336	*Nyctophilus bifax*	Eastern Long-eared Bat	V,P		4
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P		3
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		1
Plantae	Flora	Cyperaceae	7013	*Cyperus aquatilis*	Water Nutgrass	E1		2
Plantae	Flora	Dilleniaceae	8591	*Hibbertia marginata*	Bordered Guinea Flower	V	V	169
Plantae	Flora	Juncaginaceae	3363	*Maundia triglochinoides*		V		2
Plantae	Flora	Linderniaceae	7359	*Lindernia alsinoides*	Noah's False Chickweed	E1		1
Plantae	Flora	Lindsaeaceae	8128	*Lindsaea incisa*	Slender Screw Fern	E1,3		3
Plantae	Flora	Myrtaceae	4283	*Rhodamnia rubescens*	Scrub Turpentine	E4A	CE	2
Plantae	Flora	Myrtaceae	4284	*Rhodomyrtus psidioides*	Native Guava	E4A	CE	3
Plantae	Flora	Poaceae	9600	*Paspalidium grandispiculatum*		V	V	114

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Communities in selected area [North: -29.11 West: 153.13 East: 153.23 South: -29.21] returned 0 records for 12 entities.
Report generated on 13/01/2023 3:43 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Community				*Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion*		Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	E3		K	
Community				*Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*		Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		E	K	
Community				*Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				*Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*		Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				*Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions*		Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3		K	
Community				*Lowland Rainforest of Subtropical Australia*		Lowland Rainforest of Subtropical Australia		CE	K	
Community				*Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*		Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E3		K	

Community	*Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E3	K	
Community	*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	*Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions*	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	K	

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: 13-Jan-2023

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:	54
Listed Migratory Species:	17

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	22
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:	10
Regional Forest Agreements:	1
Nationally Important Wetlands:	1
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
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
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[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
[Cyclopsitta diophthalma coxeni](#) Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area	In feature area
[Erythrotriorchis radiatus](#) Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Falco hypoleucos](#) Grey Falcon [929]	Vulnerable	Species or species habitat likely 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 likely to 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
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
[Turnix melanogaster](#) Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FISH			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Nannoperca oxleyana](#) Oxleyan Pygmy Perch [64468]	Endangered	Species or species habitat may occur within area	In buffer area only
FROG			
[Litoria olongburensis](#) Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Mixophyes iteratus](#) Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat known to occur within area	In feature area
INSECT			
[Argynnis hyperbius inconstans](#) Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Phyllodes imperialis smithersi](#) Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	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 may occur within area	In buffer area only
[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

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Xeromys myoides			
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area	In buffer area only
PLANT			
Acronychia littoralis			
Scented Acronychia [8582]	Endangered	Species or species habitat may occur within area	In buffer area only
Angophora robur			
Sandstone Rough-barked Apple [56088]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area
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 may occur within area	In feature area
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eucalyptus tetrapleura Square-fruited Ironbark [7490]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat may occur within area	In buffer area only
Hibbertia marginata [21970]	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
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Melichrus sp. Gibberagee (Benwell 97239) Narrow-leaf Melichrus [86881]	Endangered	Species or species habitat may occur within area	In buffer area only
Olax angulata Minnie Waters Olax [10666]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Paspalidium grandispiculatum a grass [10838]	Vulnerable	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phaius australis			
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area	In feature area
Prostanthera palustris			
Swamp Mint-bush [66703]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
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
Rutidosis heterogama			
Heath Wrinklewort [13132]	Vulnerable	Species or species habitat may occur within area	In buffer area only
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			
Coeranoscincus reticulatus			
Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		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 feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat likely to occur within area	In feature area
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]		Species or species habitat known to occur within area	In feature area
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 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to 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
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

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
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[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 known to occur within area overfly marine 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
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely 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 likely to occur within area overfly marine area	In feature area
[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 feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to 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
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
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
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat likely to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bundjalung	State Conservation Area	NSW	In buffer area only
Bundjalung	National Park	NSW	In buffer area only
Bungawalbin	National Park	NSW	In buffer area only
Bungawalbin	Nature Reserve	NSW	In buffer area only
Jackywalbin	State Conservation Area	NSW	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Kewilpa	Private Nature Reserve	NSW	In buffer area only
Myrtle Creek	Private Nature Reserve	NSW	In buffer area only
Pyrocarpa	Flora Reserve	NSW	In buffer area only
Yarringully	Nature Reserve	NSW	In buffer area only
Yarringully	State Conservation Area	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

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

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Lower Bungawalbin Catchment Wetland Complex	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
330 kV Transmission Line, 205km in Length	2010/5326	Controlled Action	Completed	In feature area
Upgrade of the Pacific Highway from single to dual carriageway in each direction	2010/5586	Controlled Action	Post-Approval	In buffer area only
Upgrading the Pacific Highway - Woolgoolga to Ballina Upgrade, NSW	2012/6394	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

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Clarence-Moreton	Clarence-Moreton	BA website	In feature area

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 are 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

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

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

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
- 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

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-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
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-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 C

Threatened Flora Potential Occurrence

Table C.1 Threatened Flora Potential Occurrence Assessment

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/ Subject Species
Acronychia littoralis	Scented Acronychia	E	E	Littoral rainforest on sand.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Angophora robur	Sandstone Rough-barked Apple	V	V	Dry open forest in sandy or skeletal soils on sandstone, or occasionally granite, with frequent outcrops of rock.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Arthraxon hispidus	Hairy Jointgrass	V	V	Moist shady places in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not have well defined habitat and is known from a range of communities, including swamp-heath and woodland.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Cynanchum elegans	White-flowered Wax Plant	E	E	Dry, littoral or subtropical rainforest, and occasionally in scrub or woodland.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Cyperus aquatilis	Water Nutgrass	E	-	In NSW, known only from a few sites north from Grafton. Grows in ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs, in sandstone areas.	Species not detected at the site.	Unlikely, no further assessment required.
Dichanthium setosum	Bluegrass	V	V	In NSW, occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/ Subject Species
Eucalyptus glaucina	Slaty Red Gum	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Eucalyptus tetrapleura	Square-fruited Ironbark	V	V	Dry or moist eucalypt forest on moderately fertile soil, often in low areas with poor drainage.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Gossia fragrantissima	Sweet Myrtle	E	E	Dry subtropical and riverine rainforest, isolated plants can be found in paddocks from regrowth mostly on basalt-derived soils. Occurs in south-east Queensland and in north-east NSW south to the Richmond River.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Hibbertia marginata	Bordered Guinea Flower	V	V	Grassy or shrubby dry open eucalypt forest at low altitudes on sandstone, only found between Casino and Grafton.	Species not detected at the site.	Unlikely, no further assessment required.
Lindernia alsinoides	Noah's False Chickweed	E	-	Swamp forests and wetlands along coastal and hinterland creeks.		
Lindsaea incisa	Slender Screw Fern	E	-	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. Waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly.	Species not detected at the site.	Unlikely, no further assessment required.
Macadamia integrifolia	Macadamia Nut	-	V	While specimens have been collected from the North Coast of NSW (e.g. Lismore, Gross 1995), this species is not known to occur naturally in NSW (Harden 1991). The Macadamia Nut grows in remnant rainforest.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/ Subject Species
Macadamia tetraphylla	Rough-shelled Bush Nut	V	V	Subtropical rainforest usually near the coast.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Maundia triglochinoides	-	V	-	Swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Associated with wetland species e.g. Cycnogeton procerum.	Species not detected at the site.	Unlikely, no further assessment required.
Melichrus sp. Gibberagee	Narrow-leaf Melichrus	E	E	Low-altitude dry eucalypt forest on gentle slopes.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Olax angulata	Square-stemmed Olax	V	V	Low-lying coastal heaths and heathy woodlands on sandy soils near swamps, often in association with Wallum Banksia (Banksia aemula).	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Paspalidium grandispiculatum	**-**	**V**	**V**	**Restricted to poor sandy soils on sandstone. It has been found in open forest of Turpentine (Syncarpia glomulifera) on undulating topography as well as in drier forest types on ridges.**	**Marginal habitat at the site however due to dense ground cover of introduced pasture grasses the potential for the species to occur at the site undetected is low but possible.**	**Possible. Test of Significance completed.**
Persicaria elatior	Tall Knot-weed	V	V	Damp or swampy situations and sometimes with Melaleuca linarifiolia.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Phaius australis	Southern Swamp Orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest mostly in coastal areas.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/ Subject Species
Prostanthera palustris	Swamp Mint-bush	V	V	Known from Tabbimoble Swamp Nature Reserve and five sub populations in Bundjalung National Park. Grows in in wet shrubland to heathland subject to extended waterlogging in poorly drained white siliceous sandy soil with a high organic content.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Rhodamnia rubescens	Scrub Turpentine	CE	-	Subtropical rainforests, warm temperate rainforests, littoral rainforests, and wet sclerophyll forests. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations.	Species not detected at the site.	Unlikely, no further assessment required.
Rhodomyrtus psidioides	Native Guava	CE	-	Rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. Pioneer species in disturbed environments such as regrowth and rainforest margins.	Species not detected at the site.	Unlikely, no further assessment required.
Rutidosis heterogama	Heath Wrinklewort	V	V	Heaths in clay soils, disturbed roadsides.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Thesium australe	Austral Toadflax	V	V	Grassland or grassy eucalypt woodland where Themeda australis is predominant, on grassy headlands.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.
Tylophora woollsii		E	E	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Species not detected at the site and no BioNet records within the locality.	Unlikely, no further assessment required.

Appendix D

Threatened Fauna Potential Occurrence

Table D.1 Threatened Fauna Potential Occurrence Assessment

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Amphibia						
Crinia tinnula	Wallum Froglet	V	-	Acid paperbark and sedge swamps known as 'wallum', this is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies.	Unlikely, no suitable habitat at the site.	Unlikely, no further assessment required.
Litoria brevipalmata	Green-thighed Frog	V	-	Rainforest, moist to dry eucalypt forest and heath, typically where surface water gathers after rain.	Unlikely, no suitable habitat at the site.	Unlikely, no further assessment required.
Litoria olongburensis	Olongburra Frog	V	V	Paperbark swamps and sedge swamps of the coastal 'wallum' country amongst sedges and rushes.	Unlikely, no suitable habitat at the site and no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	**Possible, BioNet record within lose proximity to the site.**	**Possible. Test of Significance completed.**
Avifauna						
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Unlikely, no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts; also recorded in shrublands, heathlands and various modified habitats.	Low, low incidence (one) of BioNet records within 10km for the site.	Low, no further assessment required.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low within site. Suitable habitat in general area however no BioNet records within 10 km of the site.	Low, no further assessment required.
Burhinus grallarius	Bush Stone-curlew	E	-	Lightly timbered open forest and woodland, and partly cleared farmland with woodland remnants, preferring areas with dry leaf-litter, fallen timber and sparse ground cover.	**Possible, suitable foraging habitat at the site.**	**Possible. Test of Significance completed.**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m.	low, suitable habitat in the general area however no suitable habitat will be affected by the Activity.	Low, no further assessment required.
Circus assimilis	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	Low, no suitable breeding habitat and low potential foraging habitat at the site.	Low, no further assessment required.
Climacteris picumnus victoriae	Brown Treecreeper	V	-	Eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges.	**Possible, suitable foraging habitat at the site.**	**Possible. Test of Significance completed.**
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	CE	E	Drier rainforests and adjacent wet eucalypt forest, wetter lowland also wetter lowland rainforests.	Unlikely, no suitable habitat at the site and no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	**Possible, suitable foraging habitat at the site.**	**Possible. Test of Significance completed.**
Dromaius novaehollandiae	Emu population in the NSW North Coast Bioregion and Port Stephens LGA	E	-	Open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	**Possible, suitable foraging habitat at the site.**	**Possible. Test of Significance completed.**
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	Low, marginal foraging habitat at the site.	Low, no further assessment required.
Erythrotriorchis radiatus	Red Goshawk	CE	V	Open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water. Typically found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Population in NSW is naturally small (probably only one pair), and lies at extreme of the natural range of the species in Australia.	Unlikely, no BioNet records within 10 km of the site.	Unlikely, no further assessment required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Falco hypoleucos	Grey Falcon	E	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range.	Unlikely, no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Glossopsitta pusilla	Little Lorikeet	V	-	Forages in open Eucalyptus forest and woodland; also feeds on Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	**Possible, suitable foraging habitat at the site. No nesting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Unlikely, no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Lathamus discolor	Swift Parrot	E	CE	On mainland Australia foraging occurs where eucalypts are flowering profusely or where abundant lerp infestations occur. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Forest Red Gum E. tereticornis, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana, Blackbutt E. pilularis and Yellow Box E. melliodora.	Unlikely, no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Lophoictinia isura	Square-tailed Kite	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-urban areas. Home ranges can extend over at least 100 km2.	**Possible, suitable foraging habitat at the site. No nesting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**
Ninox connivens	Barking Owl	V	-	Eucalypt woodland, open forest, swamp woodlands and timber along watercourses.	**Possible, suitable foraging habitat at the site. No nesting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest. Requires large tracts of forest or woodland habitat but may also occur in fragmented landscapes.	**Possible, suitable foraging habitat at the site. No nesting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	Low within the site. Suitable habitat in general area.	Possible in general area however no significant nesting or significant foraging habitat would be adversely impacted by the Activity. No further assessment required.
Rostratula australis	Australian Painted Snipe	E	E	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	Low within site. Suitable habitat in general area however no BioNet records within 10 km of the site.	Possible in general area however no significant nesting or significant foraging habitat would be adversely impacted by the Activity. No further assessment required.
Turnix melanogaster	Black-breasted Button-quail	CE	V	Drier rainforests and vine scrubs, often in association with Hoop Pine and a deep moist leaf litter layer. During drought it may move to adjacent wetter rainforests.	Unlikely, no suitable habitat at the site.	Unlikely, no further assessment required.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	**Possible, suitable foraging habitat at the site. No nesting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**
Mammalia						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Near cave entrances and crevices in cliffs.	Unlikely, no suitable at the site and no BioNet records within 10 km radius of the site.	Unlikely, no further assessment required.
Chalinolobus nigrogriseus	Hoary Wattled Bat	V	-	Dry open eucalypt forest dominated by spotted gum, boxes and ironbarks. Also healthy coastal forests where Red Bloodwood and Scribbly Gum are common. Naturally sparse understorey is favourable.	**Possible, suitable aerial foraging habitat at the site. No roosting or breeding habitat will be affected by the Activity.**	**Possible. Test of Significance completed.**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	**Possible, suitable foraging habitat at the site. No latrine or denning/breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Macropus dorsalis	Black-striped Wallaby	E	-	Dry rainforests and moist eucalypt forest with rainforest understorey or dense shrub layer.	Low, marginal habitat at the site no grassy clearings in close proximity to the site and shrub layer is not dense.	Low, no further assessment required.
Miniopterus australis	Little Bent-winged Bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	**Possible, suitable aerial foraging habitat at the site. Jacky Bulbin Bridge provides low-quality opportunistic non-breeding roost habitat.**	**Possible. Test of Significance completed.**
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	**Possible, suitable aerial foraging habitat at the site. Jacky Bulbin Bridge provides low-quality opportunistic non-breeding roost habitat.**	**Possible. Test of Significance completed.**
Myotis macropus	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	**Possible, suitable foraging habitat at the site. Jacky Bulbin Bridge provides low-quality opportunistic non-breeding roost habitat.**	**Possible. Test of Significance completed.**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Nyctophilus bifax	Eastern Long-eared Bat	V	-	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending to adjacent moist eucalypt forest.	**Possible, suitable aerial foraging habitat at the site. No roost habitat occurs at the site.**	**Possible. Test of Significance completed.**
Petauroides volans	Greater Glider	-	E	Ranges and coastal plains of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands.	**Possible, suitable foraging habitat at the site. No denning or breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Petaurus australis australis	Yellow-bellied Glider	V	V	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Dens in tree hollows of large trees, often in family groups. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	**Possible, suitable foraging habitat at the site. No denning or breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Petaurus norfolcensis	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	**Possible, suitable foraging habitat at the site. No denning or breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	**Possible, suitable foraging habitat at the site. No denning or breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Phascolarctos cinereus	Koala	V	E	Appropriate food trees in forests and woodlands, and treed urban areas.	**Possible, suitable aerial foraging habitat at the site. No primary feed tree species will be impacted by the Activity.**	**Possible. Test of Significance completed.**
Potorous tridactylus	Long-nosed Potoroo	V	V	Cool temperate rainforest, moist and dry forests, and wet heathland, inhabiting dense layers of grass, ferns, vines and shrubs.	Low, marginal habitat at the site and no BioNet records within 10 km of the site.	Low, no further assessment required.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Requirement	Suitability of Site Habitat	Potential Occurrence/Subject Species
Pseudomys novaehollandiae	New Holland Mouse	-	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Unlikely, no suitable at the site and no BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	**Possible, suitable foraging habitat at the site. No camps or breeding habitat occurs at the site.**	**Possible. Test of Significance completed.**
Xeromys myoides	False Water-rat	-	V	Primarily in habitats mangrove forests but has been recorded in a variety of well-watered habitats including, freshwater lagoons, sedged lakes close to foredunes, and swamps.	Unlikely, no suitable habitat at the site. No BioNet records within 10 km of the site.	Unlikely, no further assessment required.
Reptilia						
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	E	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	Low within site. Suitable habitat in general area however no BioNet records within 10 km of the site.	Low, no further assessment required
Hoplocephalus stephensii	Stephens' Banded Snake	V	-	Rainforest and eucalypt forests and rocky areas up to 950 m.	Low, marginal habitat at the site and no BioNet records within 10 km of the site.	Low, no further assessment required
Insecta						
Argynnis hyperbius	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (*Viola betonicifolia*) occurs.	Unlikely, no BioNet records within 10 km radius of the site. No suitable habitat at the site.	Unlikely, no further assessment required.
Phyllodes imperialis southern subspecies	Pink Underwing Moth	E	E	Undisturbed subtropical rainforest below 600 m. Breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, Carronia multisepalea, grows in a collapsed shrub-like form.	Unlikely, no BioNet records within 10 km radius of the site. No suitable habitat at the site.	Unlikely, no further assessment required.

V = Vulnerable; E = Endangered; CE = Critically Endangered

Appendix E

Tests of Significance (BC Act)

From **Appendix D** and the site assessment, tests of significance ('five-part tests') under Section 7.3 of the BC Act have been completed for the following threatened entities:

Flora

Paspalidium grandispiculatum; a grass

Fauna

Frogs

- Giant Barred Frog (*Mixophyes iteratus*)

Birds

- Bush Stone-curlew (*Burhinus grallarius*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA (*Dromaius novaehollandiae*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Square-tailed Kite (*Lophoictinia isura*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)

Mammals

- Hoary Wattled Bat (Chalinolobus nigrogriseus)
- Spotted-tailed Quoll (Dasyurus maculatus)
- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*)
- Eastern Long-eared Bat (*Nyctophilus bifax*)
- Greater Glider (*Petauroides Volans*)
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Koala (*Phascolarctos cinereus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

TEC

Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion

a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The potential direct and indirect impacts from the Activity include:

- The direct removal and trimming of branches of 0.1334 ha of native riparian vegetation from *PCT 3102 - Northern Lowland Swamp Turpentine Wet Forest*, including removal of 23 native trees (refer to **Illustration 2.1** and **Table 5.1**):
    - 9 x Swamp Turpentine
    - 5 x Weeping Lily Pily
    - 1 x Willow Bottlebrush
    - 1 x Blackwood
    - 2 x Water Gum
    - 2 x *Angophora woodsiana*
    - 3 x Grey Ironbark
- Direct removal of vegetation (approximately 0.1334 ha) including trimming of branches from EPBC Act listed TEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* and BC Act listed TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.* Removal of 0.1334 ha represents ~ 0.0014 per cent of the overall mapped area for this community within the locality (9,067 ha within 10 km radius of the site) as per NSW SVTM.
- The Activity will impact a small area (approximately 60 m^2) of Jackybulbin Creek banks as part of bridge abutment construction works (as potential breeding and foraging habitat for Giant barred Frog).
- The removal of the existing Bridge structure directly impacts potential low-quality opportunistic threatened microbat habitat. However, due to the minimal roost opportunities (cracks, crevices), higher light levels and lack of evidence of use or the presence of microbats, the bridge is not considered to be breeding or important habitat for microbats within the locality.
- No primary Koala feed trees as outlined in the Richmond Valley Koala Habitat Atlas will be impacted by the Activity. However, the site is part of the Banyabba Area of Regional Koala Significance (DPIE, 2020) and BioNet records show Koala activity within the locality. A Review of Koala Tree Use Across NSW (OEH, 2018) documents Grey Ironbark and Swamp Turpentine as 'documented irregular use' and Acacia species as 'documented low use' within the Richmond Valley LGA for the North Coast Koala Management Area. All other species are not recorded as use trees and no high or significant use trees for Koala will be impacted by the Activity.
- Direct mortality or injury to fauna during tree removal or ground disturbance.

Indirect impacts from the Activity on threatened species include:

- Minor temporary impacts on water quality within the waterway by way of potential sediment runoff during installation of driven piles.
- The potential introduction or spread of pathogens (Chytrid) via introduction from plant and equipment.
- Habitat degradation of adjacent habitat due to potential clearing phase impacts (e.g. erosion and sedimentation impacts or chemical spills).
- Edge effects degrading habitat adjacent to the site. This impact is unlikely to be detrimental to the habitat value of adjacent habitat for a range of species given the location of the site within the road reserve (thus subject to existing edge effects).
- Unintentional damage to adjacent habitat during clearing.

This impact is relatively low in a local context and may be managed with a relatively high confidence such that biodiversity impacts may be minimised with the implementation of safeguards.

For the purposes of this assessment the local population of threatened fauna species is defined as the population within the site and within a two kilometre radius of the site where vegetation is contiguous. This includes the contiguous vegetation and forest located adjacent to site (approximately 1093 ha of connected native vegetation within a two kilometre radius) (including Doubleduke State Forest) and includes habitat within the road reserve. Vegetation to be removed is the same as the vegetation immediately adjacent to the site which would remain and continue to provide suitable habitat values at the site.

The proposed Activity represents a relatively minor loss/ modification of potential habitat for:

Flora

Paspalidium grandispiculatum marginal potential habitat

Frogs

- Giant Barred Frog – Foraging, refuge and breeding habitat

Birds

- Bush Stone-curlew - Foraging habitat
- Brown Treecreeper - Foraging habitat
- Varied Sittella - Foraging habitat
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA
- Little Lorikeet - Foraging habitat
- Square-tailed Kite - Foraging habitat
- Barking Owl - Foraging habitat
- Powerful Owl - Foraging habitat
- Masked Owl - Foraging habitat

Mammals

- Hoary Wattled Bat - Aerial foraging habitat
- Spotted-tailed Quoll – Foraging habitat
- Little Bent-winged Bat – Aerial foraging and low-quality opportunistic overwintering (non-breeding) roost habitat
- Large Bent-winged Bat – Aerial foraging and low-quality opportunistic overwintering (non-breeding roost habitat
- Southern Myotis – Aquatic foraging and low-quality non-breeding opportunistic roost habitat
- Eastern Long-eared Bat – Foraging habitat
- Greater Glider - Foraging habitat
- Yellow-bellied Glider - Foraging habitat
- Squirrel Glider - Foraging habitat
- Brush-tailed Phascogale - Foraging habitat
- Koala – occasional browse species and refuge habitat – no primary koala feed trees would be impacted
- Grey-headed Flying-fox - Foraging habitat

Alternative habitat is available of similar or better quality within the broader locality that would not be directly impacted by the Activity and habitat for these species would not be significantly affected by the works.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the listed threatened species such that a viable local population of the species would 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,

Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion occurs at the site and more broadly within the locality where it occupies large areas within the coastal floodplain environment. The minor removal of up to 0.1334 ha is considered unlikely to affect the extent of this ecological community such that its local occurrence is likely to be placed at risk of extinction. The removal of this relatively minor amount of native vegetation is considered unlikely to substantially or 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

TEC

The Activity would result in the direct loss/ modification of 0.1334 ha of regrowth and selected mature native vegetation (*PCT 3102 Northern Lowland Swamp Turpentine Wet Forest*) or 0.01 % of PCT 3102 mapped within a 10 km radius of the Site (as per SVTM, 2023). The removal of 0.1334 ha of *Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion* from the broader mapped areas (9067 ha) of this TEC (refer to **Section 3.2.4**) accounts for 0.0014% of this PCT within the locality (SVTM, 2023). The local landscape has been selectively logged as part of Doubleduke State Forest tenure and occurs within and adjacent to a disturbed road corridor. Retained areas of adjacent vegetation and forested areas will continue to provide foraging, breeding and dispersal resources for the subject species.

Flora

Paspalidium grandispiculatum; the species was not detected at the site and marginal habitat occurs within the Activity area. A relatively minor amount (0.1334) of potential habitat for the species will be affected.

Threatened fauna habitat impacts are as follows:

Frogs

- Giant Barred Frog – Foraging, refuge and breeding habitat

Birds

- Bush Stone-curlew - relatively minor loss/modification of foraging and potential nesting habitat (no bird nests were recording during the site assessment).
- Brown Treecreeper - relatively minor loss/modification of foraging and potential nesting habitat (no bird nests were recording during the site assessment).
- Varied Sittella - relatively minor loss/modification of foraging and potential nesting habitat (no bird nests were recording during the site assessment).
- Emu population - relatively minor loss/modification of foraging and potential nesting habitat (no Emu nests were recorded during the site assessment).
- Little Lorikeet - relatively minor loss/modification of foraging and potential nesting habitat (no bird nests were recording during the site assessment).

- Square-tailed Kite - relatively minor loss/modification of foraging and potential nesting habitat (no bird or raptor nests were recording during the site assessment).
- Barking Owl - relatively minor loss/modification of foraging habitat no hollow-bearing trees occur at the site and hence no breeding habitat would be affected.
- Powerful Owl - relatively minor loss/modification of foraging habitat no hollow-bearing trees occur at the site and hence no breeding habitat would be affected.
- Masked Owl - relatively minor loss/modification of foraging habitat no hollow-bearing trees occur at the site and hence no breeding habitat would be affected.

Mammals

- Little Bent-winged Bat - relatively minor loss/modification of aerial foraging and dispersal habitat through clearing of native vegetation. Potential for temporary loss of low-quality potential non-breeding roost habitat.
- Large Bent-winged Bat - relatively minor loss/modification of aerial foraging and dispersal habitat through clearing of native vegetation. Potential for temporary loss of low-quality potential non-breeding roost habitat.
- Southern Myotis - Foraging and potential for temporary loss of low-quality non-breeding opportunistic roost habitat.
- Spotted-tailed Quoll - relatively minor loss/modification of foraging and dispersal habitat. No breeding or denning habitat would be impacted by the Activity.
- Eastern Long-eared Bat - relatively minor loss/modification of aerial foraging and dispersal habitat for a highly mobile species.
- Greater Glider - relatively minor loss/modification of foraging habitat, no hollow-bearing trees occur at the site and hence no breeding or denning habitat would be affected.
- Yellow-bellied Glider - relatively minor loss/modification of foraging habitat, no hollow-bearing trees occur at the site and hence no breeding or denning habitat would be affected.
- Squirrel Glider - relatively minor loss/modification of foraging habitat, no hollow-bearing trees occur at the site and hence no breeding or denning habitat would be affected.
- Brush-tailed Phascogale - relatively minor loss/modification of foraging habitat, no hollow-bearing trees occur at the site and hence no breeding or denning habitat would be affected.
- Koala – minor loss of occasional browse species and potential refuge habitat – no primary koala feed trees would be impacted.
- Grey-headed Flying-fox - relatively minor loss/modification of foraging habitat, no flying-fox camps occur proximate to the site and hence no breeding or roosting habitat would be affected.

Retained areas of adjacent vegetation and intact forests will continue to provide foraging, dispersal, refuge and breeding resources for all of the subject species.

Relative to the extent of habitat available to the local population of these species within the locality, the habitat impacted by the Activity is minor. The Activity is unlikely to have any significant or long-term impacts on roosting habitat or breeding territory defended by the subject fauna species.

(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

TEC

The works footprint is located within a previously disturbed footprint associated with the existing bridge and road, the relatively minor removal of native vegetation from this area would not further fragment or isolate habitat of the Subtropical Coastal Floodplain Forest TEC, which remains connected adjacent to the site.

Flora

The works footprint is located within a previously disturbed footprint associated with the existing bridge and road, the relatively minor removal of native vegetation from this area would not further fragment or isolate habitat or limit movement of genetic material for *Paspalidium grandispiculatum*.

Fauna

Habitat at the sites is already fragmented from previous historic clearing for bridge and road construction. Considering the relatively small area of disturbance for the Activity, vegetation removal is unlikely to affect species movement or result in significant barriers to dispersal of a range of fauna species. Once the clearing is complete the habitat at each site will be similar to the existing environment for species which primarily travel along the ground. For highly mobile species including birds and bats the Activity is unlikely to affect species movement or result in significant barriers to dispersal of these highly mobile species.

No significant fragmentation of habitat would occur, retained adjacent forest and trees would continue to provide suitable movement opportunities; the proposal is unlikely to result in significant barriers to dispersal.

(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,

Considering the relatively small area impacted by the Activity and the availability of similar or better-quality foraging, dispersal and roosting/ nesting habitats nearby in the locality; the impacts to habitat by the Activity is unlikely to have any significant or long-term impacts on foraging, denning, nesting or roosting habitat or breeding territory defended the above listed species.

The habitat to be removed represents a small portion of available habitat for the subject species and TEC in the context of similar quality habitat to be retained within the road reserve and better-quality habitat available within the adjacent Doubleduke State Forest.

d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No areas of outstanding biodiversity value have been declared in Richmond Valley LGA.

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.

A key threatening process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species or ecological communities. The current list of KTPs under the BC Act, and whether the Activity is recognised as a KTP is shown in **Table E.1**.

Table E.1 Key Threatening Processes

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Aggressive exclusion of birds by noisy miners (*Manorina melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change	✓		
Bushrock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)			✓
Competition and habitat degradation by feral goats (*Capra hircus*)			✓
Competition from feral honeybees (*Apis mellifera*)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Habitat degradation and loss by Feral Horses			✓
Herbivory and environmental degradation caused by feral deer			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Habitat degradation and loss by Feral Horses, *Equus caballus*			✓
Importation of red imported fire ants (*Solenopsis invicta*)			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis		✓	
Infection of native plants by *Phytophthora cinnamomi*			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of Lantana (*Lantana camara*)			✓
Invasion of native plant communities by African Olive (*Olea europaea L. subsp. cuspidata*)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*) into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees			✓
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the feral cat (*Felis catus*)			✓
Predation by *Gambusia holbrooki* (Plague Minnow or Mosquito Fish)			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)			✓
Removal of dead wood and dead trees	✓		

KTPs relevant to the works are clearing of native vegetation, infection of frogs by amphibian chytrid causing the disease chytridiomycosis, anthropogenic climate change and removal of dead wood and dead trees. The degree that the Activity would contribute to any threatening process is not considered likely to place the local population of any of the subject species at significant risk of extinction.

Conclusion

It is considered unlikely that the local population of any of the subject species will be placed at significant risk of extinction as a result of the Activity.

Appendix F

Example Permanent Concrete Microbat Roosting Habitat

Description	Photo
Super-t bridge inbuilt microbat habitat	
Microbat box in situ concrete slab above expansion join below footpath. Features include: ■ Expansion join width: 30 mm. ■ Vertical section: 100 x 100 mm wide box, 150mm long. ■ Horizontal shaft: 100 x 100 mm wide box, 400 mm long; sloped for drainage. Carrying capacity 30 Southern Myotis. Proven effective for Southern Myotis at Barrington Bridge (Barrington). Photo source (right): G. Jenkins, Transport for NSW.	 
Cylindrical prism in-situ concrete slab, with opening in super-t girder flange below footpath. Features include: ■ 150 mm long by 90 mm diameter cylindrical prism in in-situ slab. ■ 55 mm diameter hole/ opening on underside of super-t girder flange. ■ Can be positioned at girder lift holes to avoid drilling into super-t girder flange. Carrying capacity 10 Southern Myotis. Proven effective for Southern Myotis at Sportsmans Creek Bridge, Lawrence. Use by individuals Large Bent-winged Bats also observed. False scuppers (with suitable material) may also be suitable.	 

Description	Photo
Roughened expansion joins. Comprises 25 – 30 mm wide and 75 mm deep expansion join located over water with concrete roughened. Brightness of habitat (including reflection from water) needs to be considered for determining suitability. Generally considered non-breeding habitat. Carrying capacity of 100s of microbats. Proven effective for Southern Myotis at Barrington Bridge (Barrington Bridge). Opportunistic use by individual Southern Myotis and Large Bent-winged Bats also recorded at Sportsmans Creek Bridge, Lawrence.	

Description	Photo
Plank bridge inbuilt microbat habitat	
Plank gaps: 20-40 mm wide and 150-200 mm deep. Carrying capacity of 100-1000s of microbats. Proven effective for Southern Myotis at Shark Creek Bridge (Tyndale) and Little Bent-winged Bats at Pacific Highway (Jacky-Bulbin locality).	 

Description	Photo
Retro-fit or add on microbat habitat (less desirable than inbuilt habitat)	
Lattice style bat box from Halfway Creek Bridge. Proven effective for Southern Myotis. Not suitable for bent-winged bats.	 
Hebel block with drilled in chambers (photo source: N. Williams). Proven effective for Southern Myotis. Potentially suitable for bent-winged bats.	 

Temporary bat boxes secured with anchor bolts into in-situ slab (between expansion join). Note: Bat boxes are reenforced with galvanised steel brackets. Effective for Southern Myotis. Not suitable for bent-winged bats. Bat boxes constitute **temporary habitat only**.		

Appendix C - Aboriginal Cultural Heritage (Due Diligence) Assessment

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JACKY BULBIN BRIDGE REPLACEMENT
BUNGAWALBIN WHIPORIE ROAD

ABORIGINAL CULTURAL HERITAGE (DUE DILIGENCE) ASSESSMENT

January 2033

Envirocivil Consultants Pty Ltd

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CONTENTS

FIGURES

ABBREVIATIONS

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
DEECW	Department of Environment, Climate Change and Water (now Heritage NSW)
EIS	Environmental Impact Assessment
EPA	Environmental Planning and Assessment
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
NPW	National Parks and Wildlife
NPWS	National Parks and Wildlife Service
PAD	Potential Archaeological Deposit
Proposed Works	The proposed replacement of flood damaged bridge at the Jackybulbin Creek (Sandy Crossing) crossing on the Bungawalbin- Whiporie Road, Bungawalbin NSW
REF	Review of Environmental Factors
RVC	Richmond Valley Council
SU	Survey Unit
Study Area	The Bungawalbin-Whiporie Road in the vicinity of the JackyBulbin Creek Bridge (Sandy Crossing)

1 INTRODUCTION

1.1 Project Background

Heritage Management and Planning Pty Ltd has been commissioned by Envirocivil Consultants Pty Ltd to undertake a Aboriginal Cultural Heritage (Due Diligence) Assessment (ACHA) to support the Review of Environmental Factors (REF) for the proposed replacement of JackyBulbin Bridge (Sandy Crossing), located on the Bungawalbin-Whiporie Road, Bungawalbin NSW (Figure 1 and Figure 2). The study has been commissioned to consider the potential impacts of the proposed bridge replacement on Aboriginal objects and to provide advice on the requirement additional approvals and impact mitigation measures.

1.2 Project Brief & Methodology

The brief for this project was to undertake Aboriginal cultural heritage assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DEECW 2010). The ACHA includes the following:

- a description of the nature of the works with specific consideration of movement of topsoils with the potential to contain Aboriginal objects
- a search of relevant Aboriginal heritage registers, including the Aboriginal Heritage Information Management System (AHIMS)
- a review of environmental information to consider the potential that the bridge replacement and road upgrade works are located in landforms or landscapes with an elevated potential to contain Aboriginal objects or archaeological sites
- a review of historic ground disturbance to consider the potential spatial integrity of sites to factors which might have removed Aboriginal objects form the area of proposed trail and bridge upgrades
- completion of a site inspection to verify the outcomes of the desktop study and to consider any cultural landscapes values which cannot otherwise by understood from a desktop or archaeological investigation, and
- documentation of the assessment outcomes including:
    i. a summary of any archaeological sites within the area of the proposed bridge replacement works
    ii. appropriate mitigation measures to avoid known Aboriginal archaeological sites or landforms with the potential to contain Aboriginal archaeological sites, and

iii. statements on the adequacy of the assessment including the requirement for additional archaeological investigation and Aboriginal community consultation.

1.2 Report Authorship

The study was undertaken by Tim Hill (BA. Hons. Archaeology and Palaeoanthropology, University of New England (1998)).

1.3 Description of the Proposal

The existing JackyBulbin Bridge on Bungawalbin Whiporie Road currently consists of a single span Doolan deck (composite timber and concrete) type bridge founded on pad footing abutments, with an overall length of 12 metres. The bridge consists of 1 deck unit which provides a narrow bridge with a maximum width of 3.4 metres between barriers. Both approaches are asphalt sealed ranging in 4 to 5 metre formations with MASH compliant safety barriers. The asphalt sealed approaches and the structural integrity of the northern and southern headstocks of the existing bridge were significantly damaged during the recent flood events in March 2021 (Figure 2, Figure 3 and Figure 4).

The bridge replacement works include the following ground disturbing works:

- Construction of a replacement bridge downstream (west) of the existing concrete bridge including concrete abutments
- Construction of new raised asphalt pavement connecting to Bungawalbin- Whiporie Road including removal of native vegetation and introduction of stone and aggregate to reach the bridge height
- Removal of and decommission of the existing concrete bridge including concrete abutments and asphalt required to realign the Whiporie – Bungwalbin Road, and
- Construction of drains and erosion scour protection including stone armouring of the abutments.

Figure 1: Location of JackyBulbin Creek (Sandy Crossing)

Figure 2: Location of Jackybulbin Bridge replacement in relation to the existing bridge (Envirocivil Consultants)

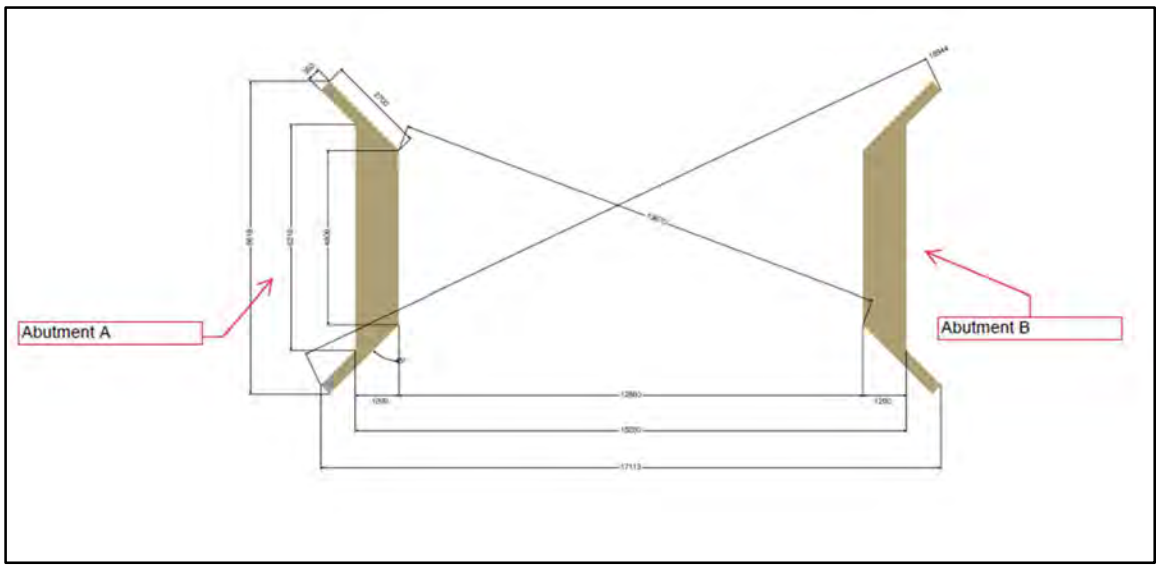

Figure 3: Concept design showing dimensions of abutments (plan view)

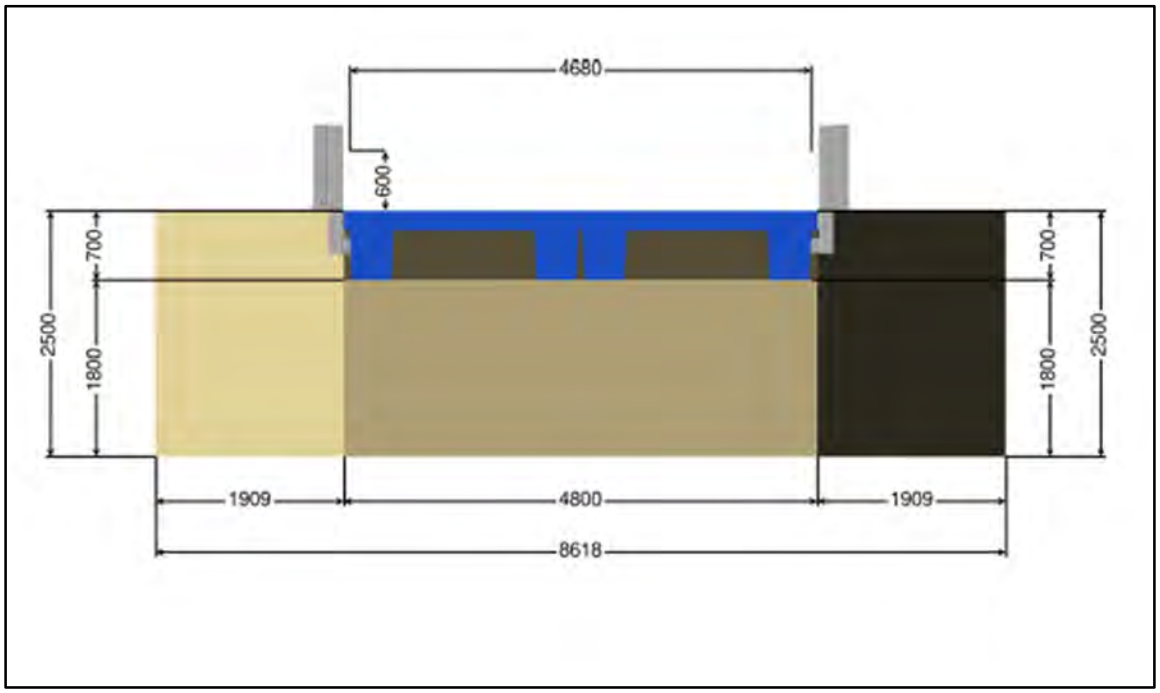

Figure 4: Concept design showing dimensions of abutments (cross section view)

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2 LEGISLATIVE AND PLANNING CONTEXT

2.1 Environmental Planning and Assessment Act (1979)

The Environmental Planning and Assessment Act (NSW) (1979) (EPA Act) provides a framework to environmental assessment and approvals in NSW. The EPA Act includes three parts relevant to ACHA assessments:

Part 3- Planning instruments which include Local Environment Plans (LEPs), Development Control Plans (DCPs) and other strategic planning controls.

Part 4- Development assessment and consent controls including approvals by local Councils and Regional Planning Panels.

Part 5- Self assessment and approvals by a government agency or Determining Authorities, for infrastructure and environmental proposals, and for the approval of State Significant Infrastructure by the Planning Minister.

The Proposal is being determined Richmond Valley Council (RVC) by a REF under Part 5 of the EPA Act. The Due Diligence Code of Practice is an appropriate approval pathway for works approved by a REF.

2.2 National Parks and Wildlife Act 1974 (NSW) and Regulations 2019 (NSW)

The National Parks and Wildlife Act 1974 (NSW) (NPW Act) is the primary legislation concerning the identification and protection of Aboriginal cultural heritage in New South Wales. Three key definitions in the NPW Act which are relevant to this assessment include:

- Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains.
- Aboriginal remains means the body or the remains of the body of a deceased Aboriginal person, but does not include—

  (a) a body or the remains of a body buried in a cemetery in which non-Aboriginal persons are also buried, or

  (b) a body or the remains of a body dealt with or to be dealt with in accordance with a law of the State relating to medical treatment or the examination, for forensic or other purposes, of the bodies of deceased persons.
- Harm an object or place includes any act or omission that—

  (a) destroys, defaces or damages the object or place, or

  (b) in relation to an object—moves the object from the land on which it had been situated, or

(c) is specified by the regulations, or

(d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c),

but does not include any act or omission that—

(e) desecrates the object or place, or

(f) is trivial or negligible, or

(g) is excluded from this definition by the regulations.

Section 86 of the NPW Act provides offense provisions for Aboriginal objects, Aboriginal skeletal remains and Aboriginal places in NSW (see the definition of 'Harm' above). Section 87 of the NPW Act outlines defences against prosecution relating to Aboriginal objects, skeletal remains and Aboriginal places. These include:

- Acting in accordance with an Aboriginal Heritage Impact Permit (AHIP) issued under Section 90 of the NPW Act
- Demonstrating that the "defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed"
- The activity was prescribed as a "low Impact" activity or an "omission" under the NPW Regulations (2019), and
- Was undertaken in compliance with a Code of Practice adopted or prescribed by the NPW Regulations (2019).

The application of the Due Diligence Code of Practice is considered an appropriate approval pathway for the works as some parts of the bridge upgrades do not meet the criteria of 'low impact activities'.

2.3 Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW

The ACHA has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DEECW 2010A). The purpose of this Due Diligence Code of Practice (is to establish a defence against prosecution in the event that Aboriginal objects may be inadvertently harms during an activity (DEECW 2010A: 1 & 2). The Due Diligence Code of Practice:

> …sets out the reasonable and practicable steps which individuals and organisations need to take in order to:
>
> 1. identify whether or not Aboriginal objects are, or are likely to be, present in an area
> 2. determine whether or not their activities are likely to harm Aboriginal objects (if present)
> 3. determine whether an AHIP application is required (DEECW 2010A:2).

The Due Diligence Code of Practice makes the following statement on the requirement for an AHIP (DECCW 2010A:2):

> If Aboriginal objects are present or likely to be present and an activity will harm those objects, then an AHIP application will be required.

However, the practical application of the Due Diligence Code of Practice is that it is a process of establishing whether additional assessment is required. In the event that the Due Diligence assessment concludes that harm to Aboriginal objects is likely, additional archaeological investigation, including Aboriginal community consultation, in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DEECW 2010 B) (CoPAI) is required.

A key limitation of the Due Diligence Code of Practice and the CoPAI is that they do not clearly define the thresholds of "likely" or "highly likely". To assist the assessment, the Merriam Webster dictionary definition (www.merriam-webster.com/dictionary) of "likely" is:

> "Having a high probability of occurring or being true: very probable"

2.4 Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW

The *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DEECW 2010B) (CoPAI) provides the following statement on the application of the Code:

> "This Code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. Where an Aboriginal cultural heritage assessment requires an archaeological investigation to be undertaken, this must be done in accordance with the requirements of this Code." (DEECW 2010B:2).

The purpose of this CoPAI is to (DEECW 2010B:1):

1. establish the requirements for undertaking test excavation as a part of archaeological investigation without an AHIP. If you comply with these requirements and you harm an Aboriginal object when undertaking test excavations, your actions will be excluded from the definition of harm and as such you will not be committing an offence of harm to an Aboriginal object.
2. establish the requirements that must be followed when carrying out archaeological investigation in NSW where an application for an AHIP is likely to be made. Under the NPW Act, the Director General can require that certain information accompany an application for an AHIP. This Code explains what that information is in relation to archaeological investigations.

Compliance with the CoPAI is a minimum requirement for archaeological test excavation or archaeological investigation which results in harm to Aboriginal objects. However, where the CoPAI investigation concludes that test excavations or an AHIP is not required the reporting requirements are considered a guideline for investigation and reporting.

2.5 Guide to Investigating, Assessing and Reporting on Aboriginal cultural Heritage in NSW (OEH 2011)

The *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) which provides the following statement on the role of the Aboriginal Cultural Heritage Assessment Report in the management of Aboriginal heritage in NSW:

> Anyone proposing to carry out an activity that may harm an Aboriginal object or a declared Aboriginal place must investigate, assess and report on the harm that may be caused by the activity they propose.
>
> The investigation and assessment of Aboriginal cultural heritage is undertaken to explore the harm of a proposed activity on Aboriginal objects and declared Aboriginal places and to clearly set out which impacts are avoidable and which are not. Harm to significant Aboriginal objects and declared Aboriginal places should always be avoided wherever possible. Where harm to Aboriginal objects and declared Aboriginal places cannot be avoided, proposals that reduce the extent and severity of harm to significant Aboriginal objects and declared Aboriginal places should be developed.
>
> An Aboriginal cultural heritage assessment report is a written report detailing the results of the assessment and recommendations for actions to be taken before, during and after an activity to manage and protect Aboriginal objects and declared Aboriginal places identified by the investigation and assessment.

Compliance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) is a minimum requirement for a AHIP application. However, it is a useful guide for all Aboriginal cultural heritage assessments irrespective of the approval pathway. As a rule, the level of assessment should be proportionate to the scale of the proposed impacts and the nature, extent and significance of Aboriginal cultural values.

3 HERITAGE DATABASE SEARCH

3.1 NSW Heritage Inventory and Section 170 register.

A search of the NSW Heritage Inventory identified no local heritage sites within close proximity to the Study Area (**Figure 5**).

Figure 5: Richmond Valley LEP Heritage Map (007)

3.2 Aboriginal Heritage Information Management System

The Aboriginal Heritage Information Management System (AHIMS) provides a list of previously recorded Aboriginal sites in NSW. A search of the AHIMS database is a condition of compliance with the Due Diligence Code of Practice and provides information on the types of sites which are, or may be, located within and around the Study Area.

A search was undertaken on 26 January 2023 for the area "Lat, Long From : -29.1778, 153.1452 - Lat, Long To : -29.1403, 153.207" (**Figure 6**). No Aboriginal sites are recorded in close proximity to the Study Area.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : TH082 Jackybulbin bridge
Client Service ID : 748348

Tim Hill Heritage Management and Planning
64 Reids Road
Bellingen New South Wales 2454
Attention: Tim Hill
Email: timhill.heritage@gmail.com

Date: 26 January 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -29.1778, 153.1452 - Lat, Long To : -29.1403, 153.207, conducted by Tim Hill on 26 January 2023.

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. *

Figure 6: AHIMS search results (#748348)

4 ENVIRONMENTAL REVIEW

Sandy Crossing is located upstream of the confluence of Bungawalbin Creek and Jackybulbin Creek, which flows north into the Richmond River (**Figure 7**). Bungawalbin Creek forms a series of small channels and lagoons through the surrounding floodplain which are subject to seasonal inundation and form large swamps in places. Sandy Crossing is located to the west of Mount Doubleduke and the Richmond Range which comprise a small coastal range which forms a watershed between the Richmond River and the Esk River which flows south-east into the Clarence River estuary above Iluka.

The geology of the Coast Range is mapped as quaternary alluvial and comprises alluvial soils and sandy gravels (Maclean 1:250,000 geological map sheet, see **Figure 8**). The Richmond Range is relatively dry and nutrient poor when compared to the volcanic/ basalt ranges of the Northern Rivers and is not considered to be resource rich in terms of available carbohydrate or protein food sources. Significant areas of deeper quaternary alluvial soils are located to the south along the Clarence River and north-east on the Richmond River that would have included an extensive mosaic of rainforests and swamps providing access to a range of resources which would be a focus for Aboriginal occupation of both the Clarence and the Richmond Valley. The coastline and estuaries to the east, in particular the lower estuary of the Clarence and Evans Rivers, would have provided significant aquatic and marine resources for Aboriginal people in the region that typically aggregated in winter for seasonal fish runs and for the harvest of shellfish.

The Bungawalbin and Yarringully Parks and Reserves Plan of Management provides the following summary of forest types of Bungawalbin (NSW National Parks and Wildlife Service 2012):

> The planning area is located within a section of the Bungawalbin floodplain which is dissected by low ridges. Small floodplains between each ridge have formed through depositional processes associated with the adjacent Bungawalbin Creek. Runoff is channelled through drainage depressions to the creek floodplain. This has resulted in a landscape with a unique combination of small billabongs, swamps, flood channels and stands of swamp vegetation.
>
> The wetlands, creeks and permanent lagoons in the planning area provide important habitat for a wide variety of fauna, including aquatic and terrestrial invertebrates, fish, amphibians, reptiles, birds and mammals. A primary role of flooding in forested wetlands is the cycling of nutrients, the soils and vegetation being able to absorb large quantities of mineral nutrients, thereby improving downstream water quality. The Bungawalbin and Yarringully parks and reserves provide excellent nutrient retention due to the low flow and drying rates, low turbulence, high levels of highly organic sediments and low biological decomposition rates. These cyclic processes of renewal maintain the diversity of flora and fauna in the forested wetlands, and are important refugia within landscapes where water and nutrients are scarce.

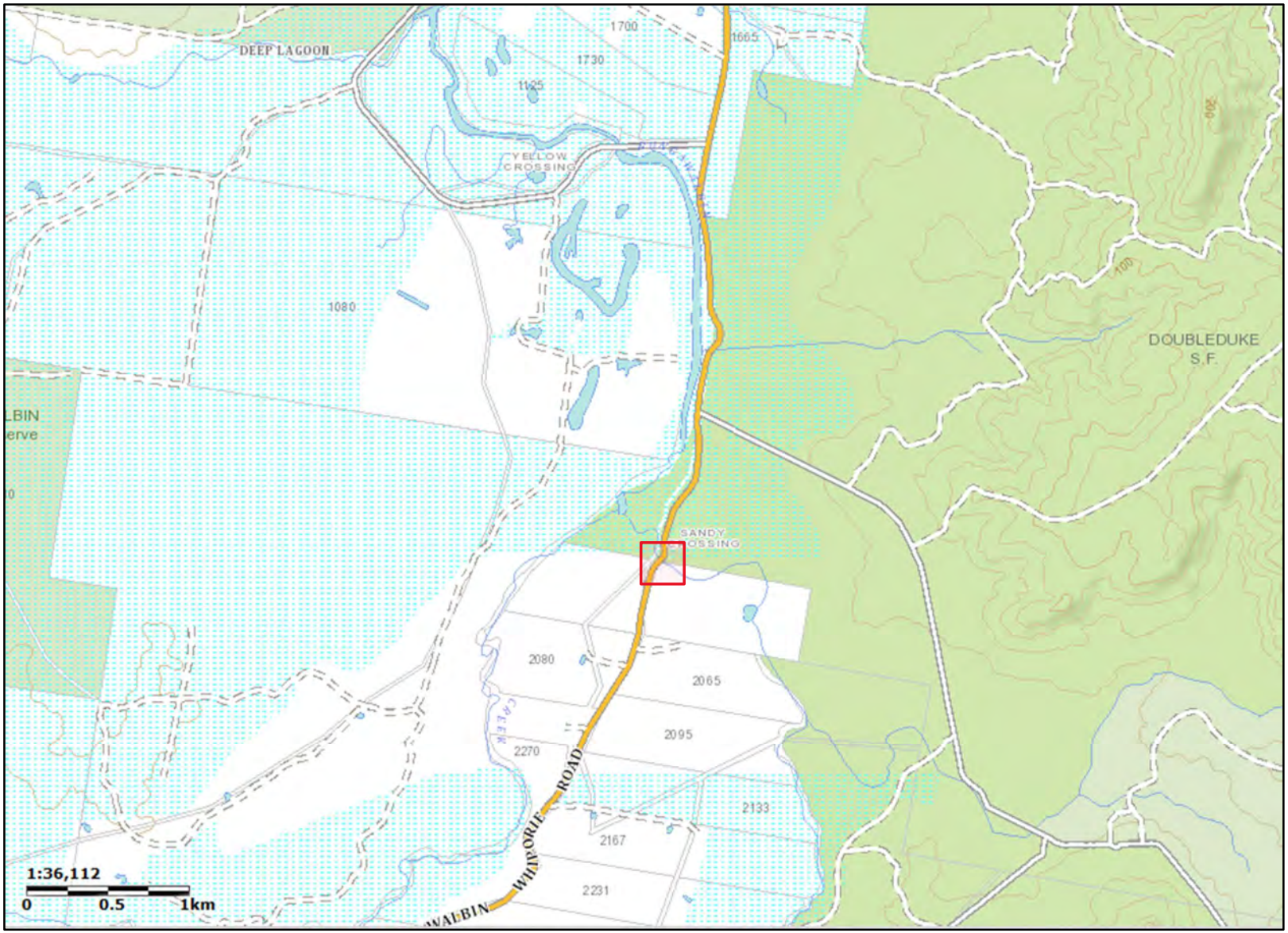

Figure 7: Topography and hydrology (source Six Maps)

Figure 8: Maclean 1:250,000 geological map sheet

A review of the 1963 aerial photos shows the Study Area has been a forested environment for at least 50 years, which is not unexpected for an area with low soil fertility that is not suitable for grazing or horticulture (**Figure 9**). The road surface in this image shows that the Bungawalbin- Whiporie Road had a gravel surface.

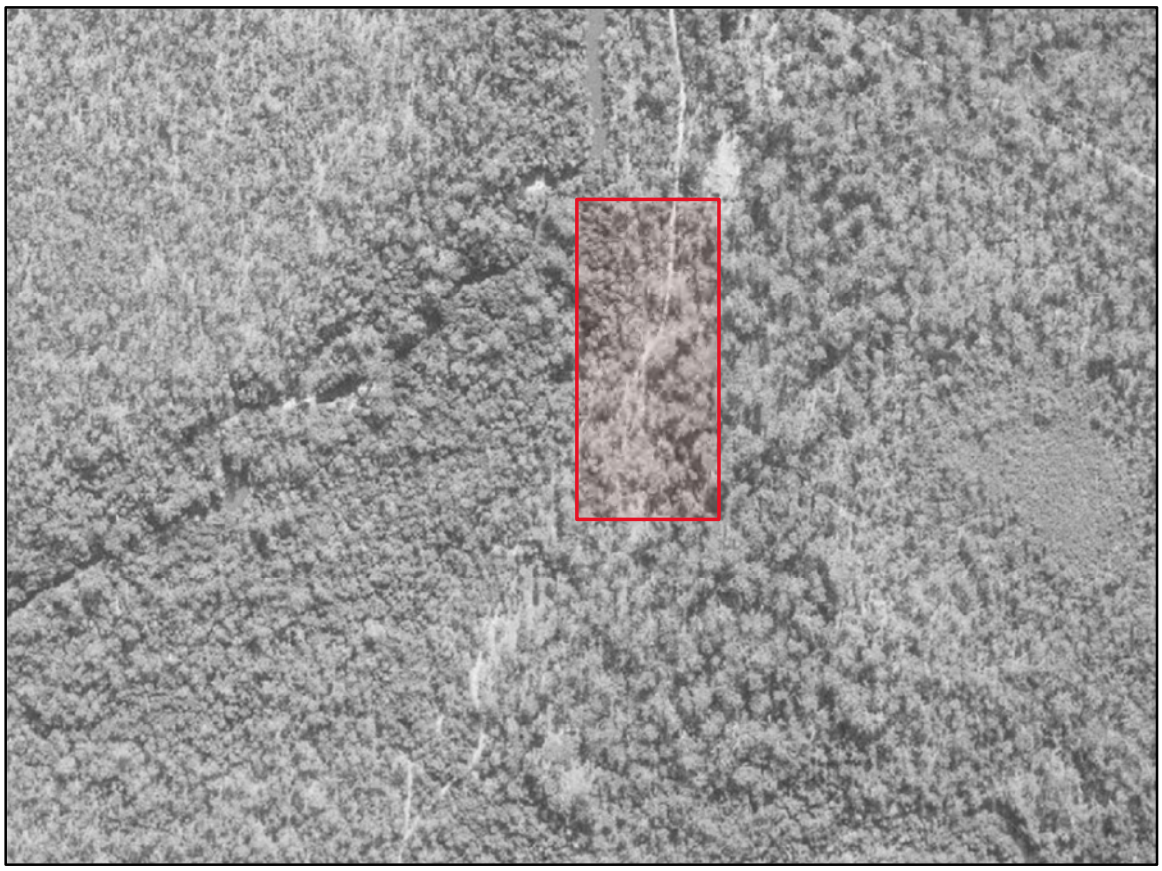

Figure 9: 1963 Aerial photo (Sandy Crossing) (source NSW Spatial Collaboration Portal)

The following comments on the bridge crossing are provided from historic parish maps (NSW Historical Land Records Viewer):

- the original crossing of Jackybulbin Creek was upstream of the current bridge location (**Figure 10**)
- the 1910 Parish map has an annotation of a possible 'track' crossing, however this is also upstream of the current crossing (**Figure 11**)
- the 1926 parish map includes the current alignment of the Bungawalbin – Whiporie Road indicating that the road was likely constructed in the interwar period (**Figure 12**), and
- the 1943 parish map shows the current alignment as the only crossing of Jackybulbin Creek (**Figure 13**).

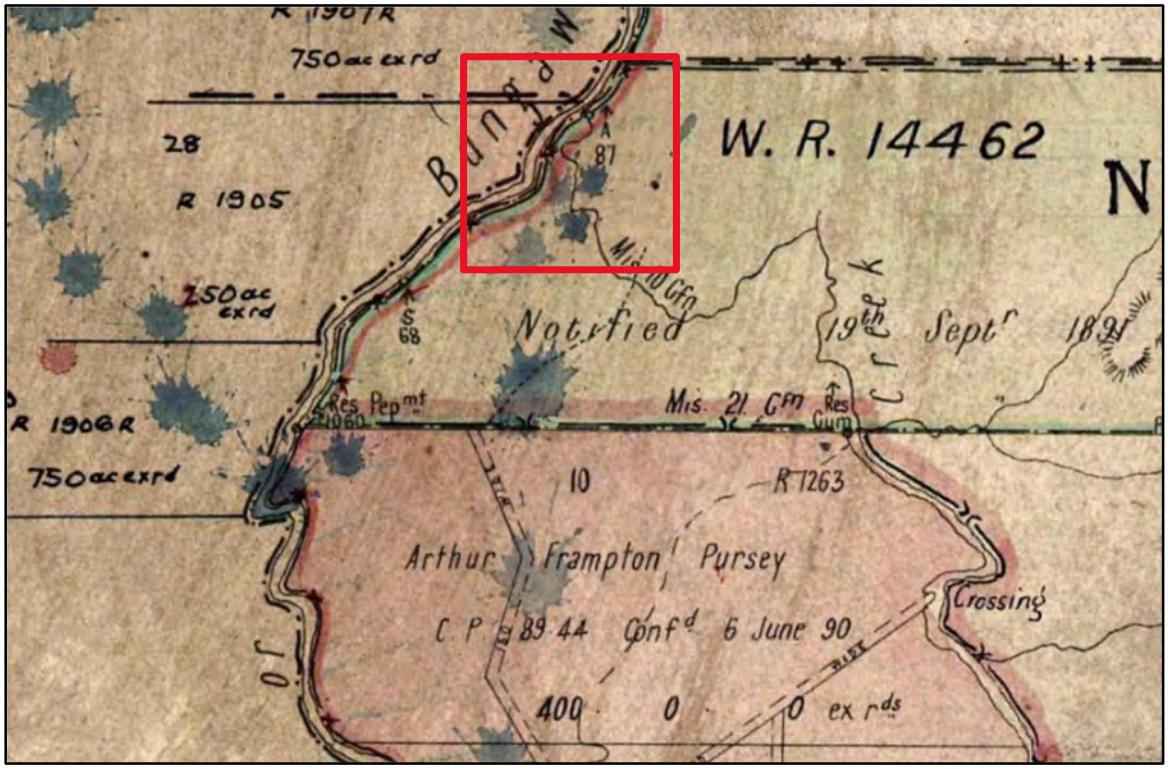

Figure 10: C.1890 Doubleduke Parish Map (NSW Historic Land Record Viewer)

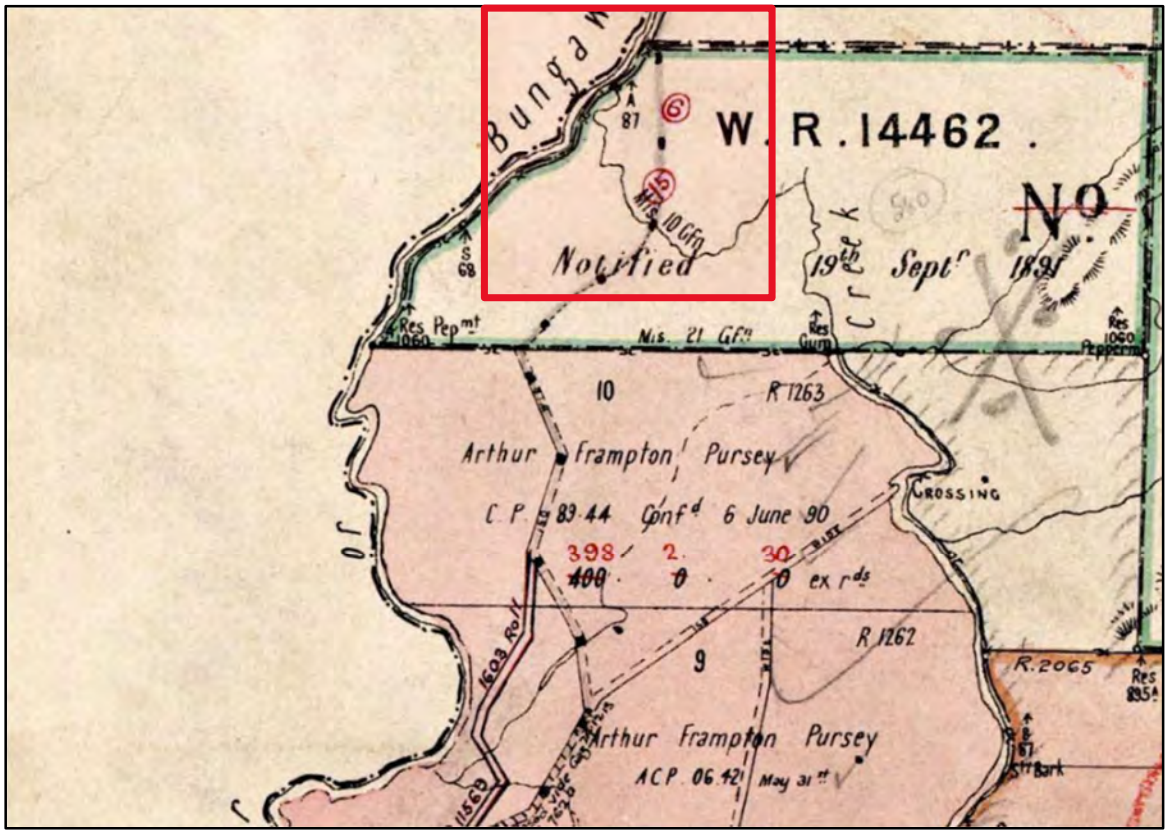

Figure 11: 1910 Doubleduke Parish Map (NSW Historic Land Record Viewer)

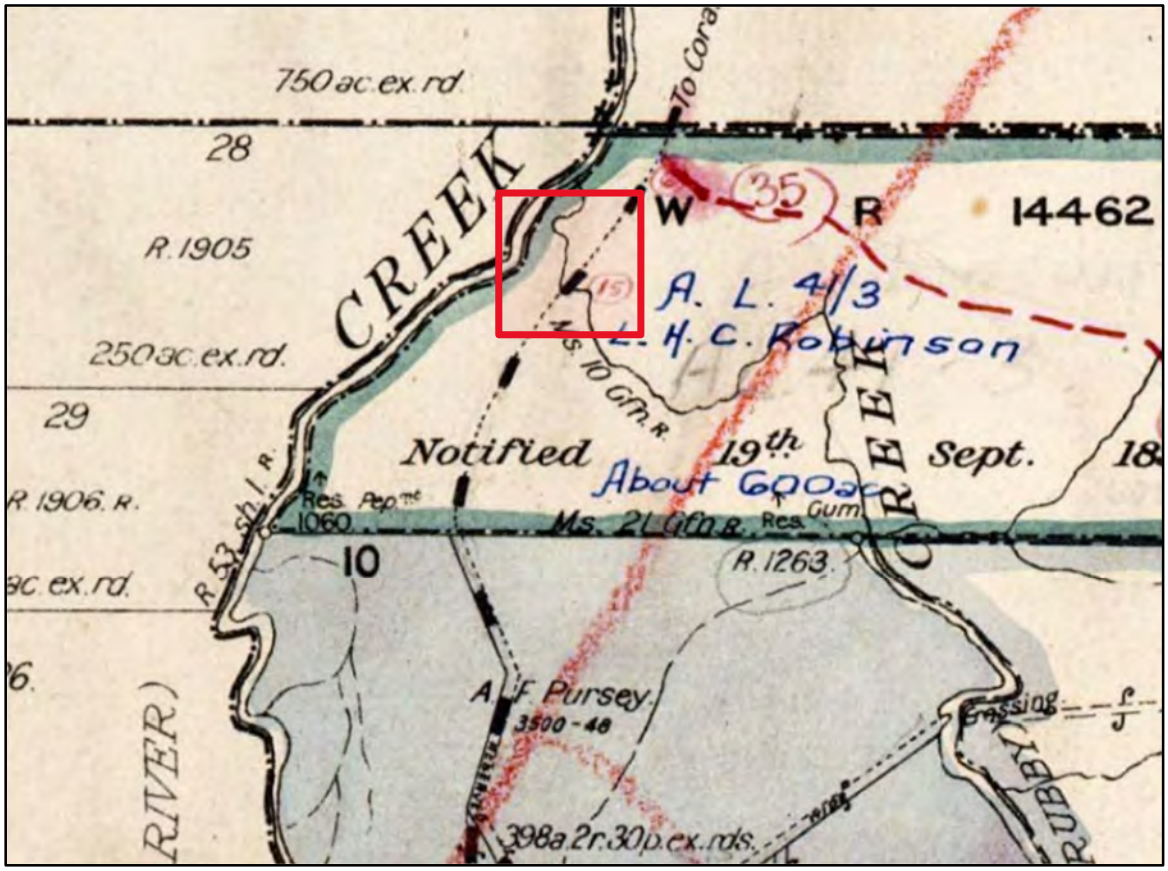

Figure 12: 1926 Parish Map (NSW Historic Land Record Viewer)

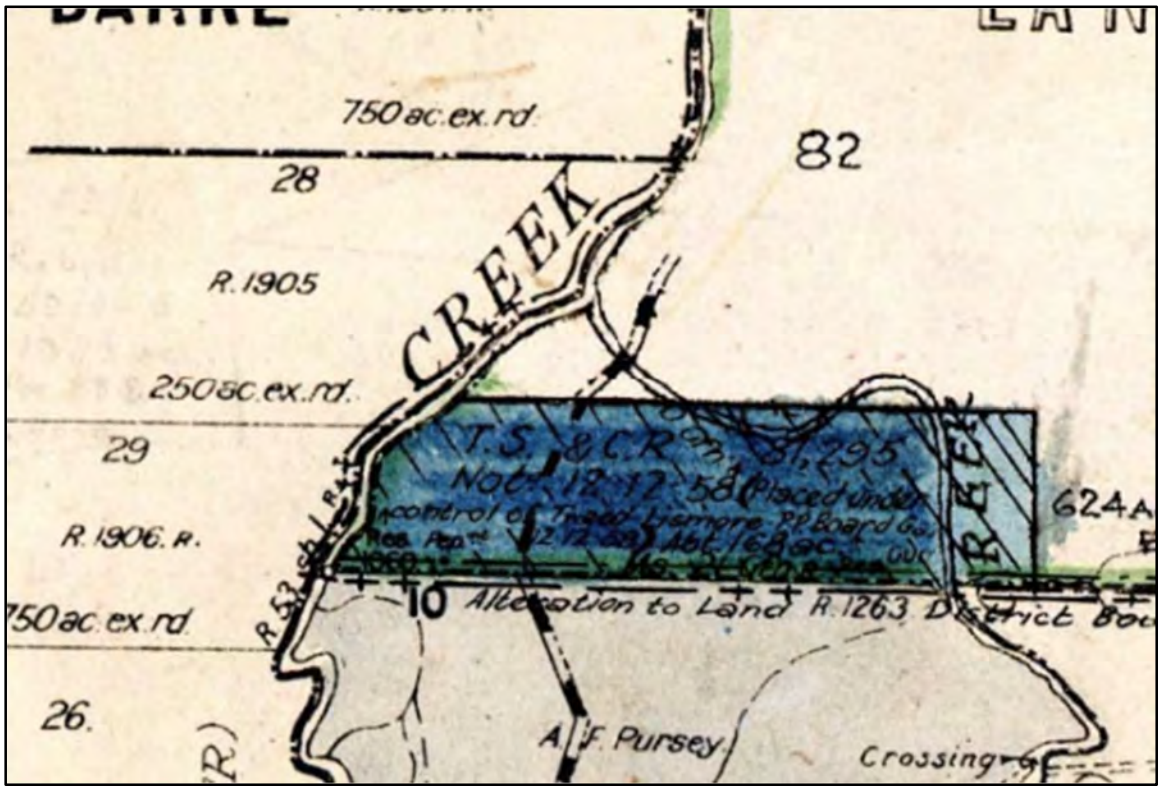

Figure 13: 1943 Doubleduke Parish Map ((NSW Historic Land Record Viewer)

Based on a preliminary review of the local environment, and specifically the relative availability of food resources that would increase the likelihood the Study Area was subject to intensive use which would result in the deposition of Aboriginal archaeological sites, it is not considered that the Jackybulbin Creek has an elevated potential to contain Aboriginal sites. Jackybulbin Creek is in low lying alluvial floodplain environment and it is considered that the seasonally inundated swamps and forests of the floodplain downstream would be more suitable for hunting and food gathering. However, the low-lying swamps and billabongs would not necessarily be preferred landforms for larger occupation sites that would be conducive to the deposition of stone artefacts and organic remains. In the Richmond Valley the more preferable landforms and environments for larger campsites would include:

- the elevated foothills around the Richmond Range to the east including Doubleduke State Forest
- the ecotones around the larger lagoons and swamps in Bungawalbin Creek and in particular where large waterbodies would create habitat for birds and fish not available in the smaller creeks that dissect the open hardwood forest environments, and
- the sub-tropical lowland rainforests of the Clarence River to the south and Richmond River valley to the north which had significantly greater botanical diversity.

An additional consideration is that the preferred landforms for campsites are typically elevated spurs and ridge crests which sit up above the low-lying river valleys and creeks to provide access to winds and are dry, or can be managed as clear spaces using fire. This pattern of site distribution is in part also due to the avoidance of creeks so as to retain them as hunting reserves as native fauna tend to avoid populated areas. The elevated foothills and spurs are also easier to walk through as they typically have a more open grassy understory. In the context of the Study Area this would include the small ridge to the south of Jackybulbin Creek.

5 FIELD SURVEY

5.1 Assessment Methodology

The archaeological site inspection was undertaken on 23 January 2022 by Tim Hill. The objectives of the site inspection included:

- inspection of the existing bridge including abutments and adjacent creek bank and inspection of the condition of the road on either side of the bridge to identify Aboriginal archaeological sites or objects
- confirmation of the disturbance history of the road reserve as it may impact on the potential of the Study Area to contain Aboriginal archaeological sites or objects
- discussion of the nature of the landscape values and the potential that surrounding areas would contain Aboriginal objects, and
- consideration of appropriate Aboriginal heritage impact mitigation measures.

5.2 Site inspection photos

Figure 14: Jacky Bulbin Bridge looking north

Figure 15: The southern abutment showing original timbers and replacement concrete/ timber bridge

Figure 16: sandy soil on the northern creek bank (white post shows proposed bridge alignment)

Figure 17: typical drain and road reserve south of Jacky Bulbin Bridge

Figure 18: Typical verge of the road and drains north of Jacky Bulbin Bridge

5.3 Survey Results

The following statements summarise the outcomes of site inspection:

- no Aboriginal objects were identified during the site inspection either within the marked alignment of the proposed new bridge or the bushland immediately adjacent to the proposed new bridge
- while grass and vegetation cover was relatively sparse the creek has been subject to the deposition of a significant amount of sand and small gravels which reduce the potential to identify archaeological sites, should they occur within the Study Area
- the creek bed is located below two small rises, the most significant being the rise to the south, and it is expected that the more elevated landforms would have the greater potential for Aboriginal archaeological sites
- there were no large trees which have the potential for anthropogenic modification (scarred or carved trees)
- it is not likely that burials would survive in the floodplain due to the increase rates of soil erosion and deposition, and
- there is visible ground disturbance from the road and road drains which would reduce the potential for intact topsoils containing archaeological sites.

Based on the outcomes of the AHIMS database search, the review of environmental considerations and the archaeological site inspection it is not considered that there is a high likelihood that the proposed replacement of Jacky Bulbin Bridge or the adjacent road surface will impact archaeological sites. As such, additional archaeological test excavation is not required prior to undertaking the works and the works can be approved using the 'Due Diligence' approval pathway.

6 MANAGEMENT RECOMMENDATIONS

Recommendation 1: Aboriginal Objects Find Procedure

It is recommended that if it is suspected that Aboriginal objects have been uncovered during the bridge and road upgrades:

- work in the surrounding area is to stop immediately and records are made of the finds via project incident reporting procedures
- a temporary fence is to be erected around the site and appropriate controls put in place to ensure that no additional ground disturbance happens in the vicinity of the find
- an appropriately qualified archaeological consultant is engaged to identify the material and provide an initial assessment of the significance of the object and the likely nature and extent of any associated archaeological sites
- if the material is found to be of Aboriginal origin, the find must be reported on the AHIMS database
- In the event that the Aboriginal objects are considered to have been damaged or disturbed, the incident must be reported through the NSW Enviro Hotline, and
- Works may only recommence after advice from Heritage NSW on the requirement for an AHIP or where design, engineer or construction measures are identified to mitigate further damage to the Aboriginal site.

Recommendation 2: Aboriginal Human Remains

Although it is unlikely that Human Remains will be located at any stage during earthworks within the Study Area, should this event arise it is recommended that all works must halt in the immediate area to prevent any further impacts to the remains. The site should be cordoned off and the remains themselves should be left untouched. The nearest police station (Coraki) and the Heritage NSW (Parramatta) are all to be notified as soon as possible. If the remains are found to be of Aboriginal origin and the police do not wish to investigate the site for criminal activities, the Aboriginal community and the Heritage NSW should be consulted as to how the remains should be dealt with. Work may only resume after agreement is reached between all parties, provided it is in accordance with all parties' statutory obligations.

7 REFERENCES

Geoscience Australia

Maclean 1:250,000 geological map sheet
< https://gmaps.geoscience.nsw.gov.au/250K/Maclean/>

Department of Environment, Climate Change and Water,

2010A *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*

2010B *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*

NSW National Parks and Wildlife Service

2012 BUNGAWALBIN AND YARRINGULLY PARKS AND RESERVES (comprising Bungawalbin National Park, Bungawalbin Nature Reserve, Bungawalbin State Conservation Area, Yarringully Nature Reserve and Yarringully State Conservation Area) PLAN OF MANAGEMENT

Office of Environment and Heritage

2011 *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*

Appendix D – Statement of Heritage Impact

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JACKYBULBIN BRIDGE REPLACEMENT, BUNGAWALBIN
STATEMENT OF HERITAGE IMPACT

JANUARY 2023

Envirocivil Consultants Pty Ltd

DOCUMENT CONTROL	
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Project Number	TH082
Author	Tim Hill
Client	Envirocivil Consultants Pty Ltd
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Status	Draft
Date	27 January 2023
Version	1a

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FIGURES

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ABBREVIATIONS

DCP	Development Control Plan
EIS	Environmental Impact Assessment
EPA	Environmental Planning and Assessment
LEP	Local Environment Plan
Proposed Works	The proposed replacement of flood damaged bridge at the Jacky Bulbin Creek (Sandy Crossing) crossing on the Bungawalbin- Whiporie Road, Bungawalbin NSW
REF	Review of Environmental Factors
RVC	Richmond Valley Council
SoHI	Statement of Heritage Impact
SU	Survey Unit
Study Area	The Bungawalbin-Whiporie Road in the vicinity of the JackyBulbin Creek Bridge (Sandy Crossing)

1. INTRODUCTION

1.1 Project Background

Heritage Management and Planning Pty Ltd has been commissioned by Envirocivil Consultants Pty Ltd to undertake a Aboriginal Cultural Heritage (Due Diligence) Assessment (ACHA) to support the Review of Environmental Factors (REF) for the proposed replacement of Jacky Bulbin Bridge (Sandy Crossing), located on the Bungawalbin-Whiporie Road, Bungawalbin NSW (**Figure 1**). It is noted that the JackyBulbin Bridge is not listed as an item of local heritage significance on the Richmond Valley Local Environment Plan (2012) (LEP) (**Figure 2**).

The objectives of the SoHI are to document the heritage significance of the existing JackyBulbin Bridge, to assess the potential impacts of the proposed bridge replacement works on the heritage significance of the proposed bridge crossing and outline appropriate impact mitigation measures to ensure the works do not have a significant impact on local heritage values of the existing bridge.

1.2 Description of the proposed bridge replacement

The existing JackyBulbin Bridge on the Bungawalbin Whiporie Road currently consists of a single span Doolan deck (composite timber and concrete) type bridge founded on pad footing abutments, with an overall length of 12 metres. The bridge consists of 1 deck unit which provides a narrow bridge with a maximum width of 3.4 metres between barriers. Both approaches are asphalt sealed ranging in 4 to 5 metre formations with MASH compliant safety barriers. The asphalt sealed approaches and the structural integrity of the northern and southern headstocks of the existing bridge were significantly damaged during the recent flood events in March 2021 (**Figure 3**, **Figure 4** and **Figure 5**).

The bridge replacement works include the following ground disturbing works:

- Construction of a replacement bridge downstream (west) of the existing concrete bridge including concrete abutments
- Construction of new raised asphalt pavement connecting to Bungawalbin- Whiporie Road including removal of native vegetation and introduction of stone and aggregate to reach the bridge height
- Removal of and decommission of the existing concrete bridge including concrete abutments and asphalt required to realign the Whiporie – Bungwalbin Road, and
- Construction of drains and erosion scour protection including stone armouring of the abutments.

1.3 Methodology

The SoHI includes three main parts, being:

- Background research and historical context and database review in accordance with the *Australia ICOMOS Burra Charter* (NSW Heritage Office 1999).
- An assessment of heritage significance in accordance with the '*Assessing Heritage Significance*' (NSW Heritage Office 2001) and '*Investigating Heritage Significance*' (NSW Heritage Office 2004) guidelines, and
- Statement of Heritage Impact in accordance with the NSW '*Statements of Heritage Impact*' Guidelines (NSW Heritage Office 2002).

1.4 Authorship

The SoHI has been written by Tim Hill (BA Hons. (1998) Archaeology and Paleoanthropology, University of New England).

Figure 1: Location of JackyBulbin Bridge (Sandy Crossing)

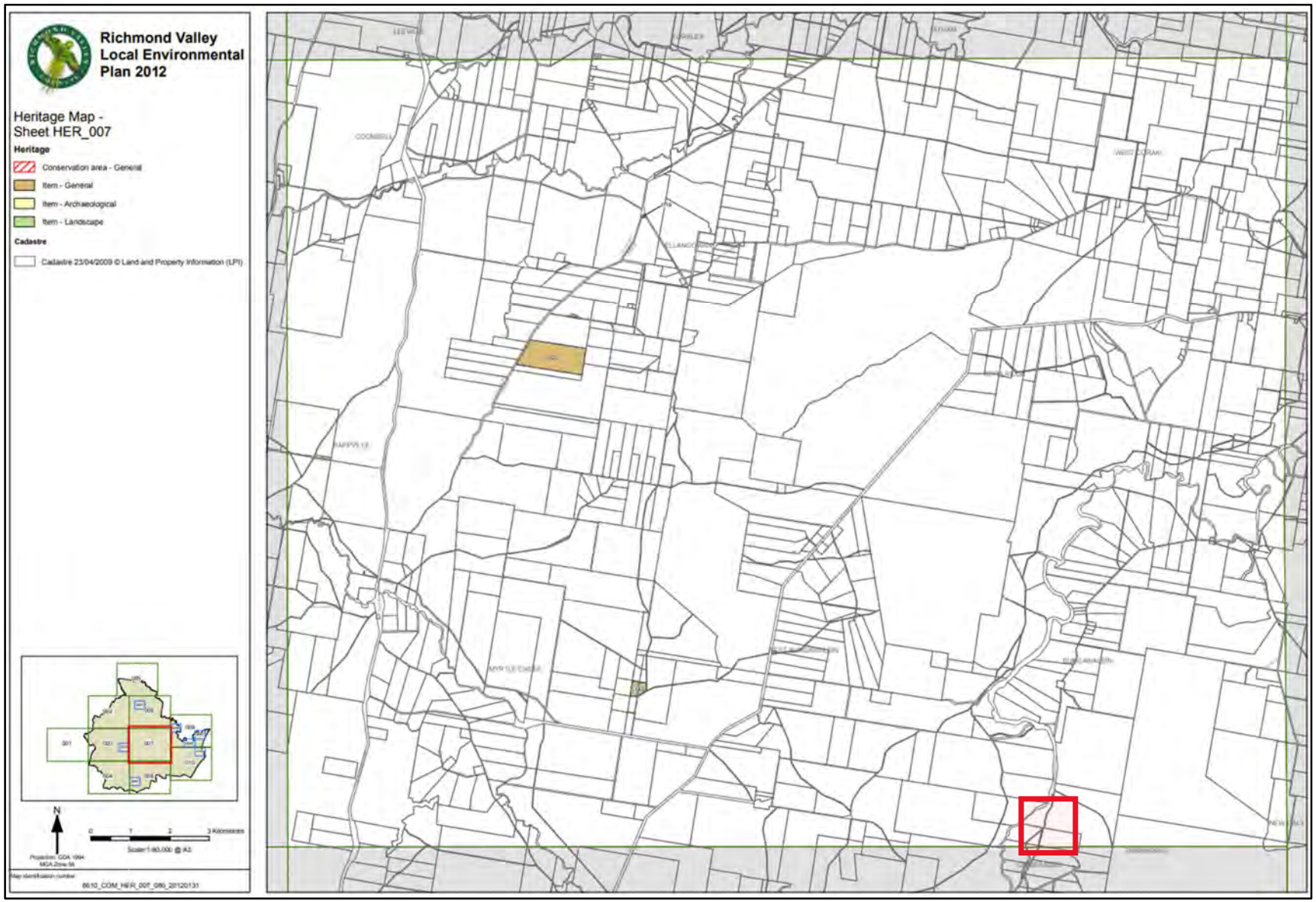

Figure 2: Richmond Valley LEP Heritage Map (Her007) showing the Study Area

Figure 3: Location of Jackybulbin Bridge replacement in relation to the existing bridge (Envirocivil Consultants)

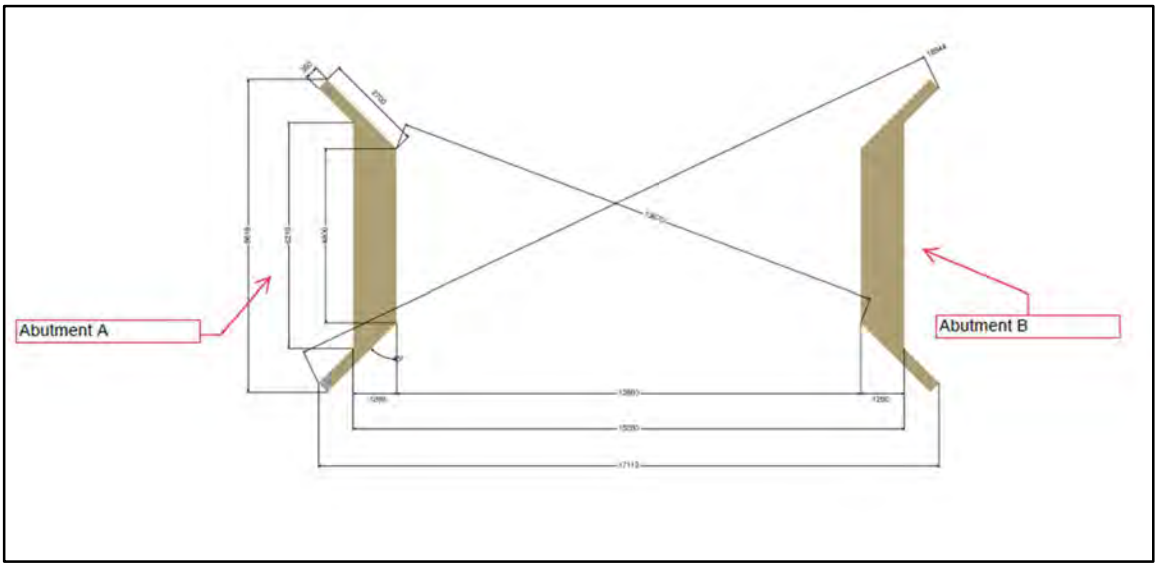

Figure 4: Concept design showing dimensions of abutments (plan view)

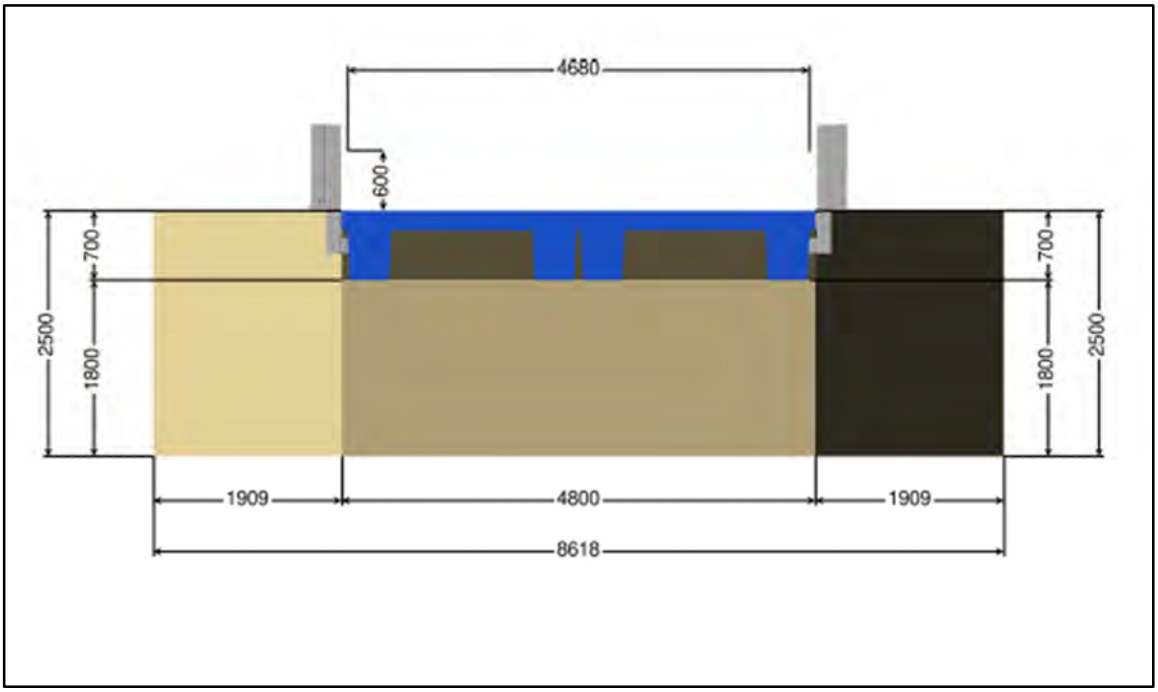

Figure 5: Concept design showing dimensions of abutments (cross section view)

2 Legislative Context

2.1 NSW Heritage Act (1977)

The Heritage Act 1977 (NSW) provides protection for the environmental and cultural heritage of the State, which includes places, buildings, works, relics, movable objects, or precincts that are of State or local heritage significance. The legislation focuses on identifying places of either local or state heritage significance and protecting them by registration on heritage registers. Significant historic heritage items are afforded little protection (other than at the discretion of councils) where they are not on a heritage register. Of note are the provisions allowing for interim heritage orders (Part 3), which grants the Minister or the Minister's delegates, (which importantly may include a local government agent) the power to enter a property and provide emergency protection for places that have not yet been put on a heritage register, but that may be of local or State significance.

For the purposes of the management of historic heritage in NSW the Heritage Act sets out the following management and regulation mechanisms:

- the establishment of the NSW Heritage Register which provides regulation and management of state significant items by the NSW Heritage Council where they have been assessed and formally listed on the register
- delegation of the management and regulation of items of local heritage significance to local councils and state Government agencies so long as they are listed on either a LEP or a Government agency heritage list (section 170 register), and
- management and regulation of 'relics' and archaeological sites by the NSW Heritage Council irrespective of whether the relics or archaeological sites are known or listed on a heritage register

The Heritage Act 1977 (NSW) also makes allowances for the protection of archaeological deposits and relics (Part 6). A 'relic' is defined by the Heritage Act as:

> Any deposit, object of material evidence which relates to the settlement of the area that comprises NSW, not being Aboriginal settlement, and has local or state significance.

Part 6 Division 9 of the Heritage Act protects archaeological 'relics' from being 'exposed, moved, damaged, or destroyed' by the disturbance or excavation of land. This protection extends to the situation where a person has 'reasonable cause to suspect' that archaeological remains may be affected by the disturbance or excavation of the land. It applies to all land in NSW that is not included in the SHR.

Section (s) 139 of the Heritage Act requires any person who knows or has reasonable cause to suspect that their proposed works will expose or disturb a 'relic' to first obtain an Excavation Permit from the Heritage Council of NSW (pursuant to s 140) unless there is an applicable exception (pursuant to s 139(4)). Section 146 of the Heritage Act requires any person who is aware or believes that they have

discovered or located a relic must notify the Heritage Council of NSW providing details of the location and other information required.

2.2 Environmental Planning and Assessment Act

The NSW Environmental Planning and Assessment Act 1979 (EP&A Act) and its associated regulations provide the framework for determining planning approvals for developments and activities in NSW. Environmental impacts are interpreted as including impacts to cultural heritage. The Environmental Planning and Assessment Act 1979 (NSW) requires that environmental impacts are considered in land-use planning, including impacts on Aboriginal and non-Aboriginal heritage. The EP&A Act requires councils to consider environmental effects when assessing new developments. Heritage is one of the matters for consideration. Sites of environmental heritage (including historic heritage sites and sometimes Aboriginal heritage sites) are protected by Local Environmental Plans (LEP) and Development Control Plans (DCP) which specify the constraints on development in the vicinity of these sites.

Proposed activities and development are considered under different parts of the EP&A Act, including:

- Major projects (State Significant Development under Part 4.1 and State Significant Infrastructure under Part 5.1) require the approval of the Minister for Planning
- Minor or routine developments requiring local council consent are usually undertaken under Part 4 activities which, in limited circumstances, may require the Minister's consent, and
- Part 5 activities which do not require development consent. These are often infrastructure projects approved by local councils or the State agency undertaking the project.

The bridge replacement works are being assessed by REF under part 5 of the EP&A Act by Richmond Valley Council (RVC).

2.3 Local Environment Plans

Local Environmental Plans (LEPs) are made under the EP&A Act to guide planning decisions by local councils, including determining the requirement for development applications. The general objectives of the LEPs are to conserve the heritage of the respective LGAs through the protection of the significance of heritage items, conservation areas, archaeological sites, Aboriginal objects, and 'Aboriginal places of heritage significance'. The LEP is the primary document which sets out the requirement for development consent for works on heritage sites.

Development consent is required for any of the following:

a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):
   a heritage item

an Aboriginal object

a building, work, relic, or tree within a heritage conservation area

b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item

c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged, or destroyed

d) disturbing or excavating an Aboriginal place of heritage significance

e) erecting a building on land

on which a heritage item is located or that is within a heritage conservation area, or

on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance

f) subdividing land

on which a heritage item is located or that is within a heritage conservation area, or

on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance

3 HISTORICAL CONTEXT

3.1 NSW Heritage Inventory

3.1.1 Main Camp Historic Listing (NSW Heritage Inventory)

Main Camp was part of the original selection made by Clark Irving in the 1860s. However, by 1888 it was acquired by Cunningham Henderson. He was to become a successful grazier and by 1905 it was reported in the Anthony Hordon's catalogue that he had increased his property to 70,000 acres and was carrying 7,000 herefords (R. Howell source). In 1906 his property was reviewed in Farm Life on the Richmond & Tweed Rivers (1906, p85) . This publication showed a photograph of the original farm house and noted that the property was connected by phone to Myrtle Creek Post Office. It also said " Mr Henderson breeds some fine horses at Main Camp and also turns off it 1,000 fats per annum keeping his breeders on the adjoining property known as Bungawalbyn Station, in which he is largely interested." Henderson was active in public life and was an Alderman on the first Woodburn Shire Council. In the 1920s a fire destroyed the original farmhouse. A new one was built on the same site in the c1930s. Henderson died in 1954 aged 90 years.

State Forestry Department maps (Myrtle SF Map No 559. Survey conducted by Foreman G, Storke & party 1945) show that in 1922-1923 portions of the property were owned by C.A and W.A. Widdes and Dorothy A. Widdes. According to B. Mason (pers. Comm. 17/7/2006) two bothers and a sister formed a syndicate to buy Main Camp. The brothers use Main Camp as a breeding property and then put the cattle on the train to Willow Tree in the Hunter Valley for fattening. B. Mason's uncle would sometimes travel with the cattle to the Hunter. Records held by the Casino & District Family History Society confirm that Charles Arthur Widdis and his brother purchased Main Camp from Cunningham Henderson.

Then property was then owned by a Mr Miller c1970s and he too ran cattle. The property was then sold to Main Camp Holdings and became associated with the production of tea tree oil. The land was substantially altered with laser levelling and the building of several large dams for irrigation purposes. However some cattle were still run on the rougher parts of the property.

3.1.2 New Italy Settlement (NSW Heritage Inventory)

The New Italy settlement covers an area of 485.62 hectares (1200 acres) and represents an unusual phase of settlement in NSW. It is the only known settlement of its type in New South Wales.

On 7 April 1881 217 Italians arrived in Sydney. They had sailed from Venetia, Italy for New Ireland north east of New Guinea to set up a new colony. The expedition had been organised by the Marquis de Ray, Charles Marie du Breil, a young Frenchman of noble descent who was unhappy with the changes that the French Revolution had made to his position. In 1879 he announced that a colony would be established to the north east of Australia, namely East New Guinea, New Britain and New Ireland to be known as La Nouvelle France, or Port Breton. Word of the venture spread to North Italy,

de Rays having placed an agent to sell the venture in Milan. To those living close to starvation and seeing only a grim future for their children in a climate of economic, social and political hardship, this venture was the opportunity for a new life.

Despite and a decree by the French government forbidding emigration agencies to recruitment for the venture and the Royal Investigation Bureau in Milan issuing a direction that no passport be issued to any Italian planning to participate in the scheme fifty families were determined to try their luck Italians had begun arriving in Barcelona, the point of departure, in April 1880.

By 8 July 1880 everyone had boarded the ship 'India' which left the following day loaded with goods thought useful and necessary were abroad. The passengers were essentially paying immigrants who had either paid in francs or who had agreed to work for the administrators of the new colony for five years before qualifying to own their own house and land. The journey was difficult and the immigrants on arrival at Port Breton found not a settlement, but a harsh land where no improvements had been undertaken. Initial attempts were made to establish a colony. The 'Genil', which had left for Port Breton prior to the 'India' with supplies and Spanish soldiers, many of whom had deserted before it reached its destination, left for Sydney for supplies in mid December. By the end of February 1881 those Italians still alive were on their way to Noumea in New Caledonia despite having requested transport to Sydney.

The 'India' barely made it to Noumea. The colonial administration and public were sympathetic and generous offering shelter, rations and gifts. However, the Italians refused to leave the ship, determined to go to Sydney. A deputation approached the British Consul who forwarded the immigrant's request to come to Sydney to Sir Henry Parkes, then Colonial Secretary of NSW and the Governor, Lord Loftus. There was no hesitation by Parkes to bring the immigrants to Australia as ship wrecked mariners but he was undecided whether they could stay as he feared their destitution would leave them without means of subsistence. An inquiry after they arrived in Sydney noted the immigrants were mainly agriculturally skilled with particular knowledge of vines and olives but had no money or knowledge of trades. The French administration advanced the funds necessary to allow Australian Steamship Navigation Co ship the 'James Patterson' to transport the people and in return the 'India' and her cargo were sold. The remaining 217 Italian immigrants left Noumea on 2 April and arrived in Sydney on 7 April.

The government, press, public and Sydney Italian community took great interest in the new arrivals and gave all the assistance possible. On 20 April Parkes announced that the Italians could stay. However, they were not to settle together but be dispersed throughout the colony to learn the language, find work and attempt to make a life for themselves. The Italians, having been through so much together, were reluctant to part ways and did so only through the persuasion of the Italian Consul General. In the coming months they made the most of their new life and King Umberto of Italy

conferred honours on the men who had helped the Italians throughout the ordeal. Parkes was made Commander of the Crown of Italy. The desire to be together however, remained.

In early 1882 Rocco Caminotti, a man of Italian origin met some of the settlers from the de Ray expedition. He knew of their desire to remain together and while in Northern NSW noticed that there was land still being offered and believed it a place that may allow the new settlers to live in close proximity. He and Antonio Pezzutti investigated the region in April and applied for a selection close to a creek on the South Woodburn - Chatsworth Island coach route. This was at the junction of the main road between the Clarence and Richmond Rivers and of the Road to Swan Bay. This would form the nucleus of the New Italy settlement.

The first seven families came to New Italy in 1882 and were followed by 19 in 1883. The men, women and children set about creating a new community. The earliest arrivals lived at Swan Bay travelling every day on foot to their selections to build homes. The first child was born at the settlement on 29 July 1882 to Angela Pezzutti. The houses were built of materials available on and around their selections including clay, bark or wattle and daub. Later homes were built with chamferboard and trees felled from the selections. Wells were dug 2.43 to 3.65 metres (8 to 12 feet) deep as there was no natural water source, ovens were built close to homes and later cellars to store the wine the settlement produced.

Men felled trees and cleared land while the women dug trenches for drainage. The inhabitants made their own baskets and chairs and utilised whatever resources they could. They called the settlement La Cella Venezia, the Venetian Cell, as a symbol of their closeness. A travelling correspondent for the Sydney Tribune visited the settlement and found hospitable, amiable and interesting people growing fruits and vegetables including grape vines, melons, lemons and pumpkin. Among the families were the Caminottis, Pezzuttis, Nardis as well as the Pallis, French brothers who had joined the Italians. The new arrivals continued to work their land and planted peach, apple and loquat trees, corn and more vines. They acquired pigs, cows, poultry and sheep.

In 1889 Frank Clifford wrote of the success of the settlement, suggesting similar colonies be established in New South Wales. Frank Treatt visited the settlement in 1899 having encountered the families as an immigration agent in 1881. He found the people content, at the beginning of prosperity and held in high esteem throughout the district.

The settlers funded their achievements by taking work in the district, particularly in the sugar cane fields and mill and were known as reliable, hard workers. They made and sold wine and the fruits and vegetables they grew. They also sold the timber from the trees they felled on their selections. Timber remained an important industry for around thirty years at New Italy. As the settlement developed the men were less willing to leave regularly for work. The poor soil quality and lack of water prevented them turning to full scale commercial production of fruit and vegetables. Instead they worked for a

period while they saved money and then returned to the settlement until the money ran out again. They were often away for about six months of the year. Eager for the men to remain in the settlement permanently the settlers eagerly embraced the suggestion that they consider silk production.

Many children only went to school for a few years but there were always children to go to school. The first teacher was French but spoke Italian. The second teacher Thomas Morgan, who took over in 1890, considered it a responsibility to teach the children English so they could participate in English speaking society. He forbade Italian in the classroom. He stayed for 13 years and during this time the school was enlarged twice. In 1896 a pupil teacher was appointed to assist him. Introduction of a school was not without its problems. The Public Instruction Act made it compulsory for school attendance which decreased the available labour at settlement, forcing some families to move away as they could not survive without this help.

In 1918 the timber industry folded at New Italy. During the 1920s the population further decreased and became less Italian in character. In 1931 the jubilee of the settlement was celebrated with descendents arriving to visit those left behind. They had become prosperous in their lives. The school closed in 1933. However a new tradition began at this time. In 1936 Giacomo Piccoli established a Park of Peace on his property where a tree was planted every year on 7 April to celebrate the immigrant's arrival in Sydney. Younger members of the families assembled every year for the commemoration. The tradition continued throughout World War Two without the festivities. Trees were planted on other important occasions. In 1942 Picolo was the last surviving resident of New Italy. He remained there until his death in 1955.

Between 1942 and 1955 the settlement slowly disintegrated. A cyclone severely damaged the church and its contents were distributed throughout the district. The school residence was removed from the settlement before being brought back and used as a home by a new resident in the 1970s.

Today many houses and buildings have disintegrated though evidence of their existence can be found in the form of wells, footings, and other artefacts scattered throughout the settlement site. However, the spirit of the settlement lives on.

Interest in New Italy was revived in the 1950s when a reporter from Ballina, Diana Mercer wrote about the settlement. The Richmond River Historical Society suggested preserving the old mud house there. This did not eventuate. However proposal for a memorial was accepted. Money was raised and on 8 April 1961 the Richmond River Historical Society erected a monument to commemorate the pride, courage and strength of the Italian settlers and their contribution to the community. Approximately 1500 people attended the function including the Consul General for Italy, several members of Parliament and local dignitaries. With the imminent arrival of the centenary of the immigrant's arrival in 1981 a committee was established to organise celebrations.

3.2 Parish Maps

The following comments on the age of bridge crossing are provided from historic parish maps (NSW Historical Land Records Viewer):

- the original crossing of Jackybulbin Creek was upstream of the current bridge location (**Figure 6**)
- the 1910 Parish map has an annotation of a possible 'track' type crossing, however this is also upstream of the current bridge location (**Figure 7**)
- the 1926 parish map includes the current alignment of the Bungawalbin – Whiporie Road indicating that the road was likely constructed in the interwar period (**Figure 8**), and
- the 1943 parish map shows the current alignment as the only crossing of Jackybulbin Creek (**Figure 9**).

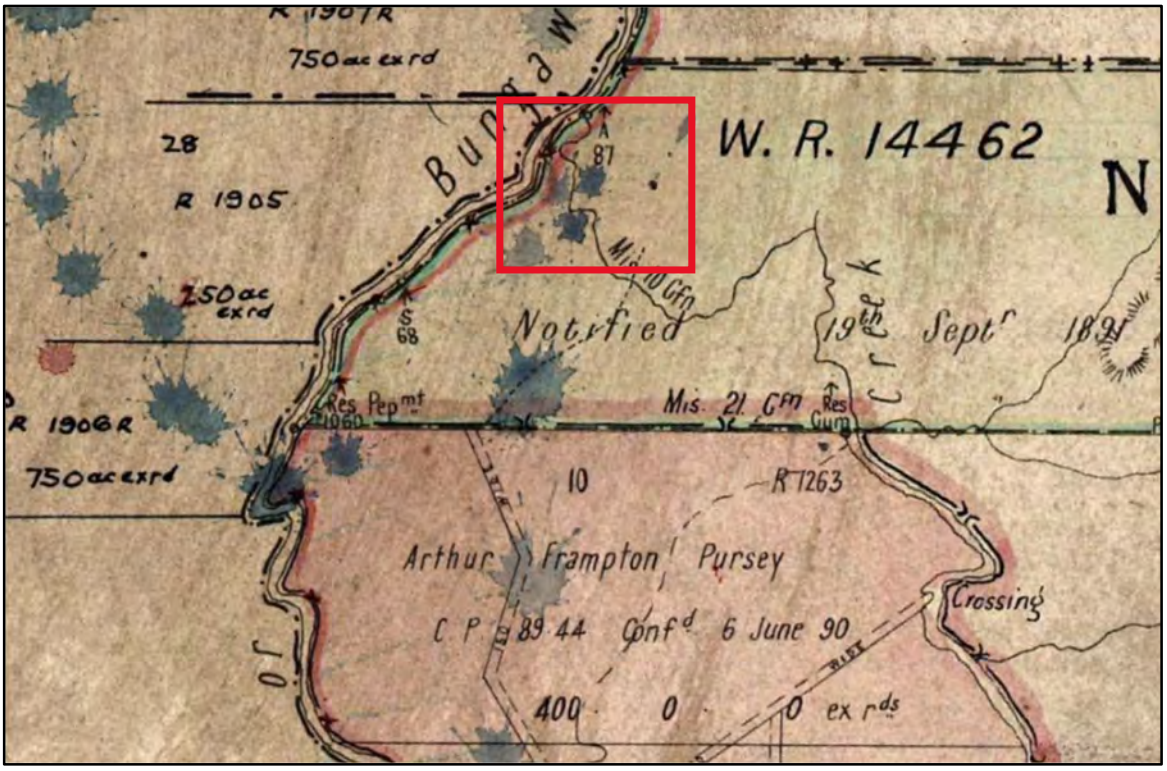

Figure 6: C.1890 Doubleduke Parish Map (NSW Historic Land Record Viewer)

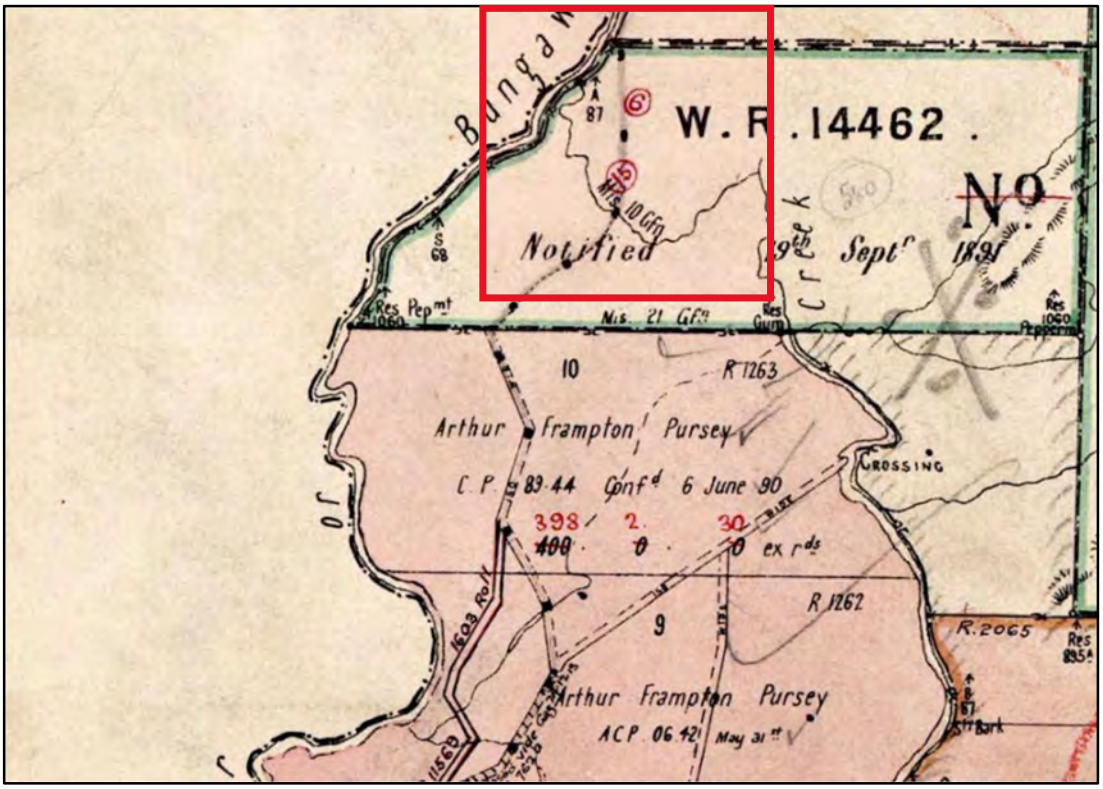

Figure 7: 1910 Doubleduke Parish Map (NSW Historic Land Record Viewer)

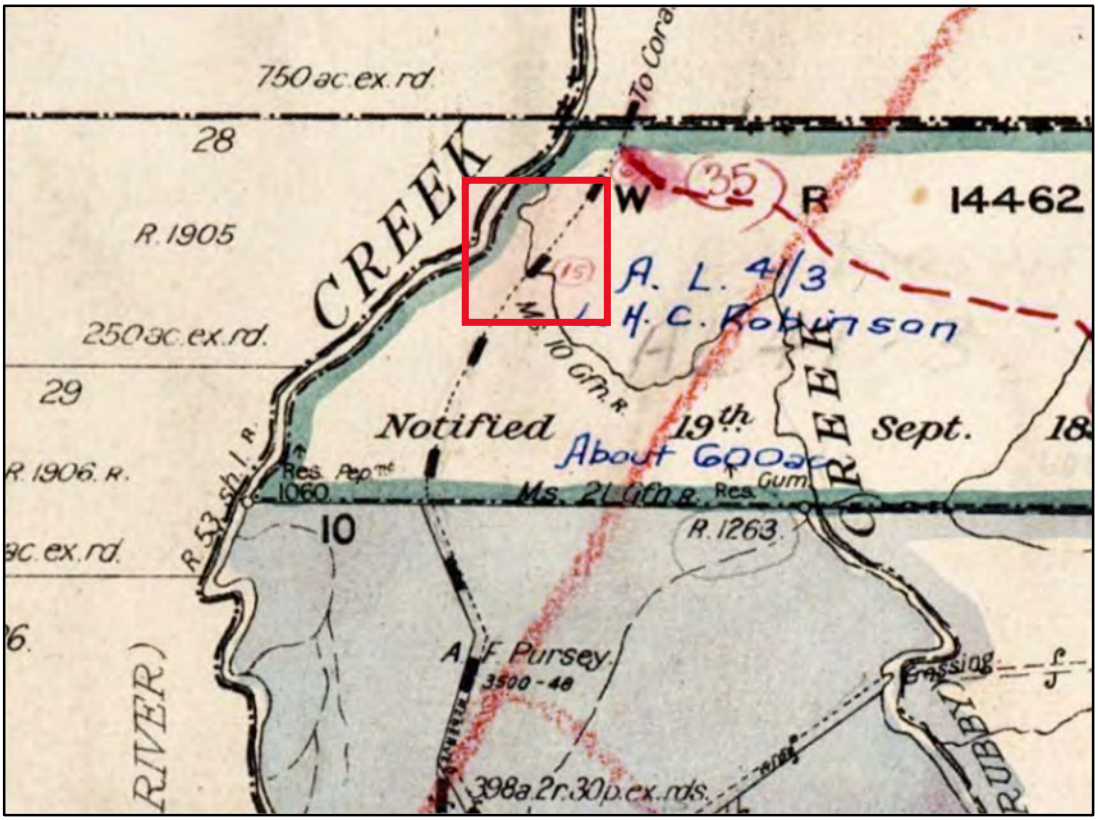

Figure 8: 1926 Parish Map (NSW Historic Land Record Viewer)

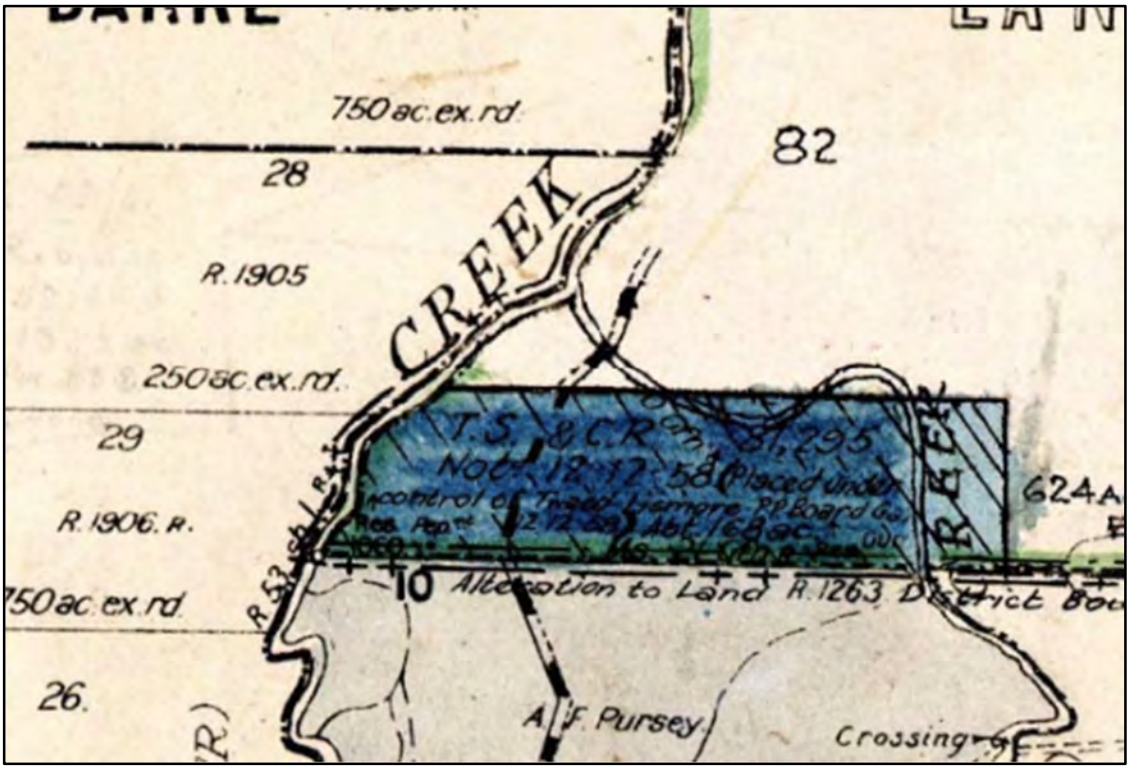

Figure 9: 1943 Doubleduke Parish Map (NSW Historic Land Record Viewer)

3.3 North Coast Forest History

The following summary of the importance of transport in the development of the NSW forestry industry in Northern NSW is provided int eh Comprehensive Regional Assessment for the Upper and lower north east forests (Bickford, Brayshaw and Proudfoot 1998):

> It appears that logging tramways were not so widely used in NSW as they were in the Victorian Mountain Ash forests, but in the 1920s and 30s sawmillers in the Northern State Forests and Crown Lands built a small number, for example Long Creek (Heritage Item ID 3911984, Appendix 2), Wootton Logging Railway (Heritage Item ID 391312, Appendix 3) and the Dorrigo to Glenreagh Railway (Heritage Item ID 3911784, Appendix 3). The Forestry Department was authorised to issue occupation permits for tramways, and a number were in place before 1900, and they increased slightly in the following decades (See table from Grant 1988: 298).
>
> Some of the tramways were constructed long distances on the forests. At Woolgoolga and Coff's Harbour the construction of jetties and logging tramways encouraged the export of hardwoods and removed the dependence on maintaining pastures for the bullockswhich used to take the timber from the logging sites to the mills (Pearson 1994).
>
> Sawmillers built and operated them at their own cost to bring logs to their mills. They were gradually replaced by Forestry constructed roads suitable for log transportation by petrol or diesel powered motor lorries, with a timber jinker in tow. One of the last tramways operated in

NSW was the Munro & Lever Pty Ltd tramway in Roseberry State Forest north of Kyogle used until 1947. One of the most spectacular was Longworth's at Laurieton built in 1917, with its strongly built bridges over gullies and rough terrain (Grant 1988:295). The tramways had either 100 mm square sawn wooden rails usually of brush box or light steel rails placed on sleepers. The log trucks were mostly hauled on the tramways by horses in the early days, but some used light steam locomotives. The British Australian Timber Co at Wedding Bells SF 360 had three sections, one with a counter-weight offsetting horses, and one with a steam locomotive. An incline tramway was used in the Never Never SF east of Dorrigo before 1908, and continued until 1931 (Grant 1988: 296). Many logging tramways are known in the State Forests, and have been listed in the Data Audit. Some of the responses to Jen Houghton's archival resources questionnaire by the District Foresters in 1997 point out that there are many more tramways in the forests, both in the Wauchope and Dorrigo districts. P.K. Roberts in Dorrigo states that there are logging tramways in Wild Cattle Creek SF, yet there are none listed for that Forest in the Data Audit (Houghton 1997:Files 2 & 3).

In the 1960s then, 'sustained yield' was the forest management policy. The traditional areas of supply and quotas in the Grafton area were suspended. Forest yields there in 1964/65 were the lowest on record. In NSW overall, timber yield fell badly. Sawmills were forced to close or amalgamate and transfer to the larger towns.

Before time, silvicultural and conservation practices had been only intermittently effective, because they were of lesser priority than maintaining the yield. The 'creaming' of the big hardwoods ceased in the Murwillumbah Management Area in 1960, and a tree marking system was adopted to improve and intensify forest regeneration. Experimental hardwood regeneration schemes in Whian Whian and Mebbin State Forests emerged as more important. The post-war boom, combined with the improvement of rural roads, had made the North Coast and other forests more accessible to city-based tourists. 'Bush tourism' became popular; more people gained access to a wider variety of environmental experiences, and previously inaccessible forests were within reach. This development had far-reaching implications for the Forestry Commission.

3.4 Timeline of the Richmond River (Richmond River Historical Society)

DATE	EVENT
1828	Captain Henry John Rous in the frigate Rainbow explores and names the Richmond River.
1839	Squatters Clay and Stapleton become first white settlers in the Richmond Valley, at Cassino Station.
1842	Cedar cutters arrive, amongst them Steve King.
1842 – 1848	Main stations established: Cassino, Runnymede, Wooroowoolgen, Wyangarie, Dyraaba, Fairymount, Tunstall and Lismore.
1843	Conflict with settlers results in massacre of up to 100 Aborigines at Evans Head.
1846	First boiling-down plant in the district built at Fairymount.
early 1850s	First sawmill built, at Shaw's Bay, Ballina.
1853 or 54	Reported massacre of 30-40 members of Ballina Tribe by Native Mounted Police.
1855	Surveyor Peppercorne makes plans for the village of Lismore; one year later the village is notified.
1859	Clark Irving elected first member for the Clarence District which includes the Richmond and Tweed River valleys.
1861	Enactment of Robertson Land Act, which results in settlers of moderate means flocking to the district and selecting land.
1862	First steam drogher (tug) introduced to the Richmond River by W.T. Yeager.
1865	First large sawmill built, at Wyrallah.
1870	James Reeves sets up first dairy, at Fairy Hill near Kyogle.
1871	First newspaper, the Richmond River Express, appears at Casino.
1876	The Northern Star newspaper started by W. Kelleway.
1879	Lismore becomes a municipality.
1881	The Colonial Sugar Refinery opens sugar mill at Broadwater.
1889	First dairy cooperative established at Springhill, Wollongbar.
1889 – 1911	Breakwater built at Ballina.
1892	First plantings of Paspalum grass, originally discovered by Edwin Seccombe of Wollongbar, lead to major development of dairy pastures on the North Coast.
1894	First train in the district runs between Lismore and Byron Bay.
1895	The North Coast Fresh Food and Cold Storage Cooperative Ltd (later Norco) begins operations at Byron Bay.
1907	Dedication of St Carthage's Cathedral, Lismore.
1946	Lismore officially gazetted as a City.

3.5 Photos of heritage listed bridges in the Richmond Valley

Figure 10: Glebe Bridge over the Richmond River at Coraki

Figure 11: Black Gully Bridge, Casino

Figure 12: Richmond River Underbridge, Casino

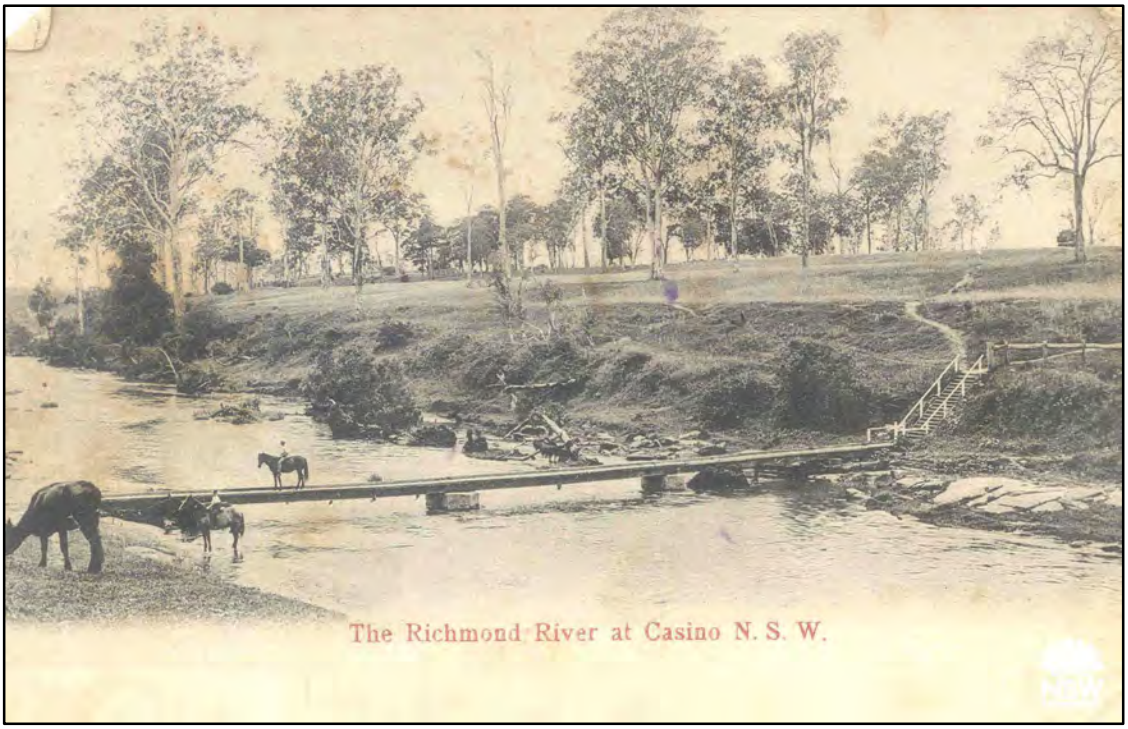

Figure 13: Casino Footbridge over Richmond River

4 HERITAGE SIGNIFICANCE ASSESSMENT

4.1 Site Inspection

A site inspection was undertaken by Tim Hill on 24 January 2023. The following statements are provided to inform the heritage assessment.

- the bridge comprises a concrete deck on top of treated log girders and has a concrete abutment (Figure 14, Figure 15 and Figure 16)
- remains of an older timber girder bridge are visible in front of the existing concrete abutments and comprise four hardwood logs piles recessed for timber bearings/ capwale (bearers are retained on northern piles) and hardwood sheet (sleeper) abutments
- hardwood logs are located on either side of the abutments indicting that the original bridge had timber wingwalls, however they could also be cast off piles that were not removed (see Figure 17),
- the original timber abutment is not visible from the road pavement however will be visible from the proposed new bridge alignment should it be retained (Figure 18)
- there are no timber deck, rails or kerbing from the original bridge retained at the crossing
- no historic structures or moveable heritage is visible in the area marked out for the new bridge alignment which comprises riparian vegetation and sand deposits (Figure 19), and
- the road pavement is gravel and there is no indication that the a former / older road has been located within the alignment of the proposed replacement bridge (Figure 20 and Figure 21).

Figure 14: Jacky Bulbin Bridge looking north

Figure 15: The southern abutment showing original timbers and the current bridge

Figure 16: Timber pile and abutment on northern bank with concrete abutment behind

Figure 17: Timber log and wing wall on the southern bank

Figure 18: Relationship between the current bridge and proposed new bridge (white post)

Figure 19: Sandy soil on the northern creek bank (white post shows proposed bridge alignment)

Figure 20: Typical road verge and drain south of Jacky Bulbin Bridge

Figure 21: Typical road verge and drain north of Jacky Bulbin Bridge

4.2 Significance assessment

The following statements are provided to understand the heritage significance of Jacky Bulbin Bridge (Table 1).

Table 1: NSW Heritage Assessment Criteria- Jacky Bulbin Bridge.

Criteria	Assessment statement (NSW Heritage Inventory)
A	The Bungawalbin - Whiporie Road has not played a significant role int eh development fo the Richmond or Clarence Valleys with major access routes including the Summerland Way (Grafton- Casino) or the Old Coast Road (Grafton to Woodburn). The Parish maps indicate the current road alignment was in place between the 1920's and 1940's which is decades after the major industrial and agricultural development of the North Coast but consistent with the regulation of the forestry industry.
B	Jacky Bulbin Bridge has no particular association to a person or group of people who made a significant contribution to the Richmond Valley in the early phase of settlement.
C	The original timber abutment is typical of timber pile and girder bridges utilised through northern NSW in the interwar period. The bridge is consistent with the standard design of bridges to transport forest and agricultural products with the increased mechanisation and widespread adoption of vehicle transport in the early 1900's.
D	There are no direct links between the Jacky Bulbin Bridge and local community or cultural groups, such as the Italian community of Swan Bay/New Italy.
E	The remaining timber abutment and piles have limited potential to contribute to future local history research.
F	Jacky Bulbin Bridge is not considered to the rare or endangered as timber pile and girder bridges are common throughout northern NSW.
G	The timber abutment and piles are not in poor condition and have limited potential for conservation as a 'typical' timber girder bridge.

A An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area);

B An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area);

C An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);

D An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;

E An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);

F An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)

G An item is important in demonstrating the principal characteristics of a class of NSW's
- cultural or natural places; or
- cultural or natural environments.

(or a class of the local area's
- cultural or natural places; or
- cultural or natural environments).

Based on the significance assessment and having consideration of the nature of bridges which have been listed as items of local heritage significance in the Richmond Valley (see section 3.5 above), it is concluded that the Jacky Bulbin Bridge does not meet the criteria of local heritage significance.

4.3 Impact Assessment

The following statements are provided to address the impact assessment questions in the Statement of Heritage Impact Guidelines (NSW Heritage Office 2002).

The following aspects of the proposal respect or enhance the heritage significance of the item or conservation area for the following reasons:

The proposed bridge upgrade will be located downstream from the current crossing and will not add an additional structure into the footprint of the original timber girder bridge.

The following aspects of the proposal could detrimentally impact on heritage significance.

The proposal includes removal of the current and original bridge structure, including piles and timber sheet abutment.

The following sympathetic solutions have been considered and discounted for the following reasons.

Reuse of the original timber bridge structure is not possible as:

- the abutment is for a single lane bridge and is not wide enough
- the original timber piles and abutment have deteriorated and the engineering requirements of the new bridge cannot be achieved using the fabric of the original timber bridge, and
- the ongoing maintenance and management costs of timber bridges is significant compared to concrete structures.

4.4 Determining an appropriate level of assessment

The NSW Heritage Office Guidelines for Statement of Heritage Impact (NSW Heritage Office 2002) includes test questions to assist in the determination of an appropriate level of assessment and supporting information. These include:

- Statement of Heritage Impact / Statement of Significance
- Conservation Policy / Heritage Asset Action Plan, and
- Conservation Management Plan

The following statements are provided in response to the test questions in the SoHI guidelines.

- *Have all options for retention and adaptive re-use been explored?*

  The options to rebuild or retain the original timber piles and timber sheet abutment are not required as the structure does not meet the criteria for local heritage significance. A visual

inspection of the fabric of the original bridge indicates that the original timbers are in poor condition and have already deteriorated significantly since the current bridge has been in place.

- *Can all of the significant elements of the heritage item be kept and any new development be located elsewhere on the site?*

It is possible to retain the fabric of the original timber bridge onsite, however this would have no interpretive value as the crossing is not a visitor or tourist location.

- *Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?*

Demolition can be postponed, however due to changes in engineering/ public safety requirements it is not likely that redevelopment or re-use of the original bridge will ever be feasible.

- *Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why not?*

Yes

5 Statement of Heritage Impact

Based on the assessment it is determined that no additional assessment or planning is required for the proposed bridge redevelopment, including the removal of the girders and timber deck. This conclusion is based on the following:

- the overall poor condition of the timber piles and abutment of the original timber girder bridge which include visible signs of decay and flood damage
- the chronology of the bridge which demonstrate that the current alignment of the Bungawalbin Whiporie Road postdates the early settlement of the Richmond/ Clarence Valleys, and the original alignment was upstream of the Sandy Crossing
- the relative abundance of timber girder bridges in the forest landscapes of north-eastern NSW, and
- the engineering requirements of modern structures which make future reuse of the original timber fabric unlikely.

No additional mitigation or management measures are required to ensure that the proposed replacement of Jacky Bulbin Bridge has a significant impact on the heritage values of the Richmond Valley.

6 REFERENCES

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1999, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance,* Australia ICOMOS, Burwood (revised 2013).

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1998 Thematic Forest History and Heritage Assessment (Non Indigenous) UNE/LNE CRA Regions: A report undertaken for the NSW CRA/RFA Steering Committee project number NA 29/EH

Heritage Office

2001, *Assessing Heritage Significance*, Heritage Office, Parramatta.

2002, *Statements of Heritage Impact*, Heritage Office, Parramatta.

2004, *Investigating Heritage Significance*, Heritage Office, Parramatta.

NSW Heritage Inventory

Main Camp Homestead and Surrounds
<https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2850056>

New Italy Settlement
< https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2850483>

Richmond River Historical Society

Historical timeline
<https://richhistory.org.au/lismore-history/lismore-chronology/timeline/>

Richmond Valley Council

2011 *Local Environmental Plan 2011*

Appendix E – Environmental Factors to be Considered

Environmental Factor	Length of Impact	Section addressed	Comment
a) Any environmental impact on a community	Short	7.10	There may be short term impacts associated with noise, dust and visual amenity, however the long term impacts are considered to be positive only.
b) Any transformation of a locality	Short	7.7	No additional change is considered over the existing. Short term impacts to visual amenity may occur during construction only.
c) Any environmental impact on the ecosystems of the locality	Short to Long	7.1	Vegetation removal and disturbance to flora and fauna is required. A Biodiversity Assessment Report has considered the risk to be low.
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality	Short	7.7	Short term impact to visual amenity during construction only.
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations	NIL	7.8 and 7.9	No impacts to Aboriginal or Non-aboriginal cultural heritage. No other significant structures, landscapes, etc exist in the locality.
f) Any impact on the habitat of protected animals (within the meaning of the Biodiversity Conservation Act 2016)	Short	7.1	Vegetation removal and disturbance to flora and fauna is required. A Biodiversity Assessment Report has considered the risk to be low.
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air	Short	7.1	Vegetation removal and disturbance to flora and fauna is required. A Biodiversity Assessment Report has considered the risk to be low.

			No direct impacts to threatened species is required.
h) Any long-term effects on the environment	NIL	7	No long term impacts have been determined.
i) Any degradation of the quality of the environment	NIL	7	No degradation of the existing environment would occur.
j) Any risk to the safety of the environment	NIL	7	No safety risk to the environment has been determined.
k) Any reduction in the range of beneficial uses of the environment	NIL	7	No change to the beneficial uses of the environment have been determined.
l) Any pollution of the environment	Short	7	Short term impacts to water quality, noise and dust may occur during construction only.
m) Any environmental problems associated with the disposal of waste	Short	7.11	No issues with waste disposal have been identified.
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	NIL	7	No impacts to resource availability have been identified.
o) Any cumulative environmental effect with other existing or likely future activities	Short	7.13	No significant cumulative impacts have been determined.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	NIL	5.1	No impacts to coastal processes and coastal hazards have been identified. The work is within mapped coastal area, however due to the nature and extent of the works, it is unlikely to impact on coastal processes.
q) Any applicable local strategic planning statement, regional strategic plan or district strategic plan made under Division 3.1 of the Act	NIL	5	This proposal is consistent with the local and regional strategic planning approach.

r) Any other relevant environmental factors	NIL		No other aspects have been identified.

Appendix F – Geotechnical Study

Richmond Valley Council

Geotechnical Assessment for Bridge Replacement

Jacky Bulbin Bridge

Bungawalbin-Whiporie Road, Bungawalbin

Report No. RGS33185.1-AC

4 July 2022

REGIONAL GEOTECHNICAL SOLUTIONS

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS33185.1-AC

4 July 2022

Richmond Valley Council
Locked Bag 10
CASINO NSW 2470

Attention: Jack Baker

Dear Jack,

RE: Jacky Bulbin Bridge – Bungawalbin-Whiporie Road, Bungawalbin
Geotechnical Assessment for Bridge Replacement

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment for the replacement of Jacky Bulbin Bridge, Bungawalbin which was damaged during the March 2021 storm event.

The investigation included the drilling of three boreholes (one at either abutment and one behind the identified instability on the western side of the southern abutment). Presented herein is a summary of the conditions encountered along with comments and recommendations regarding foundation design and installation.

If you have any questions regarding this project, please contact the undersigned.

For and on behalf of Regional Geotechnical Solutions Pty Ltd

Prepared by

Joel Babbage
Geotechnical Engineer

Reviewed by

Simon Keen
Associate Geotechnical Engineer

Table of Contents

Figures

Appendices

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical investigations and assessment for the proposed replacement of Jacky Bulbin Bridge. The site is located on Bungawalbin-Whipore Road, Bungawalbin.

We understand that it is proposed to replace the bridge with a new bridge on a similar alignment to the existing structure.

The purpose of the assessment was to provide the following:

- A description of the subsurface conditions encountered, including any problematic conditions (gravels, cobbles, etc.).
- An interpreted geotechnical cross-section along the alignment of the bridge.
- Alternative foundation options and foundation design parameters including appropriate geotechnical strength reduction factors and founding materials for both shallow and / or piled footings as appropriate;
- Aggressivity assessment of the soils to buried structural elements in accordance with AS2159 -2009;
- Abutment scour protection including retaining wall options and design parameters; and
- Conceptual remedial option to remediate the identified instability on the western side of the southern abutment.

2 METHODOLOGY

Fieldwork for the assessment was undertaken by a Geotechnical Engineer from RGS on 12 and 13 May 2022 and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site. A site plan and a longitudinal section along the alignment of the existing bridge were also developed;
- Drilling of two boreholes (one on either abutment) with a truck mounted drill rig. The boreholes were drilled using auger and wash bore drilling techniques through the soil profile to depths of up to 20.95m;
- Drilling of one borehole with a truck mounted drill rig, behind the identified instability on the western side of the southern abutment, to a depth of 4.45m; and
- Standard Penetrometer Tests (SPTs) were undertaken at about 1.5m intervals to assist in assessing the strength of the soil profile.

Engineering logs of the boreholes are presented in Appendix A. The approximate locations, obtained by taped measurements from the existing bridge, are presented on Figure 1.

3 SITE CONDITIONS

3.1 Surface Conditions

The site is situated in the locality of Bungawalbin on Bungawalbin-Whiporie Road. A satellite photograph that illustrates the site location and setting is reproduced below.

Satellite photograph from SixMaps that illustrates the site location and site setting.

The site is situated within a region of gently to moderately undulating alluvial and residual terrain. The bridge is located on a gently sloping alluvial area, of a width of approximately 80m, associated with Jacky Bulbin Creek.

The existing single span bridge is about 12m long and has a concrete deck. Cracking is present between the bridge deck and the adjacent pavement on the northern abutment indicating differential movements between the bridge approach and the bridge structure itself.

At the time of the fieldwork, water was 2.1m below the bridge deck and up to 2.9m deep. Road approaches in both directions are relatively flat, sealed roads with the northern approach extending along a fill embankment for approximately 30m. The riverbed and exposed banks consisted of alluvial sands and clayey sands. Signs of scour could be seen along the creek including fallen trees, unvegetated banks and small landslips.

Directly southwest of the existing bridge a small slip had occurred on the creekbank. The slip contained gravelly fill, alluvial sands and some vegetation and appeared to have moved approximately 700mm.

Selected site photographs are presented below.

Looking west towards the bridge, drill rig setup at BH1.

Differential movement between the bridge deck and the northern abutment pavement

Looking west at the landslip, showing fill mixed with alluvial sands exposed along the slip.

3.2 Subsurface Conditions

The MinView NSW Seamless Geology map indicates that the site is underlain by quaternary alluvium consisting of fluvially deposited fine to medium grained lithic to quartz-rich sand, silt and clay.

The subsurface conditions have been characterised into geotechnical units based on the results of the subsurface investigations. The profiles encountered in the boreholes are summarised in Table 1. Further details are presented on the Engineering Logs. An interpretive geotechnical section is presented on Figure 2.

Table 1: Summary of Subsurface Conditions

Material Name	Material Description	Depth Measured Below Ground Level (m)		
		BH1 (Northern Abutment)	BH2 (Southern Abutment)	BH3 (Behind Instability)
Fill	Sandy GRAVEL to Clayey SAND, fine to coarse grained, with silt fines, some cobbles and boulders	2.6	1.8	0.55
Alluvial Soil 1	SAND and Clayey SAND, fine to medium grained, pale brown-grey, loose to medium dense	7.4	7.3	≥4.45
Alluvial Soil 2	Sandy CLAY, medium plasticity, fine to medium grained, some interbedded clayey sand, trace organics, firm	10.0	8.5	
Alluvial Soil 3	SAND, fine to medium grained, with clayey layers, trace fine grained quartz gravel, medium dense to very dense	20.4	≥18.95	
Alluvial Soil 4	Sandy CLAY, medium plasticity, grey, fine to medium grained sand, stiff to very stiff	≥20.95		

Notes: ≥ indicates that the base of the material layer was not encountered
-- indicates that the material was not encountered within the borehole

Groundwater seepage was encountered at a depth of 2.4m, 2.3m and 2.2m in BH1, BH2 and BH3 respectively.

Groundwater levels do fluctuate due to weather, seasonal variations, or due to reasons that may not have been apparent at the time of the site investigation.

4 FOUNDATIONS

4.1 Foundation Options & Design Parameters

It is recommended that the new bridge be supported on piles that extend to found within medium dense to very dense alluvial sands at depths of between 11m and 16m. However, the piles should be founded no deeper than 4 pile diameters above 20.4m unless further deeper investigations are undertaken.

Driven timber, steel or concrete piles can be adopted. If bored piles are proposed, temporary or permanent steel liners should be allowed for due to the likely collapse of the pile holes.

The design parameters presented in Table 2 and Table 3 can be adopted for the design of piles.

Table 2: Pile Design Parameters Bored Piles

Material Name	Ultimate End Bearing Pressure, fb	Ultimate Skin Friction (Compression), fm,s	**Effective Vertical Young's Modulus, E'v**	**Effective Horizontal Young's Modulus, E'h**	Limiting Lateral Yield Pressure, py
Fill	--	10 kPa	5 MPa	3.75 MPa	--
Alluvial Soil 1	--	15 kPa	5 MPa	3.75 MPa	250 kPa
Alluvial Soil 2	--	20 kPa	8 MPa	6 MPa	200 kPa
Alluvial Soil 3	2 MPa	30 kPa	14 MPa	10.5 MPa	700 kPa
Alluvial Soil 4	--	--	--	--	--

Table 3: Pile Design Parameters Driven Piles

Material Name	Ultimate End Bearing Pressure, fb	Ultimate Skin Friction (Compression), fm,s	**Effective Vertical Young's Modulus, E'v**	**Effective Horizontal Young's Modulus, E'h**	Limiting Lateral Yield Pressure, py
Fill	--	10 kPa	5 MPa	3.75 MPa	--
Alluvial Soil 1	--	25 kPa	10 MPa	7.5 MPa	250 kPa
Alluvial Soil 2	--	20 kPa	8 MPa	6 MPa	200 kPa
Alluvial Soil 3	4 MPa	50 kPa	28 MPa	21MPa	700 kPa
Alluvial Soil 4	--	--	--	--	--

NOTES:

1. *Ultimate end bearing values occur at large displacements (approx. 5% of pile diameter).*
2. *Assumes pile walls have adequate roughness (Roughness Class ≥ R2). This could be affected by using temporary liners and must be taken as zero over the cased length of pile where permanent casing is used.*
3. *Lateral capacity for pile lengths within 4.5 pile diameters of the surface must be taken to be zero. Assumes pile centre to centre spacing of at least 5 pile diameters.*

In accordance with AS2159-2009, when assessing the geotechnical reduction factor (Φ_g) an assignment of an Average Risk Rating (ARR) is required which considers the redundancy of the pile system and the quantity and type of pile testing. This process requires the consideration of several factors which are beyond the direct control of a geotechnical consultant during the site investigation stage. For a recommendation to be provided the assumptions listed below have been made. If these assumptions change, the geotechnical reduction factor would need to be modified in accordance with the requirements of AS2159-2009 Clause 4.3.

- Design of piles and pile groups will be undertaken in accordance with the recommendations presented in this report.
- Limited geotechnical involvement will occur during pile installation.
- Some performance monitoring of the supported structure would be undertaken during or after construction.
- At least 10% of piles will be statically load tested.
- The foundations will be designed by a designer of at least moderate experience in similar geotechnical profiles and pile design.
- Established pile design methods will be used.

Based on the above assumptions and in accordance with AS2159-2009 a risk rating of 2.03 is estimated. Therefore, assuming the pile configuration will have high redundancy a Geotechnical Strength Reduction Factor of Φ_g=0.75 would be appropriate. If no static load testing is undertaken the Geotechnical Strength Reduction Factor would be increased to 0.56.

If any of the assumptions outlined above are not correct, the Geotechnical Strength Reduction Factor may change, and further advice should be sought.

Where piles are proposed a temporary granular working platform should be constructed to support the piling rig. The platform should be designed by a suitably experienced engineer in accordance with the BRE design guide '*Working platforms for tracked plant: good practice design guide to the installation, maintenance and repair of ground-supported working platforms*' (2004). The platform design must also consider the stability of the abutments where piling works are required near the crest of slopes. To design the platform the piling contractor will be required to provide Case 1 and Case 2 loading conditions (as defined within the BRE guide) as well as effective track lengths and widths for each case. The loading cases are generally unique for each different piling rig/setup.

5 CHEMICAL AGGRESSIVITY

The aggressivity test results presented in Table 4 were compared to the exposure classifications provided in Australian Standard AS2159-2009, *Piling Design and Installation*. It has also been assumed that the piles will be exposed to fresh water.

Table 4: Results of Soil Aggressivity Testing

Sample Location	Sample Depth (m)	Sample Type	pH	Soluble Sulfate (mg/kg)	Chloride (mg/kg)	Resistivity (ohm.cm)
BH2	12.5 to 12.95	Soil	5.18	130	141	10,309

Based on the above, an exposure classification of moderate can be adopted for both concrete and steel elements.

6 SCOUR PROTECTION AND ABUTMENT RETAINING WALL DESIGN

There is evidence of instability within the existing creek banks in the form of rotational failures and tension cracks. Ongoing instability, scour and erosion of the creek banks must therefore be considered and be allowed for within the design of the new bridge.

It is recommended that suitable creek bank protection be adopted as part of the works for the new bridge. Such measures could include rock berms comprising large durable rock placed over a geotextile lining, or Reno mattresses. Alternatively, the abutments could be protected by adopting a reinforced concrete retaining wall incorporating wing walls, although, scour rock will also be required around the ends of the structure(s).

Abutment retaining walls can be designed as gravity or cantilever walls based on a triangular lateral earth pressure distribution using the following parameters:

- The walls should be uniformly founded below potential scour levels. Shallow footings founded in the upper alluvial soils are not recommended due to the potential for deep scour. The retaining walls could be supported on piles founded on the underlying profile. Pile design parameters are provided in Tables 2 and 3.
- For cantilever walls where movement is of little concern, an active earth pressure coefficient (ka) of 0.3 may be adopted for the alluvial soil and road formation embankment fill assuming a horizontal backfill surface.
- A bulk unit weight of 18kN/m^3 should be adopted for the soil profile behind the retaining wall.
- Any surcharge affecting the walls (e.g. traffic loads, adjacent footings or retaining walls or inclined slopes) should be allowed for in the design.
- An allowance for potential water pressure build-up equivalent to the full wall height should be made in the design to allow for rapid draw down effects following flooding.

Retaining wall backfill should comprise free draining granular material such as 20mm drainage gravel. Subsoil drains should comprise a geocomposite drain or geotextile (Bidim A34 or similar) wrapped gravel drain at the toe of the back of the wall. The drains should discharge downstream of the wall. Where appropriate, flushing points should be incorporated into the design.

7 SLOPE STABILITY

7.1 Conceptual Geotechnical Model

Instability was identified along the creek bank on the western side of the southern abutment. A conceptual model has been developed for the assessment based on site observations and the results of the investigations. Material parameters for the assessment are summarised in Table 5.

Table 5: Summary of Adopted Material Properties

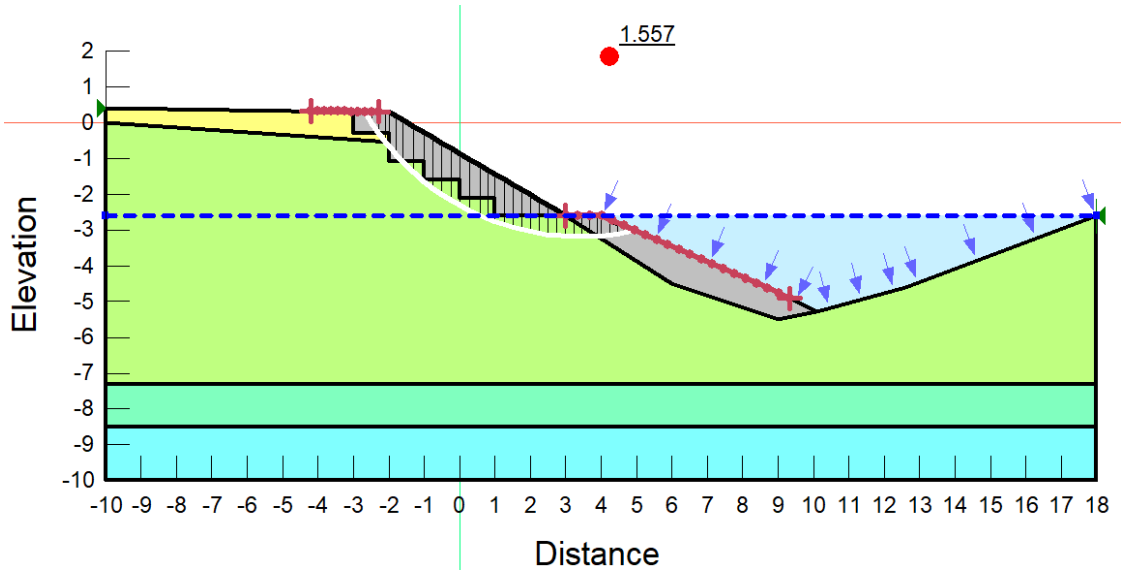
Material	Unit Weight (kN/m³)	Friction Angle (°)	Effective Cohesion (kPa)
Fill	19	34	0
Loose to Medium Dense Alluvial SAND	18	35	0
Alluvial Sandy CLAY and interbedded Clayey SAND	18	24	2
Medium Dense to Very Dense Alluvial SAND	18.5	34	0
Rockfill	20	45	0

Stability modelling was undertaken using proprietary software (Slope/W) that uses two-dimensional modelling to calculate a factor of safety against instability. The method assesses the resisting forces (i.e. shear strengths) along a range of failure surfaces, and compares those values to the driving forces for the potential failed mass. The ratio of the resisting forces to the driving forces provide the Factor of Safety (FOS). A FOS equal to 1 represent limiting equilibrium.

For long term stability a FOS of greater than 1.5 is recommended.

7.2 Conceptual Remedial Options

The identified instability is likely to have been triggered by the alluvial sand being scoured during high flow events and it is likely that the instability will continue to regress. It is therefore recommended that the instability be remediated by the construction of a rockfill batter. Stability modelling of the rockfill option is reproduced below. A factor of safety against instability has been achieved.

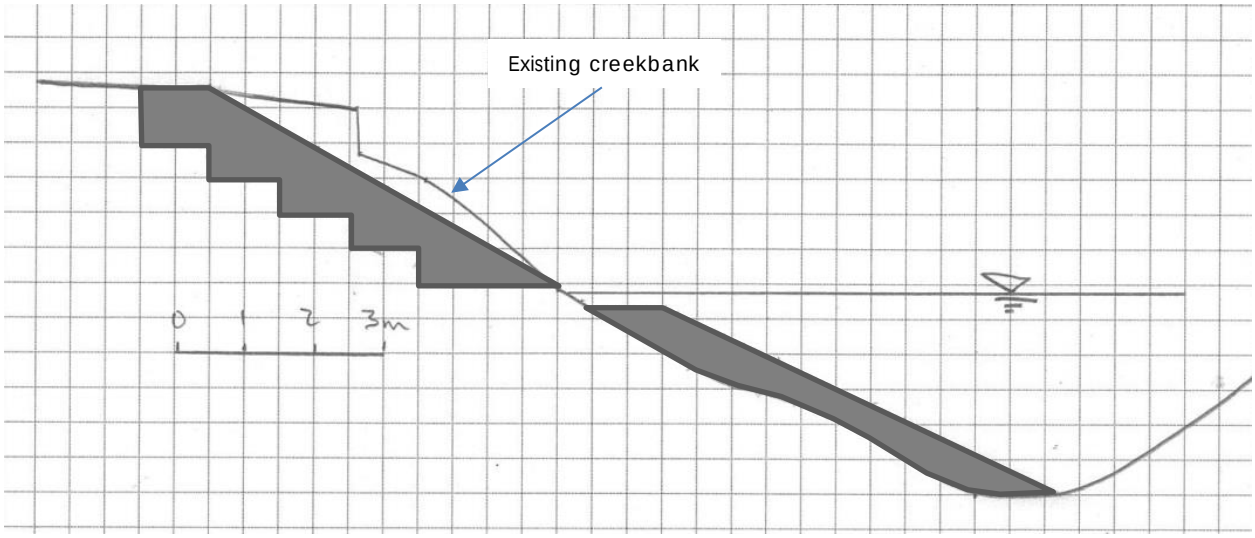


Stability modelling indicates that a factor of safety of 1.5 can be achieved with rockfill

The rockfill wall should extend behind any tension cracks. A site length of 10m was estimated during the site investigation. A general construction procedure is presented below:

- Place rockfill below the waterline to achieve an overall batter of no steeper than about 2H:1V. Approximately 5m³ of rockfill per lineal metre has been estimated;
- Commencing at the water level, excavate horizontal benches into the creek bank as illustrated on the figure below;
- Place a heavy duty geofabric (Class C) over the base and rear of the excavation; and
- Place rockfill within excavation to achieve an overall batter of no steeper than 2H:1V. Approximately 5m³ of rockfill per lineal metre has been estimated.

Rockfill should comprise very high strength, angular and durable material with a minimum particle size of about 500mm.



Typical cross section of the conceptual rockfill wall

8 LIMITATIONS

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the document. The report should not be used by other parties or for purposes or projects other than those assumed and stated within the report, as it may not contain adequate or appropriate information for applications other than those assumed or advised at the time of its preparation. The contents of the report are for the sole use of the client and no responsibility or liability will be accepted to any third party. The report should not be reproduced either in part or in full, without the express permission of Regional Geotechnical Solutions Pty Ltd.

Geotechnical site investigation is based on data collection, judgment, experience, and opinion. By its nature, it is less exact than other engineering disciplines. The findings presented in this report and used as the basis for the recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent

a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

The recommended depth and properties of any soil, rock, groundwater, or other material referred to in this report is an engineering estimate based on the information available at the time of its writing. The estimate is influenced and limited by the fieldwork method and testing carried out in the site investigation, and other relevant information as has been made available. In cases where information has been provided to Regional Geotechnical Solutions for the purposes of preparing this report it has been assumed that the information is accurate and appropriate for such use. No responsibility is accepted by Regional Geotechnical Solutions for inaccuracies within any data supplied by others.

If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

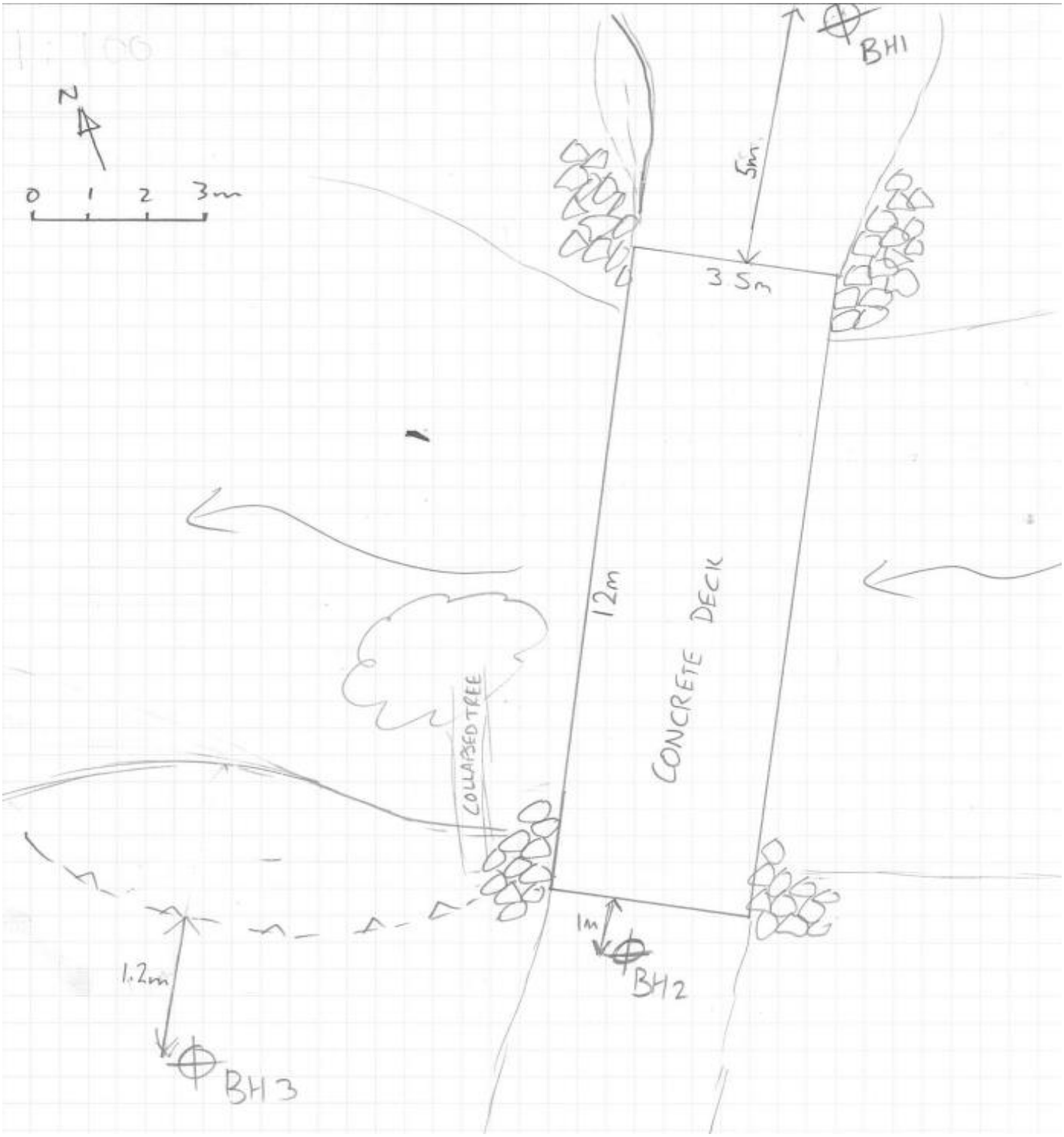
This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of Regional Geotechnical Solutions Pty Ltd

Prepared by	Reviewed by
	
Joel Babbage	Simon Keen
Geotechnical Engineer	Associate Geotechnical Engineer

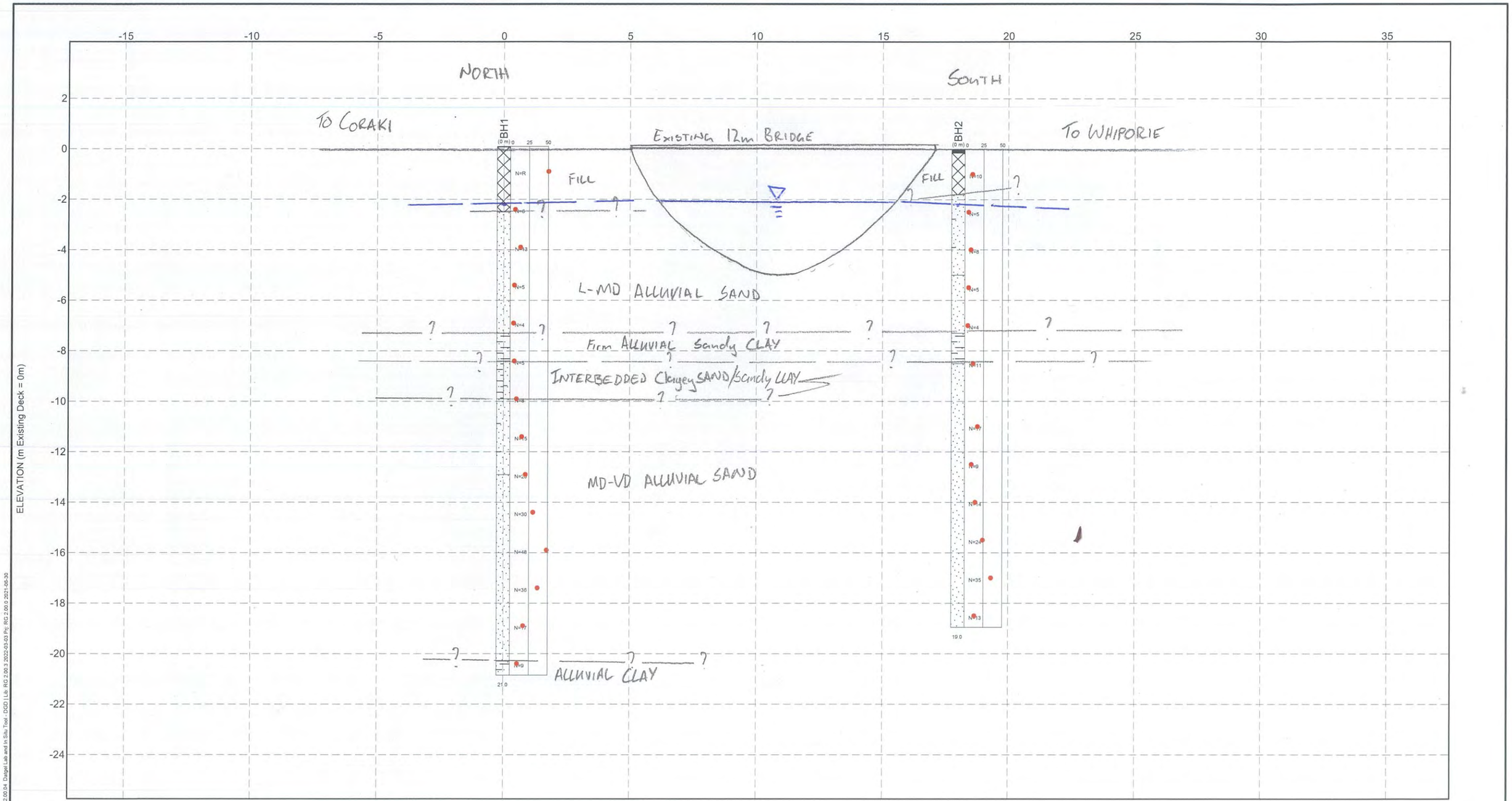
Figures



Legend

Borehole Location

	Client:	Richmond Valley Council	Job No.	RGS33185.1
	Project:	JackyBulbin Bridge Replacement	Drawn By:	JB
			Scale:	As Shown
		Bungawalbin Whiporie Road	Date:	14-Jun-22
	Title:	Borehole Location Plan	Drawing No.	Figure 1



MATERIAL GRAPHIC

- MADE GROUND
- Asphalt, Tar, Bituminous Material
- Sandy CLAY
- SAND
- Clayey SAND

REGIONAL GEOTECHNICAL SOLUTIONS	TITLE: Richmond Valley Council Bungawalbin Whiporie Road Jacky Bulbin Bridge Replacement Interpretive Geotechnical Section	DRAWN: SK	DATE: 14/06/2022
		CHECKED:	DATE: 14/6/2022
		SCALE: H 1:150 V 1:150	A3
		PROJECT No: RGS33185.1	FIGURE No: Figure 2

Appendix A

Results of Field Investigation

ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH1

CLIENT: Richmond Valley Council
PAGE: 1 of 2
PROJECT NAME: Jacky Bulbin Bridge Replacement
JOB NO: RGS33185.1
SITE LOCATION: Bungawalbin Whiporie Road
LOGGED BY: JB
TEST LOCATION: Northern Abutment
DATE: 12/5/22

DRILL TYPE: Tightsite Truck Mounted Drill Rig
EASTING: 516785 m
SURFACE RL: 0.1 m
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6773996 m
DATUM: Existing Deck = 0m

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	12/5/2022		0.0			GP	0.03m 0.20m **ASPHALT:** 30mm	M				ASPHALT
						SC	**FILL:** Sandy GRAVEL, fine to medium grained, brown, fine to coarse grained sand, with clay fines					FILL
		1.00m SPT 10/30mm N=R 1.03m				SC	0.80m **FILL:** Clayey SAND, fine to coarse grained, orange-brown, trace fine to medium grained gravel					
			-2.0	2.0			**FILL:** Clayey SAND, fine to coarse grained, orange-brown, trace fine to medium grained gravel, with cobbles and boulders, weathered sandstone					
		2.50m SPT 3,3,3 N=6 2.95m				SP	2.60m **SAND:** Fine to medium grained, pale brown-grey	W	MD			ALLUVIAL SOIL
		4.00m SPT 8,6,7 N=13 4.45m	-4.0	4.0								
WB		5.50m SPT 2,1,4 N=5 5.95m	-6.0	6.0								
		7.00m SPT 2,2,2 N=4 7.45m				CI	7.40m **Sandy CLAY:** Medium plasticity, dark grey	M > w_P	F	HP	60 - 70	
		8.50m SPT 2,2,3 N=5 8.95m	-8.0	8.0		CI	8.50m **INTERBEDDED Sandy CLAY/Clayey SAND:** Medium plasticity, fine to medium grained, dark grey, trace organics	W	L - MD	HP	70 - 80	
		10.00m SPT 3,3,5 N=8 10.45m	-10.0	10.0		SC	10.00m **Clayey SAND:** Fine to medium grained, grey	W	MD			

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG 2.00.3 LIB.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS33185.1 BH LOGS.GPJ <<DrawingFiles>> 14/6/2022 11:31 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Prj: RG 2.00.0 2021-06-30

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH1

CLIENT: Richmond Valley Council
PAGE: 2 of 2
PROJECT NAME: Jacky Bulbin Bridge Replacement
JOB NO: RGS33185.1
SITE LOCATION: Bungawalbin Whiporie Road
LOGGED BY: JB
TEST LOCATION: Northern Abutment
DATE: 12/5/22

DRILL TYPE: Tightsite Truck Mounted Drill Rig
EASTING: 516785 m
SURFACE RL: 0.1 m
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6773996 m
DATUM: Existing Deck = 0m

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
WB		11.50m SPT 4,6,9 N=15 11.95m	-12.0	12.0		SC	**Clayey SAND:** Fine to medium grained, grey *(continued)*	W	MD D			
		13.00m SPT 7,9,11 N=20 13.45m	-14.0	14.0		SP	13.00m **SAND:** Fine to medium grained, grey		D - VD			
		14.50m SPT 12,15,15 N=30 14.95m										
		16.00m SPT 18,22,26 N=48 16.45m	-16.0	16.0								
		17.50m SPT 12,19,17 N=36 17.95m	-18.0	18.0								
		19.00m SPT 7,8,9 N=17 19.45m	-20.0	20.0		SP	19.00m **SAND:** Medium to coarse grained, grey, trace fine grained quartz gravel		D			
		20.50m SPT 3,4,5 N=9 20.95m				CI	20.40m **Sandy CLAY:** Medium plasticity, grey, fine to medium grained sand 20.95m	M > w_P	St - VSt			No Sample Recovery
							Hole Terminated at 20.95 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG 2.00.3 LIB.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS33185.1 BH LOGS.GPJ <<DrawingFile>> 14/6/2022 11:31 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Prj: RG 2.00.0 2021-06-30

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH2**

CLIENT: Richmond Valley Council
PAGE: 1 of 2
PROJECT NAME: Jacky Bulbin Bridge Replacement
JOB NO: RGS33185.1
SITE LOCATION: Bungawalbin Whiporie Road
LOGGED BY: JB
TEST LOCATION: Southern Abutment
DATE: 12/5/22

DRILL TYPE: Tightsite Truck Mounted Drill Rig
EASTING:
SURFACE RL: 0.0 m
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: Existing Deck = 0m

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T							0.15m **ASPHALT:** 150mm					ASPHALT
						GC	**FILL:** Clayey Sandy GRAVEL, fine to coarse grained, brown, fine to medium grained sand	M				FILL
		1.00m SPT 9,5,5 N=10 1.45m					1.10m					
	12/5/2022					GM	**FILL:** Silty GRAVEL, fine to medium grained, dark grey					
			-2.0	2.0			1.80m					
						SC	**Clayey SAND:** Fine to medium grained, brown		L - MD			ALLUVIAL SOIL
		2.50m SPT 2,2,3 N=5 2.95m						W				
		4.00m SPT 5,5,3 N=8 4.45m	-4.0	4.0								
							5.00m					
						SP	**SAND:** Fine to medium grained, grey					
		5.50m SPT 2,2,3 N=5 5.95m	-6.0	6.0								
		7.00m SPT 3,2,2 N=4 7.45m					7.30m					
WB						CI	**Sandy CLAY:** Medium plasticity, grey	M > w_P	F	HP	40 - 50	
			-8.0	8.0								
		8.50m SPT 3,3,8 N=11 8.95m					8.50m					
						SP	**SAND:** Fine to medium grained, grey, with clayey layers	W	MD			
			-10.0	10.0								
		11.00m										

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH2**

CLIENT: Richmond Valley Council
PAGE: 2 of 2
PROJECT NAME: Jacky Bulbin Bridge Replacement
JOB NO: RGS33185.1
SITE LOCATION: Bungawalbin Whiporie Road
LOGGED BY: JB
TEST LOCATION: Southern Abutment
DATE: 12/5/22

DRILL TYPE: Tightsite Truck Mounted Drill Rig
EASTING:
SURFACE RL: 0.0 m
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: Existing Deck = 0m

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
WB		SPT 11,10,7 N=17 11.45m				SP	**SAND:** Fine to medium grained, grey, with clayey layers *(continued)*	W	MD			
			-12.0	12.0								
		12.50m SPT 7,6,3 N=9 12.95m										
		14.00m	-14.0	14.0								
		SPT 7,7,7 N=14 14.45m										
		15.50m							D			
		SPT 4,9,15 N=24 15.95m	-16.0	16.0								
		17.00m SPT 18,18,17 N=35 17.45m										Organic material (wood fibres) in SPT
			-18.0	18.0					MD			
		18.50m SPT 6,8,5 N=13 18.95m					18.95m					
							Hole Terminated at 18.95 m					
			-20.0	20.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH3

CLIENT: Richmond Valley Council
PAGE: 1 of 1
PROJECT NAME: Jacky Bulbin Bridge Replacement
JOB NO: RGS33185.1
SITE LOCATION: Bungawalbin Whiporie Road
LOGGED BY: JB
TEST LOCATION: Behind Landslip
DATE: 12/5/22

DRILL TYPE: Tightsite Truck Mounted Drill Rig
EASTING: 516771 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6773987 m
DATUM: Existing Deck = 0m

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	12/5/2022	1.00m SPT 3,2,1 N=3 1.45m		2.0		SP	**FILL:** Gravelly SAND, fine to medium grained, brown, fine to coarse grained gravel	M				FILL
							0.55m					
						SP	**SAND:** Fine to medium grained, brown, with layers of fine to medium grained Clayey SAND, trace fine to medium grained gravel		L			ALLUVIAL SOIL
		2.50m SPT 5,4,6 N=10 2.95m						W	MD			
		4.00m SPT 5,5,7 N=12 4.45m		4.0			4.45m					
							Hole Terminated at 4.45 m					
				6.0								
				8.0								
				10.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
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Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Appendix B

Laboratory Test Results

RESULTS OF SOIL ANALYSIS

1 sample supplied by Regional Geotechnical Solutions Pty Ltd on 17/05/2022. Lab Job No. M8736.
Samples submitted by Joel Babbage. Your Job: RGS33185.1.
44 Bent Street WINGHAM NSW 2429

	Method	Sample 1 BH2
	EAL job No.	***M8736/1***
Moisture (%)	*inhouse*	15
Texture	*See note 2 below.*	Coarse
pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	5.18
Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.097
Resistivity (ohm.mm)	** Calculation	103,093
Resistivity (ohm.cm)	** Calculation (ohm.mm / 10)	10,309
Chloride (mg/kg)	** Water Extract - ISE (1:5 Water)	141
Chloride **(as %)**	** Calculation	0.014
Sulfate (mg/kg)	** Water Extract-APHA 3120 ICPOES	130
Sulfate **(as % SO_4)**	** Calculation	0.013
Chloride / Sulfate Ratio	** Calculation	1.1

Notes:

1. ppm = mg/kg dried soil
2. For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays
3. All results as dry weight DW - soils were dried at 60°C for 48hrs prior to crushing and analysis.
4. For conductivity 1 dS/m = 1 mS/cm = 1000 µS/cm
5. Methods from Rayment and Lyons, 2011. Soil Chemical Methods - Australasia.CSIRO Publishing: Collingwood.
6. Based on Australian Standard AS: 2159-2009
7. Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). Acid Sulfate Soils Laboratory Methods Guidelines. QLD DNRME.
8. Analysis conducted between sample arrival date and reporting date.
9. ** NATA accreditation does not cover the performance of this service.
10. .. Denotes not requested.
11. This report is not to be reproduced except in full.
12. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal or on request).
13. Results relate only to the samples tested.
14. This report was issued on 06/06/2022.

NATA
WORLD RECOGNISED ACCREDITATION
Accreditation No. 14960
Accredited for compliance with ISO/IEC 17025 - Testing

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

checked: .....
Graham Lancaster
Laboratory Manager

Council Reference
Review of Environmental (REF)
Project Number – 840405

26 April 2023

Richmond Valley Council

Richmond Valley Council Conflicts of Interest Risk Management Statement

Project Name	Design and Construct Jackybulbin Bridge Replacement – Unsealed Road, Bungawalbin Whiporie Road
DA Number	N/A Project number = 840405 REF = Review of Environmental Factors Bridge Replacement on road from Whiporie to Bungawalbin over Jackybulbin Creek
Potential conflicts	Richmond Valley Council is the applicant of Jackybulbin Bridge replacement on Bungawalbin Whiporie Road. This project involves replacing the existing bridge that is flood damaged from March 2021 with a new structure in accordance with AS5100.2017. The project has an estimated cost of works of $1,250,300.00. Richmond Valley Council will be the determining body for this development.
Assessed level of Risk	Medium
Management strategy	Council is managing potential conflicts of interest in this matter as follows: • Application is assessed by Council staff not directly involved in the project design and application preparation. • The application will be prepared by an independent consultant (Envirocivil Consultants). • The Department of Lands Fisheries permit is being organised by the contractor undertaking the works - Engineering and Civil Contractors. • The REF and Fisheries permit for this project will be posted to Councils website.
Contact	Anyone with concerns about Council fulfilling its obligations under this Statement should report their concerns to the Council or the NSW Local Government Ombudsman.

Statement prepared by applicant:

Jack Baker
Engineering Assistant – Road and Transport Assets

Assessed level of risk confirm by:

Tony McAteer
Acting Manager of Development & Certification