Review of Environmental Factors

Deep Creek and Spring Gully Bridge Replacements, Casino Coraki Road, Tatham

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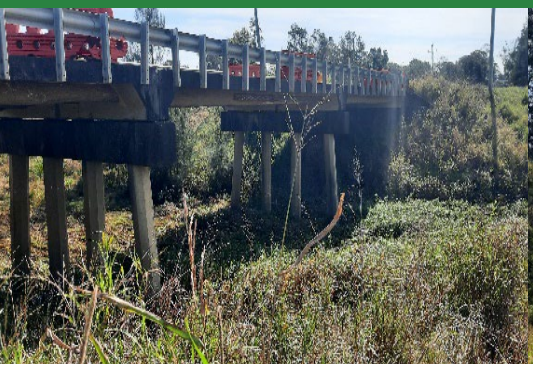

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Prepared for: Quickway and Richmond Valley Council

UPR	Description	Issued By	Date Issued
5060-1003	Version 1 DRAFT	LVB	18/09/2024
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Executive Summary

Proponent and Determining Authority	Richmond Valley Council (RVC)
Background	Richmond Valley Council (RVC) propose to replace Deep Creek and Spring Gully bridges; these bridges are located over Shannon Brook and Spring Creek, on the Casino Coraki Road at Tatham. The existing bridges are Doolan Deck type bridges (timber girders composite with a concrete deck). These bridges have been assessed and identified as being in poor condition, resulting in the speed limit being reduced from 100 km/ hr to 60 km/ hr, with traffic restricted to one-way at a time, causing heavy vehicles to detour away from using the existing bridges. It is proposed to construct the two new bridges offline, in parallel locations to the existing bridges. This will allow for traffic to continue utilising Casino Coraki Road during the construction period. Once the new bridges are complete, the existing bridges will be demolished. The new bridges will comprise Super T girders (T5) with a width of 8.4 m between barriers to accommodate two traffic lanes. Deep Creek bridge is proposed to consist of one 15 m long span and three 25 m long spans, totalling 90 m. Spring Gully bridge is proposed to consist of two 21 m long spans, totalling 42 m. The bridges have been designed to be nearly identical where possible.
Location	The bridges are located within the village of Tatham, which is located 15 km south-east of Casino, 16 km west of Coraki and 28 km north-west of Woodburn, on the Far North Coast of NSW (refer to **Illustration 1.1**). Casino Coraki Road is the primary access road from Casino to the coast. The site is a rural locality, dominated by cleared agricultural land.
Site Features	The site comprises the two existing bridges over Shannon Brook and Spring Creek. The bridges are located at the intersection of Casino Coraki Road, Perkins Bridge Road and Tomki Tatham Road. These are all sealed asphalt roads. Both Shannon Brook and Spring Creek are mapped as Key Fish Habitat by the NSW Department of Primary Industries. The Richmond Valley Flood Survey 2023 indicates that the site is flood prone, with flood water levels predicted to reach around 14 m AHD in the probable maximum flood event and around 12 m in the 1 in 100-year flood event. The site has an elevation of around 10 m AHD. Vegetation within the survey area consists of disturbed grassland within the road reserve and adjacent paddocks. Remnant native vegetation was recorded in proximity to Shannon Brook and Spring Creek.
Proposed Activity	The Activity comprises replacing Deep Creek and Spring Gully bridges with new bridges. Key features of the works include: ■ Construction of ancillaries ■ Tree and vegetation clearing ■ Utility Relocation ■ Construction of temporary piling pads ■ Piling ■ Construction of temporary crane pads for girder install

	■ Installation of a 4 span 91 m long bridge over Shannon Brook ■ Installation of a 2 span 43 m long bridge over Spring Gully Creek ■ Approximately 700 linear meters of road/pavement construction ■ Exiting bridge demolition. ■ Stabilisation of disturbed areas including ancillary sites ■ Demobilisation Concept design plans are provided at **Appendix A**.
Statutory and Planning Framework	All relevant statutory planning instruments have been examined in relation to the proposed bridge replacement works. Development consent is not required for the proposal under section 2.109 of the SEPP (Transport and Infrastructure). However, the proposal becomes an 'Activity' for the purposes of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is subject to an environmental impact assessment (this REF).
Environment Assessment and Conclusion	An environmental assessment of the proposed Activity has been undertaken; some minor impacts are anticipated to occur as a result of the Activity. However, no significant or long-term adverse impacts are expected. To ensure that the extent of impacts is limited and that unavoidable impacts are managed and minimised, mitigation measures and safeguards have been recommended and would be implemented and monitored. The Activity is considered justified, taking into account the potential and residual environmental impacts, including the associated mitigation measures and safeguards. The Activity is in accordance with ecologically sustainable development (ESD) principles and consistent with the objectives of the EP&A Act. As the potential environmental impacts of the Activity are not likely to be significant, it is not necessary for an Environmental Impact Statement to be prepared under Division 5.1, Subdivision 3 of the EP&A Act or approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. The Activity is unlikely to significantly affect threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement (or BDAR if the Proponent elected) is not required. The Activity is also not expected to affect Commonwealth land or have a significant impact on any matters of national environmental significance. Accordingly, the proposed Activity does not require referral to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW).

1. Introduction

1.1 Background and Activity Identification

Richmond Valley Council (RVC) propose to replace the twin bridges over Shannon Brook and Spring Creek, on Casino Coraki Road at Tatham. The existing bridges are Doolan deck style, which are currently in a poor condition, resulting in a limitation to a 5-tonne load limit, a restriction to one-way traffic and a reduction of the speed limit from 100 km/ hr to 60 km/ hr. The condition of the existing bridges is causing heavy vehicles to detour the site and utilise other rural roads.

The proposed new bridges will be constructed off-line, removing the requirement for a detour or temporary side track. The bridge over Shannon Brook will be a four-span bridge and the bridge over Spring Gully Creek will be a two-span bridge; both will consist of a concrete plank and deck structure.

At the completion of construction of the new bridges, the road will be re-aligned to connect with the new bridges. The old bridges will be demolished, and the sites will be rehabilitated.

The location of the proposed works is shown in **Illustration 1.1**. All construction and operational activities associated with the bridge replacement works are referred to herein as 'the Activity'.

1.2 Purpose of this Report

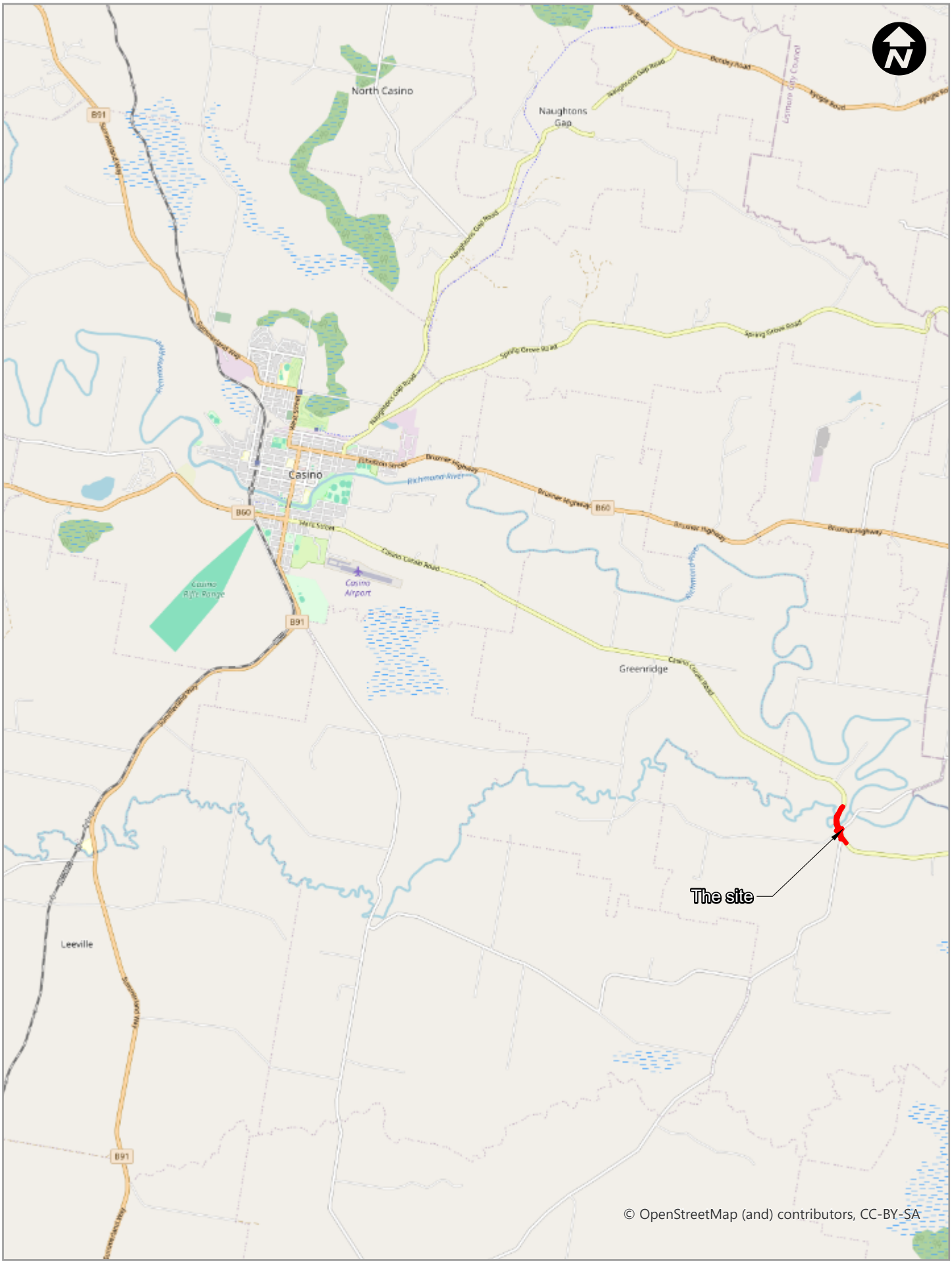
This Review of Environmental Factors (REF) has been prepared by GeoLINK on behalf of RVC. For the purpose of these works, RVC is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The description of the Activity and associated environmental impacts have been undertaken in the context of Section 171 of the Environmental Planning and Assessment (EP&A) Regulation 2021, having regard for the *Guidelines for Division 5.1 Assessments* (DPE 2022) approved under Section 170 of the EP&A Regulation, the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, which requires RVC to 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 proposed Activity is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared under Division 5.1, Subdivision 3 of the EP&A Act or approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the *Biodiversity Conservation Act 2016* (BC Act) and/or the *Fisheries Management Act 1994* (FM Act), in relation to Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement, or if the Proponent so elects - a Biodiversity Development Assessment Report (BDAR).
- The potential for the Activity to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) for a decision by the Commonwealth Minister on whether assessment and approval is required under the EPBC Act.



0 2 km

Site Locality - Illustration 2.1

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Deep Creek and Spring Gully Bridge Replacements, Casino Coraki Road, Tatham
5060-1005

Information shown is for illustrative purposes only
Drawn by: AB Checked by: AB Reviewed by: MES
Source of base data: Open Street Map
Date: 2/09/2024

2. Description of the Existing Environment

2.1 Site Location and Context

The location of the proposed Activity is on Casino Coraki Road at Tatham (refer to **Illustration 1.1**). Deep Creek Bridge spans Shannon Brook, and Spring Gully Bridge spans Spring Creek; together they are known to be the Tatham twin bridges.

Tatham is a small locality situated 15 km south-east of Casino, 16 km west of Coraki, and 28 km north-west of Woodburn. Casino Coraki Road connects to Woodburn Coraki Road in the south east and is a connecting route for Casino (and other towns to the west) to the south east coast and Pacific Highway.

Tatham is situated in a rural landscape, consisting of large cropping and grazing properties. The Richmond River runs through the Tatham township and is located east of the Activity site. Both Shannon Brook and Spring Creek are tributaries of the Richmond River.

Site photographs were obtained during a site inspection in August 2024 and are provided at **Plate 2.1** to **Plate 2.4**.

In this location, parts of Casino Coraki Road are not within the road reserve are within private property, resulting in the need for land acquisition. Furthermore, Shannon Brook is Crown Land; Council has issued a Section 175 Notice to take possession of land for road works to all affected landholders. Therefore, while the land is being used or occupied under this notice, the land is taken to be a public road for the purposes of the Roads Act 1993.

Plate 2.1 View to the north-west of Spring Gully Bridge

Plate 2.2 View to the east, underneath Spring Gully Bridge

Plate 2.3 View to the north-west of Deep Creek Bridge

Plate 2.4 View to the north-west, underneath Deep Creek Bridge

2.2 Site Analysis

2.2.1 Existing Bridges

Deep Creek and Spring Gully bridges are approximately 100 m apart. Both bridges are Doolan Deck style construction, which means they are constructed of low shrinkage hardwood log girders with a reinforced concrete deck. Both bridges have driven concrete piles and concrete abutments.

Deep Creek Bridge is eight spans with an overall length of approximately 96 m. Spring Gully Bridge is three spans with an overall length of approximately 36 m. Both bridges have a width between barriers of approximately 7.2 m.

2.2.2 Topography

The site is situated within a region of alluvial floodplain associated with the Richmond River and Shannon Brook (refer to **Illustration 2.1**). The elevation of the land at the bridges is around 8.5 m AHD.

Deep Creek Bridge has a deck elevation of 8.2 – 8.75 m AHD. Spring Creek Bridge has a deck elevation of 8.36 – 8.69 m AHD.

2.2.3 Soils

A Geotechnical Investigation has been prepared by Regional Geotechnical Solutions Pty Ltd for the proposed Activity (refer to **Appendix K**). The investigation found that the 1:250,000 Tweed Heads Geological Map indicates that the site is underlain by quaternary alluvial soils consisting of river gravels, alluvium, sand and clay. Lismore Basalt is mapped as being within 2 km to the southwest of the existing bridge. The site is not located in an area of known occurrence of acid sulfate soils.

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 2.1** below. The locations of the boreholes is shown in **Appendix K.**

Table 2.1 Summary of Subsurface Conditions Encountered in Boreholes

Unit	*Material Description*	*Depth to Base of Layer Below Ground Level (m)*		
		BH1	*BH2*	*BH3*
Fill	COBBLES, up to 100 mm with silty clay fines	-	0.8	-
Alluvial Clay 1	SILTY CLAY, stiff to very stiff, high plasticity, dark brown	4.0	1.8	7.5
Alluvial Sand 2	SAND, fine to medium grained, loose to medium dense, grey	11.7	10.0	11.0
Alluvial clay 3	SILTY CLAY high plasticity, stiff, grey and yellow, trace shell fragments	-	16.2	23.0
Alluvial Clay 4	SILTY CLAY, high plasticity, very stiff to hard, grey mottled orange/ brown	22.0	23.5	-
Alluvial Sand 5	Silty SAND fine to medium grained, medium dense, with lenses of clayey sand, grey with orange / brown	30.0	29.5	34.5

Unit	Material Description	Depth to Base of Layer Below Ground Level (m)		
		BH1	BH2	BH3
Residual Soil	Silty CLAY, high plasticity, with fine to coarse grained gravel, grey to dark grey grading into Extremely Weathered BASALT	32.5	29.7	35.1
EW-MW Basalt	BASALT, extremely to moderately weathered, partially weathered to boulders and cobbles with clay infill, low strength	-	-	36.5
SW-Fr Basalt	BASALT, slightly weathered to fresh, high to very high strength, average defect spacing of approximately 100 to 500 mm	≥36.72	≥32.98	≥41.00

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

Further assessment on soil conditions is provided in **Section 6.5**.

2.2.4 Vegetation

Vegetation within the survey area consists of disturbed grassland within the road reserve and adjacent paddocks. Remnant native vegetation was recorded in proximity to Shannon Brook and Spring Creek.

Vegetation within the site is aligned with the following Plant Community Types (PCTs):

- PCT 4070 Far North River Oak Wet Forest
- PCT 3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest
- Miscellaneous Ecosystem (does not align with a PCT)

No threatened flora species listed under the BC Act and/ or EPBC Act were recorded within the survey area or are likely to occur.

2.2.5 Waterways

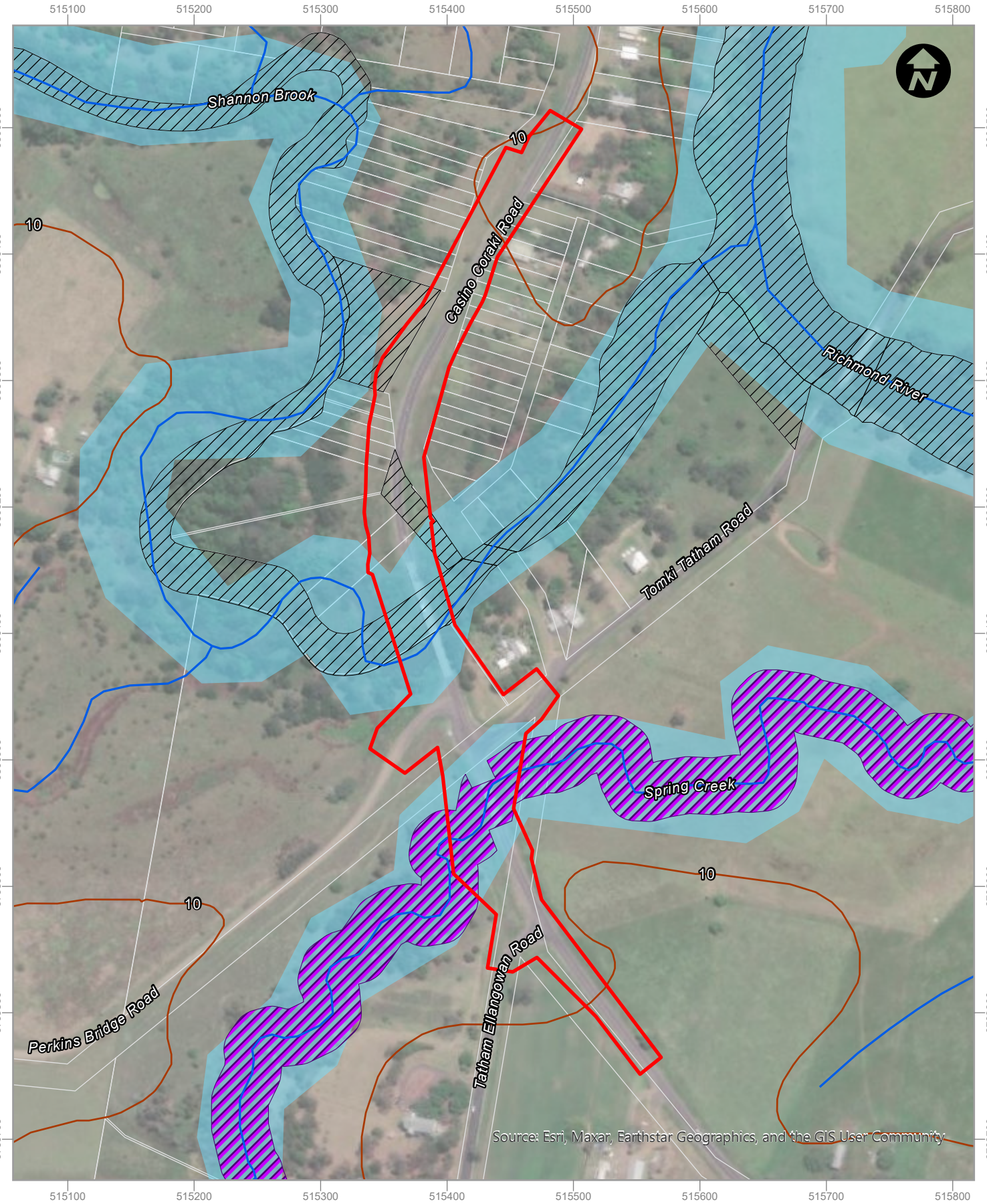
Shannon Brook and Spring Creek are tributaries of the Richmond River, and respectively join the Richmond River 400 m and 800 m downstream from the bridges.

Both waterways are 3rd order streams and are mapped as Key Fish Habitat. At the time of inspection Spring Creek had very low water levels present within the survey area; both waterways showed disturbance from cattle, sedimentation, erosion and rubbish. The waterways may provide habitat for locally occurring freshwater fish, invertebrates, birds and amphibians.

There are no mapped Coastal Wetlands within 20 km of the site.

2.2.6 Existing Land Uses

The site comprises the existing roadway and bridges. There are several residences in close proximity to the roadway. The site is surrounded by grazing and cropping land that is zoned RU1 Primary Production. Shannon Brook is zoned W1 Natural Waterways, pursuant to the Richmond Valley Local Environmental Plan 2012 (RVLEP).



LEGEND

- Cadastre
- Crown Land
- Biodiversity Values mapping
- Key fish habitat
- Extent of works
- Contours at 10m intervals
- Watercourse

0 80 Metres

Site Analysis - Illustration 2.1

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Deep Creek and Spring Gully Bridge Replacements, Casino Coraki Road, Tatham
5060-1005

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Drawn by: AB Checked by: AB Reviewed by: MES
Source of base data: ESRI World Imagery
Date: 2/09/2024

3. Description of the Proposed Activity

The Activity comprises replacing Deep Creek and Spring Gully bridges, which are located over Shannon Brook and Spring Creek on the Casino Coraki Road at Tatham.

The existing bridges are Doolan Deck type bridges (timber girders composite with a concrete deck). These bridges have been assessed and identified as being in poor condition, resulting in the speed limit being reduced from 100 km/ hr to 60 km/ hr, with traffic restricted to one-way at a time, causing heavy vehicles to detour away from using the existing bridges.

It is proposed to construct the two new bridges offline, in parallel locations to the existing bridges. This will allow for traffic to continue utilising Casino Coraki Road during the construction period. Once the new bridges are complete, the existing bridges will be demolished.

The new bridges will comprise Super T girders (T5) with a width of 8.4 m between barriers to accommodate two traffic lanes. Deep Creek bridge is proposed to consist of one 15 m long span and three 25 m long spans, totalling 90 m (refer to **Figure 3.1**). Spring Gully bridge is proposed to consist of two 21 m long spans, totalling 42 m (refer to **Figure 3.2**). Both bridges will have driven square reinforced concrete piles and reinforced concrete headstock and wing walls. The bridges have been designed to be nearly identical where possible.

Once the new bridges are complete, approximately 700 m of new roadway will be constructed to tie in with the new bridges and the existing side roads (Perkins Bridge Road, Tomki-Tatham Road and Tatham-Ellangowan Road). The new roadway will also tie back into the existing Casino Coraki Road at each end of the Activity. The existing bridges will then be demolished, and the sites rehabilitated.

Design drawings of the Activity are at **Appendix A** and a Design Report prepared by the bridge engineer Bridge Knowledge is at **Appendix J**.

The specific works proposed and subject to the scope of this REF are outlined below.

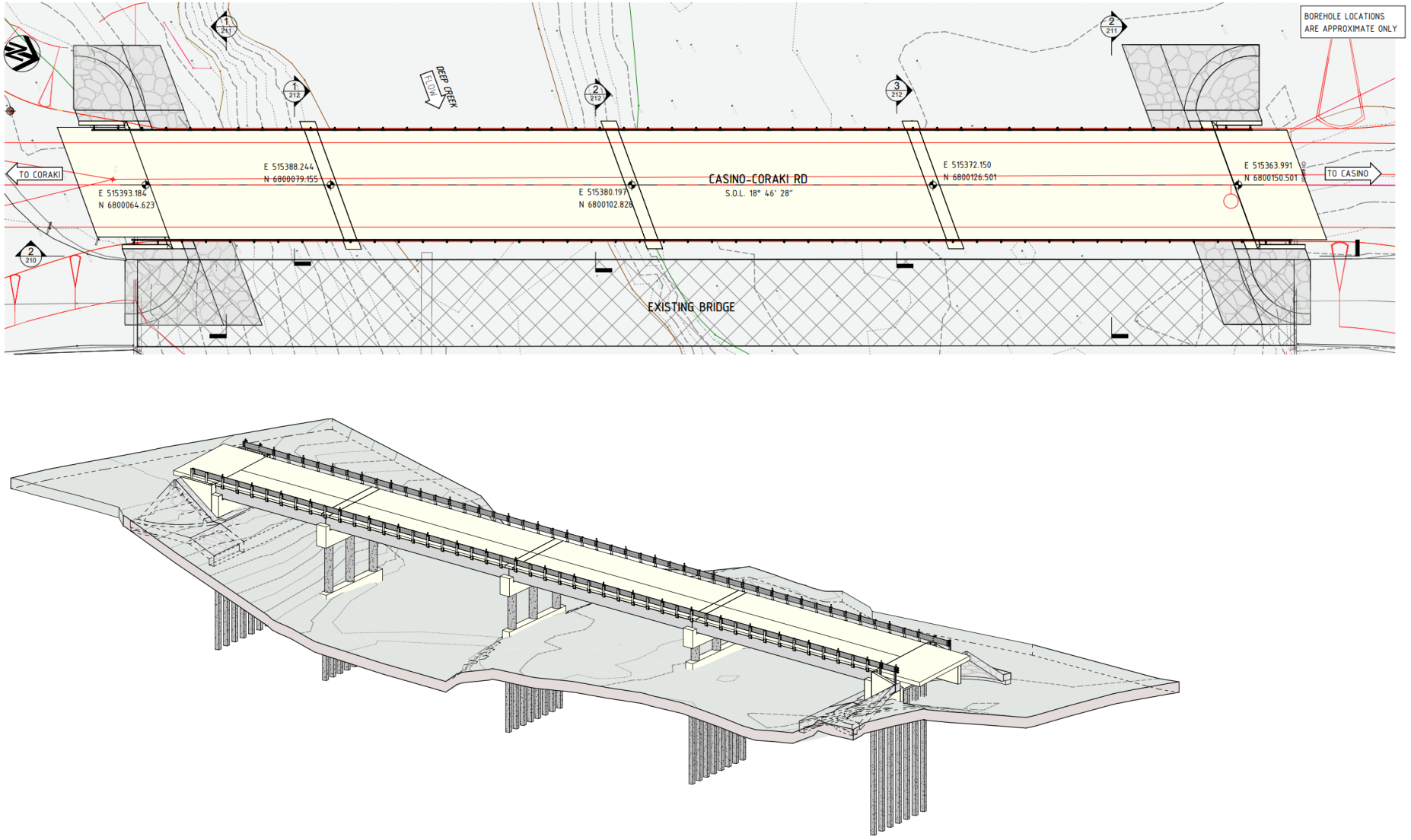


Figure 3.1 Deep Creek Bridge Proposed Works

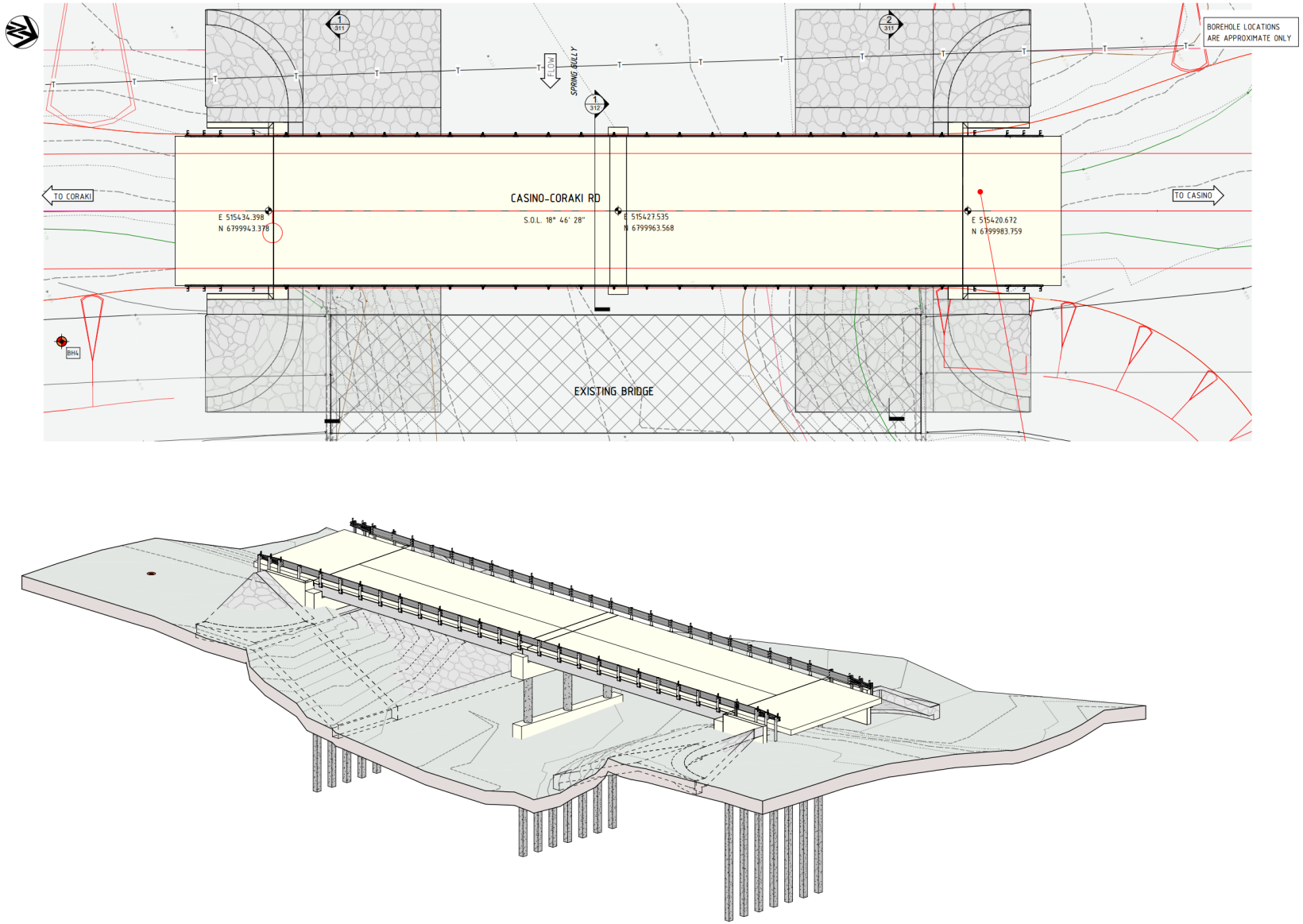


Figure 3.2 Spring Gully Bridge

3.1 Consideration and Selection of Crossing Types/ Alternatives

Overall, the bridge design has remained of the same style throughout the design process, i.e. Super T girders as the superstructure with driven piles and concrete abutments. The design has varied with regard to the length of each span and the material of the piles (concrete or steel). The design considerations included geometry, hydraulic, environmental/ fisheries, constructability and cost.

To 'do nothing' to the bridges would be inappropriate. The bridges have been assessed and found to be in poor condition, resulting in a load limit of 5 t, the speed limited being reduced to 60 km/ hr from 100 km/hr and restricted to one way traffic only. It has also resulted in the re-routing of heavy vehicle traffic away from this traffic route.

3.2 Ancillary Facilities

A temporary ancillary facility will be established at 3225 Casino Coraki Road (Lot 3 DP706888), on a cleared area at the intersection of Casino Coraki Road and Tatham Ellangowan Road, as shown on **Illustration 3.1**. This is private property; however, agreement with the land holder has been obtained by Council. Plant and materials will be stored on site for the duration of the works. This area will also contain a site office and ancillary operational facilities for the Activity works.

3.3 Implement Environmental Controls

Erosion and sediment controls will be designed and implemented prior to ground disturbance which may resulting in exposed sediments.

Similarly, instream controls are required to prevent dispersal of material downstream from the works areas. Controls will also be required to prevent dispersal of materials from stockpiles established for the Activity. Erosion and sedimentation controls will be undertaken in accordance with the Landcom/ Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) and be maintained during the construction activities and will not be removed until all sites are suitably stabilised. All chemicals and refuelling required on site will be secured in bunded areas.

3.4 Tree Removal

The Activity requires the removal of vegetation in the road and bridge construction areas. No tree removal will be required within the ancillary facility locations, which will be located in already cleared areas of the road corridor. Discussion of biodiversity impacts can be found in **Section 6.1** of this REF.

3.5 Construction Works

Key features of the Activity include:

- Establishment of ancillary facility
- Tree and vegetation clearing
- Utility Relocation
- Construction of temporary piling pads
- Piling
- Construction of temporary crane pads for girder install
- Installation of a 4 span 91 m long bridge over Shannon Brook
- Installation of a 2 span 43 m long bridge over Spring Gully Creek

- Approximately 700 linear meters of road/ pavement construction
- Exiting bridge demolition.
- Stabilisation of disturbed areas including ancillary sites
- Demobilisation

The bridge construction works will include:

- Install temporary environmental controls
- Establish access, compound and laydown ancillaries.
- Relocate overhead power lines
- Relocate Telstra cables (If needed)
- Tree & Vegetation clearing for bridge & roadworks.
- Install temporary Piling platforms
- Install Piles (Driven)
- Construct in-situ concrete pile caps
- Construct in-situ concrete piers
- Construct in-situ concrete abutments
- Construct in-situ concrete headstocks
- Install bridge bearings
- Backfill behind abutments
- Install temporary crane pad
- Crane mobilisation
- Install precast girders
- Pour concrete deck and approach slabs
- Earthworks and road pavement for realigned road & tie ins
- Installation of new safety barriers and road furniture
- Spray seal new road alignment
- Stabilisation, landscaping and finishing works
- Remove site compound and re-establish areas to original state, ensuring any disturbed areas are stabilised.

Design drawings are provided in **Appendix A**.

3.6 Demolition and Removal

Demolition of the existing bridges will be undertaken once the new bridges are complete and trafficable. The demolition works will include:

- Crane set up on existing road behind the old bridge abutments.
- Dismantle exiting Doolan deck bridge in sections starting with the barriers and working down.
- Lift out each section with crane, using lifting straps, chains etc.
- Load onto truck and cart off site, to be recycled or repurposed.
- Cut the piers and pile caps and remove by crane.
- Use of 20 t excavator to dig out the existing abutments to ground level and remove any concrete. Shape up disturbed area using excavator to match existing, stabilise and plant/ landscape as required to design.
- Remove erosion sediment controls once disturbed areas are stabilised.

Any excess material will be disposed of at a licensed waste recovery facility.

3.7 Plant and Equipment

Plant and equipment required for the works includes:

- Light vehicles.
- Proline crane borer
- Lines truck (dressing powerline)
- Excavator
- Mobile crane/s
- Piling rig
- Tipper
- Truck and dog
- Concrete vibrators
- Concrete truck
- Concrete pump
- Handheld jack hammer
- Profiler
- Grader
- Vibration Roller
- Static Roller
- Plate compactors
- Line marker
- Spray sealing equipment
- Screeds
- Hand tools including concrete saw
- Traffic control equipment
- EWP
- Hand tools

3.8 Materials

Materials required for the works includes:

- Concrete
- Steel
- Curing Compounds
- Formwork release agents
- Road base for pavements
- Clean rock for scour protection
- Clean rock for piling platforms
- Clean earth fill
- Temporary enviro controls (e.g. Geofabric, Silt Fence, Sandbags, Flagging)
- Spray sealing materials including bitumen

3.9 Traffic Control

Construction of the two new bridges will occur offline, allowing traffic to continue utilising the existing bridges and removing the need for a detour.

The existing traffic control that is in place to ensure the existing bridges are on-way only will remain in place until the new road is connected.

There will be some additional traffic control in place when the road tie-in works are underway; however, the delays are expected to be minor.

A Traffic Management Plan will be prepared as part of the Construction Management Plan for the Activity.

3.10 Services Works

Existing overhead electricity infrastructure will be relocated as part of the Activity. The construction contractor for the Activity will be responsible for liaising with Essential Energy and finalising the new location and design of the electricity infrastructure.

Further on-site assessment is required to determine the exact location of telecommunications infrastructure and whether relocation is required.

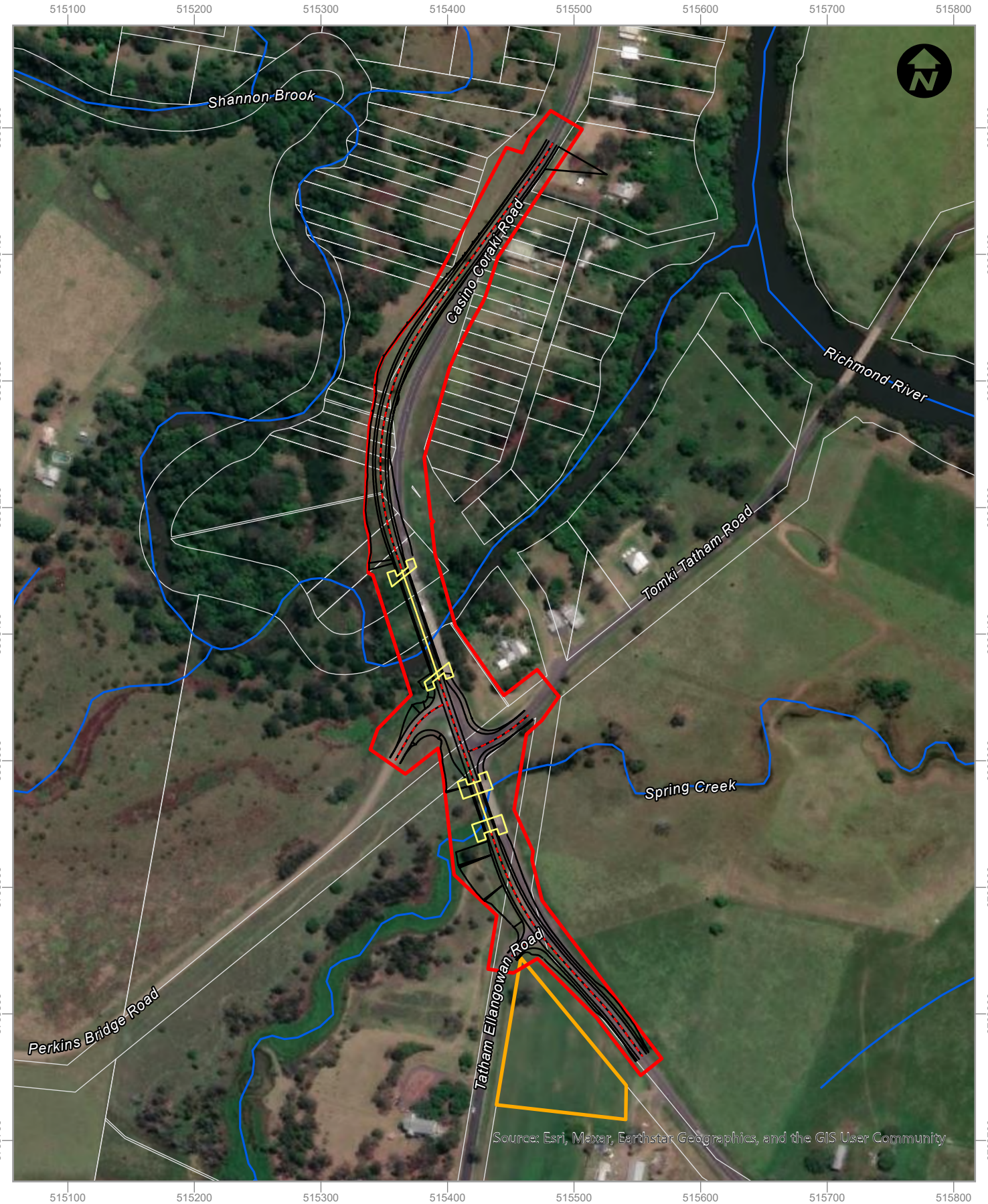
No other services infrastructure will be impacted by the Activity.

3.11 Spoil Material

Waste material will be generated by the Activity, specifically the demolition of the existing bridges and roadway. The removed bridge materials will be transported to the Waste and Resource Recovery Facility at Casino for assessment and determination on recycling and reuse opportunities.

Other spoil materials generated by the Activity, including excavated materials for the installation of the new bridges will also be assessed on site for its reuse suitability. Where the excavated material is not suitable for reuse, it will be transported to the Waste and Resource Recovery Facility at Casino.

It is not expected that any Acid Sulfate Soils will be encountered during this Activity.



LEGEND

- Extent of works
- Alignment
- Bridge design
- Road design
- Watercourse
- Proposed compound
- Cadastre

0 80 Metres

The Activity - Illustration 3.1

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Deep Creek and Spring Gully Bridge Replacements, Casino Coraki Road, Tatham
5060-1005

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Source of base data: ESRI World Imagery
Date: 11/09/2024

3.12 Site Clean-up

At the completion of the works, all exposed soil areas will be stabilised with ground cover and all excess materials and waste will be removed from the sites. All temporary facilities will be decommissioned at the end of the relevant component of the works.

3.13 Working Hours

Construction activities would be undertaken in accordance with standard construction work hours:

- Monday to Friday: 7:00 am to 6:00 pm.
- Saturday 8:00 am to 1:00 pm.
- Sundays or public holidays No work.

3.14 Construction Timeframe

Construction works are expected to commence in October 2024 and will take 14 months to complete.

3.15 Acquisition

In this location, Casino Coraki Road is not within an accurate road reserve and intersects with many private properties, as shown in **Illustration 3.1** and listed in **Table 3.1** below. RVC has issued a Section 175 Notice to take possession of land for road works to all affected landholders; therefore, while the land is being used or occupied under this notice, the land is taken to be a public road for the purposes of the *Roads Act 1993*.

Table 3.1 Impacted Private Properties

Lot	Section	Deposited Plan	Lot	Section	Deposited Plan
2		706888	11	1	1494
202		815264	12	1	1494
1		594704	13	1	1494
3	2	1494	14	1	1494
3	1	1494	15	1	1494
122		136466	16	1	1494
26	6	1494	17	1	1494
24	2	1494	18	1	1494
23	2	1494	19	1	1494
22	2	1494	120		136466
21	2	1494	121		136466
20	2	1494	4	2	1494
134		726553	8	2	1494
2	2	1494	5	2	1494
1	2	1494	3		706888
2	1	1494	201		815264

Lot	Section	Deposited Plan	Lot	Section	Deposited Plan
4	1	1494	1	1	1494
5	1	1494	20		1125446
6	1	1494	21		1125446
7	1	1494	7	2	1494
8	1	1494	6	2	1494
9	1	1494			
10	1	1494			

4. Statutory Planning Framework

4.1 Environmental Planning and Assessment Act 1979

The Activity does not require development consent, however it requires environmental assessment and approval pursuant to Part 5 and Section 5.5 of the EP&A Act whereby determining authorities, when assessing activities under Part 5, must examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity.

To ensure the Activity adequately addresses the requirements of Section 5.5, an assessment of the Activity's consistency with relevant EPIs including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) has been completed.

4.2 State Environmental Planning Policies

4.2.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 aims to facilitate the effective delivery of infrastructure across the State and allows certain development by or on behalf of public authorities to be undertaken without consent.

Section 2.109 of the SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is appropriately characterised as development for the purposes of a road or road infrastructure facilities and is to be carried out by or on behalf RVC (a public authority), it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The Activity is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land mapped as Coastal Wetland or Littoral Rainforest under the State Environmental Planning Policy (Resilience and Hazards) 2021. The Activity is not development identified under State Environmental Planning Policy (Planning Systems) 2021.

Part 2 of the SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation as required by SEPP (Transport and Infrastructure) is discussed in **Section 4** of this REF.

4.2.2 State Environmental Planning Policy (Biodiversity & 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 Chapter 3 Koala Habitat Protection 2020:

- 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 6.1**.

4.2.3 State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 Coastal Management

Chapter 2 of this SEPP deals with Coastal Management; it aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*, including the management objectives for each coastal management area. It defines the four coastal management areas through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

No Littoral Rainforest or Coastal Wetland is mapped in proximity to the site; no impact to this aspect is expected.

The Activity is within the mapped Coastal Use and Coastal Environment Areas. Development assessment provisions for these areas are provided within Chapter 2, Division 3 and Division 4 of SEPP (Resilience and Hazards). However, these provisions only apply 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 apply. It is Council's responsibility to consider environmental issues relating to their works to the fullest extent possible, including impacts on Coastal Environment and Coastal Use Areas. **Table 4.1** below provides an assessment of the Activity against the provisions of Chapter 2: Division 3 and 4 of SEPP (Resilience and Hazards).

Table 4.1 SEPP (Resilience and Hazards) Assessment

Matters for Consideration	*Comment*
Division 3 Section 2.10 Coastal Environment Area	
(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—	
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	(a) the design of the works and the construction management measures that will be in place will ensure that surface and groundwater is properly managed throughout construction and once operational to ensure the biophysical, hydrological and ecological environment is not adversely affected. Shannon Brook and Spring Creek flow into the Richmond River and it will be important to ensure that the management and mitigation measures are in place and maintained for the recommended period of time. An assessment of the impacts of the proposal on water quality and water resources has

Matters for Consideration	Comment
	been carried out as well as biodiversity and ecological matters under **Section 6**.
(b) coastal environmental values and natural coastal processes,	(b) replacement of the existing bridges would not have a significant impact on the 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,	(c) The Activity will not impact on the Marine Estate or any Sensitive Coastal Lakes. None of the sensitive coastal lakes listed in Schedule 1 are near the Activity.
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	(d) the Activity will not impact any marine vegetation. Detailed discussion on biodiversity impacts is located at **Section 6.1** of this report.
(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(e)	(e) The Activity does not occur on public open space. There would be no impact on any public open space.
(f) Aboriginal cultural heritage, practices and places,	(f) Searches of the Aboriginal Heritage Information Management System have been carried out as part of the Aboriginal Cultural Heritage Assessment (refer to **Appendix F**). There are no known Aboriginal heritage places at the site. Safeguards must be put in place throughout construction in the event of an artefact being found.
(g) the use of the surf zone.	(g) The site is not near the surf zone.
Division 4 Section 2.11 Coastal Use Area	
(1) Development consent must not be granted to development on land what is within the coastal use area unless the consent authority:	
(a) has considered whether the proposed development is likely to cause an adverse impact on the following: (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability, (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores, (iii) the visual amenity and scenic qualities of the coast including coastal headlands, (iv) Aboriginal cultural heritage, practices and places, (v) Cultural and built environment heritage, and	The Activity will not affect any foreshore, beach, headland or rock platform area. The Activity would not create overshadowing, wind funnelling or the loss of views. The Activity is not situated in an area where it would have an impact on visual amenity or scenic qualities of the coast or headland. The site does not have a high level of visual amenity, scenic qualities or views. An assessment of the Activity on Aboriginal and non-Aboriginal heritage is in **Section 6.2** and **Section 0** of this REF.
(b) is satisfied that: (i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or	Through this REF, an assessment of the Activity with regard to biodiversity, heritage, visual amenity, traffic impacts etc. has been carried out. Where a potential adverse impact is identified, measures are proposed to minimise and mitigate that impact (see **Section 6**).

Matters for Consideration	Comment
(ii) if that impact cannot be reasonably avoided – the development is designed, sited and will be managed to minimise that impact, or (iii) if that impact cannot be minimised – the development will be managed to mitigate that impact, and	
(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.	The Activity has been designed to achieve the transport and traffic outcomes that are required, whilst having the least impact on the surrounding environment.

As detailed in the above table, the proposed Activity is not anticipated to adversely impact any of the relevant matters for consideration, and applicable safeguards and mitigation measures have been recommended in this REF to ensure any potential impact is avoided or minimised. The proposed Activity would not adversely affect the surrounding coastal environment or related use.

Chapter 4 - Remediation of Land

Chapter 4 of this SEPP deals with Remediation of Land. The proposed works occur along the existing road network alignment on land that has been previously disturbed. A search of the NSW Environmental Protection Authority (EPA) contaminated land database and cattle dip site locator was undertaken for the RVC area. No records were found in proximity to the site (refer to **Appendix H**).

The site is not declared to be 'significantly contaminated land' under part 3 of the *Contaminated Land Management Act 1997* and is not subject to a 'management order' within the meaning of the *Contaminated Land Management Act 1997.* The land is not the subject of an approved voluntary management proposal or an 'ongoing maintenance order'.

There is no proposed change of use, and the site is unlikely to be contaminated from past activities, which includes cattle grazing and the construction of previous bridges. There is no known contamination to note, and the Activity is unlikely to disturb contaminated land. Overall, the site is considered suitable for the Activity.

4.3 Local Environmental Plans

The Activity is located within the Richmond Valley LGA. Planning controls within this LGA are set out in the Richmond Valley Local Environmental Plan 2012 (RVLEP). The site is zoned RU1 Forestry and W1 Natural Waterways.

The objectives of RU1 Zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To ensure that development does not unreasonably increase the demand for public services or public facilities.*

The objectives of the W1 zone are:

- *To protect the ecological and scenic values of natural waterways.*
- *To prevent development that would have an adverse effect on the natural values of waterways in this zone.*
- *To provide for sustainable fishing industries and recreational fishing.*

The Activity will upgrade bridge infrastructure on a local road which connects rural localities. The proposed Activity is consistent with the zone objectives and is precluded from requiring consent as it is permitted without consent pursuant to Section 2.109 of the SEPP (Transport and Infrastructure) 2021.

4.4 NSW Legislation

Table 4.2 below lists other NSW legislation relevant to the assessment of the Activity and comments on their implications for the Activity.

Table 4.2 NSW Legislation

Legislation	Section(s)	Comment
Environmental Planning and Assessment Act 1979 (as amended)	Section 1.7	Section 1.7 of the EP&A Act relates to the application of Part 7 of the *Biodiversity Conservation Act 2016* (BC Act) and Part 7A of the *Fisheries Management Act 1994* (FM Act). Biodiversity has been assessed in **Section 6.1**. The Activity is unlikely to have a significant impact on biodiversity or threatened species or communities.
	Section 5.5	The determining authority in its consideration of an activity shall examine and consider, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity. This assessment provides Council with the information required in regard to the environment to assess the Activity.
Environmental Planning and Assessment Regulation 2021	Section 170	The *Guidelines for Division 5.1 Assessments* issued under Section 170, have been considered in **Section 6** and **8.1**. It is not expected that the Activity would result in a significant impact.
Fisheries Management Act 1994	Section 200	A permit is required when carrying out dredging and reclamation work on water land. RVC are required to obtain a permit for dredge and reclamation work on water land/ key fish habitat prior to works commencing.
	Sections 219-220	A permit is required when barriers to the movement of fish including water course crossings are to be constructed or modified. This includes temporary barriers for erosion and sediment control measures during construction. The Activity is not expected to completely block fish passage as the works methodology for the bridge replacement indicates that at least partial watercourse connectively during works will be maintained. If fish passage cannot be maintained along the waterway during construction, a permit would be obtained prior to commencing any activities that block fish passage.
	Section 205	The Activity is not within a marine environment and no marine vegetation would be affected.

Legislation	Section(s)	Comment
Protection of the Environment Operations Act 1997		No Protection of the Environment Policies (PEPs) are relevant to the Activity. No licenses would be required pursuant to the *Protection of the Environment Operations Act 1997*. RVC and/ or contractors working on behalf of RVC are required to notify EPA when a 'pollution incident' occurs that is likely to impact upon the environment.
	Section 115	It is an offence to negligently dispose of waste in a manner that harms the environment. Waste would be managed in accordance with the *Waste Avoidance and Resource Recovery Act 2001.* The Activity would aim to reduce the environmental impact of dumping waste and include mechanisms to recover resources and reduce the production of waste where possible. Construction waste will be assessed for reuse and recycling opportunities.
	Section 120	It is an offence to pollute any waters of the State. This REF includes safeguard and mitigation measures to minimise the risk of the Activity resulting in pollution of waters.
National Parks and Wildlife Act 1974	Sections 87(1), 90	The provisions of the Act are unlikely to be triggered by the Activity. Works would cease if any potential artefact or place of significance is encountered during the Activity; and RVC and the Casino Local Aboriginal Land Council (LALC) would be notified immediately.
Biodiversity Conservation Act 2016	Schedules 1, 2 and 3	Threatened species and communities have been assessed in accordance with the BC Act. No significant impact is expected. Refer to **Section 6.1**.
Crown Land Management Act 2016		Part of the site (Shannon Brook) is Crown Land. Council has issued a Section 175 Notice to take possession of land for road works to all affected landholders. Therefore, while the land is being used or occupied under this notice, the land is taken to be a public road for the purposes of the Roads Act 1993.
Water Management Act 2000	Section 91 (2) & 91 (E). Section 41 of the Water Management (General) Regulation 2018.	Works within water lands or those comprising of extraction or management of water may be subject to approval if they constitute a 'controlled activity'. However, public authorities are exempt from a controlled activity approval. As the Activity is being carried out on behalf of a public authority (RVC) a controlled activity approval is not required.
Biosecurity Act 2015		The Department of Primary Industries (DPI) biosecurity risk weed declarations for the North Coast, including the Richmond Valley LGA, lists numerous weed species. Two declared weed species listed in the *Biosecurity Act 2015* occur within the work footprint of the Activity being Lantana (*Lantana camara*) and Fireweed (*Senecio madagascariensis*). Lantana and Fireweed will be managed in accordance with the *General Biosecurity Duties* to prevent, eliminate or minimise any biosecurity risk they may pose as well as specific duties under the Act for these species in the region that includes 'Prohibition of dealings' and "Must not be imported into the State or sold".
Heritage Act 1977		Searches of the State Heritage Register, State Heritage Inventory and Schedule 5 of the RVLEP were undertaken.

Legislation	Section(s)	Comment
		The searches identified two items of local heritage significance in proximity to the Activity. The Killarney Homestead (Item 159) located at 50 Perkins Bridge Road, and the former Tatham Church (Item 160) located at 10 Tatham Ellangowan Road are listed in Schedule 5 of the RVLEP. The proposed site compound area is 60 m away from Item 160. The proposed new alignment of Casino Coraki Road is 250 m from Item 159. No adverse impacts to heritage are expected (refer to **Section 6.2**.)
Roads Act 1993	Section 138	Section 138 of the *Roads Act 1993* requires approval from the relevant road's authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road. Council is both the proponent and relevant roads authority in this instance.

4.5 Commonwealth Legislation (Environment Protection and Biodiversity Conservation Act 1999)

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), any action that has, or is likely to have, a significant impact on matters of national environmental significance or other aspects of the environment, such as on commonwealth land, may progress only with approval of the Commonwealth Minister for the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under Part 9 of the EPBC Act. There are no matters of national environmental significance or Commonwealth land that would be significantly affected by the proposed Activity and therefore no Commonwealth referral or approval is necessary for the Activity (refer to **Section 8.2**).

4.6 Native Title (Native Title Act 1993)

A search of the New South Wales Native Title Vision website (15/08/2024) found no positive determinations of Native Title at the site. The nearest native title areas are at the Bungawalbin State Forest to the south (Bandjalang People #2) and at South Gundurinba to the north-east (Widjabul Wia-Bal).

4.7 Confirmation of Statutory Position

An assessment of the relevant statutory provisions and planning instruments has concluded that the proposed Activity can be carried out as development without consent under the State Environmental Planning Policy (Transport and Infrastructure) 2021 and can be assessed and determined under Part 5, Division 5.1 of the EP&A Act.

A comprehensive environmental assessment of all matters affecting or likely to affect the environment by reason of that Activity has been undertaken pursuant to Section 5.5 of the EP&A Act (refer to **Section 6**), including the factors outlined in the Division 5.1 Guidelines approved under Section 170 and as required by Section 171(1) of the EP&A Regulation 2021 (refer **Section 8.1**).

The Activity described will not affect areas of outstanding biodiversity value or Wilderness Areas. This REF has determined that the Activity is unlikely to significantly affect threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994,* and therefore, a Species Impact Statement (or Biodiversity Development Assessment Report (BDAR) if the Proponent elected) is not required.

The Activity is also unlikely to affect Commonwealth land or have a significant impact on any matters of national environmental significance in relation to the EPBC Act and therefore does not require referral to or approval of the Australian Government.

Given the impacts of the Activity are not likely to be significant, an Environmental Impact Statement (EIS) is not required under Section 5.7 of the EP&A Act, nor is approval required from the Minister for Planning under Division 5.2 of the EP&A Act.

The Activity is not State Significant Development or State Significant Infrastructure as declared in State Environmental Planning Policy (Planning Systems) 2021.

5. Consultation

5.1 Community Consultation

Richmond Valley Council have undertaken extensive consultation and negotiation with the owners of all properties that require some acquisition to carry out the works.

Further notice of the proposed works and road changes would be given to adjoining/ affected properties and road users, including emergency services and school bus operators (including but not limited to Northern Rivers Bus lines) prior to works commencing. Roadworks and changed access conditions would be detailed on Council's website, via road signage and on social media.

5.2 State Environmental Planning Policy (Transport and Infrastructure) 2021 – Consultation

The Transport and Infrastructure SEPP aims to facilitate the effective delivery of infrastructure across the State. Part 2 of the Transport and Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Pursuant to Section 2.17 (1)(c) (exceptions) of the Transport and Infrastructure SEPP, Sections 2.10–2.12 and 2.14 do not apply with respect to the Activity to the extent that (as relevant), they would require notice to be given to a council or public authority that is carrying out the development or on whose behalf it is being carried out. Given the Activity is being carried out by or on behalf of RVC, and Council is the determining authority, these Sections do not apply.

Section 2.13 contains provisions requiring consultation with the State Emergency Service (SES) for development with impacts on flood liable land, including development without consent under Division 17 (Roads and Traffic). As the land is mapped as flood liable land under the RVLEP, a notice of the proposed Activity was provided to the SES on 14 August 2024. The SES responded on 29 August 2024. The advice provided and how the matter has been addressed is provided in **Table 5.1** below. A copy of the correspondence from SES is provided as **Appendix L**.

Table 5.1 SES Consultation Response

SES Comment	Response
Consider the impact of flooding on the infrastructure and people using the road up to and including the Probable Maximum Flood (PMF), along with the impact of climate change on the flood risks.	BMT have conducted a Flood Impact Assessment to determine the impact of the bridge replacement on flood levels. It was determined that the bridge replacement will increase flood levels by up to 3 mm.
Pursue, if relevant, site design and stormwater management that reduces the impact of flooding and minimises any risk to the community. Any improvements that can be made to reduce flood risk will benefit the community.	For both the 5% and 1% AEP events the proposed bridges and approach embankments are overtopped, and the resulting flood impacts are shown to be minimal (a maximum impact of 3 mm at nearby buildings for the two events assessed).
Ensure workers and people using the road during and after the upgrades are aware of the flood risk, for example through site inductions and by using signage.	A mitigation measure has been included in this REF to comply with SES advice (refer to **Section 6.6**). This will form part of the Construction Environmental Management Plan (CEMP).

SES Comment	Response
Consider removing any plant and materials to a location above the PMF level on receipt of a Flood Warning, where safe to do so, to reduce the risk of them being washed into waterways.	As above
Consider closing the worksite and securing all materials and equipment prior to the start of the working day if there is a risk of riverine flooding, on receipt of advice from the Bureau of Meteorology (BoM), or when other evidence leads to an expectation of flooding. During site works, check the BoM website prior to start of the workday for any Flood Warnings or Severe Weather Warnings likely to lead to flooding.	As above
In addition, if the construction phase of the upgrades causes disruption to the operation of local roads, this may impact the ability for emergency vehicles to use these routes. The NSW SES requests that notification be provided where there are likely to be significant delays in the operation of the roads affected by the upgrades.	Notification of the temporary road closure would be provided.

No consultation with other public authorities is triggered under Section 2.15 of the Transport and Infrastructure SEPP. Section 2.16 (Consideration of Planning for Bush Fire Protection) of the Transport and Infrastructure SEPP is not applicable to the Activity.

6. Environmental Assessment

6.1 Biodiversity

For the biodiversity assessment, the site refers to the 'Extent of works', while the survey area refers to the whole area the ecological field inspection was undertaken within (refer to **Illustration 6.1**).

The Activity will require removal of 3.18 ha of vegetation in the form of the following:

- 0.01 ha of PCT 3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest (this PCT is indicative of the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*).
- 0.38 ha of PCT Far North River Oak Wet Forest.
- 2.79 h of roadside vegetation

The Activity will also require removal of three regrowth Forest Red Gum, which are Koala feed trees; and potentially impact threatened microbat habitat on the existing bridge structures that are proposed to be removed as part of the Activity works. It is noted that no koala's or microbats were observed in the Activity area at the time of the site assessment.

6.1.1 Existing Environment

6.1.1.1 Desktop Review

BioNet Atlas Search

A search of the BioNet Atlas database was undertaken on 19 August 2024 to identify threatened species recorded within a 10 km x 10 km search area centred on the site. Results indicate four flora species, 15 threatened fauna species, and 16 threatened ecological communities (TECs) have been recorded within the search area (refer to **Appendix B**). Relevant species are included in the potential occurrence assessments in **Appendix C**.

EPBC Protected Matters Report

The Protected Matters Search Tool (PMST) was accessed on 26 March 2024. The PMST search identified 25 threatened flora species, 37 threatened fauna species and six threatened ecological communities listed under the EPBC Act which may occur within 10 km of the site (refer to **Appendix B**). Relevant species are included in the potential occurrence assessments in **Appendix C**.

Areas of Outstanding Biodiversity Value

A search of the BC Act indicates that no Areas of Outstanding Biodiversity Value occur within or in close proximity to the site.

Wildlife Corridors

The site does not occur within any regional or subregional wildlife corridors as per Scotts (2003).

Key Fish Habitat/ Fisheries NSW Spatial Data

The DPI Fisheries Spatial Data Portal indicates that both Shannon Brook and Spring Creek area mapped as Key Fish Habitat. Additionally, Shannon Brook is mapped as Southern Purple Spotted Gudgeon habitat.

6.1.1.2 Site Assessment

GeoLINK ecologists completed a site assessment in August 2024 for the Activity area.

Vegetation

Vegetation within the survey area consists of disturbed grassland within the road reserve and adjacent paddocks. Remnant native vegetation was recorded in proximity to Shannon Brook and Spring Creek.

Vegetation within the survey area is described in **Table 6.1** below and aligned with a Plant Community Type (PCT) in the BioNet Vegetation Classification system where applicable. Vegetation mapping can be found in **Illustration 6.1**. Refer to **Appendix D** for a full flora inventory recorded within the survey area.

Threatened Flora

No threatened flora species listed under the BC Act and/ or EPBC Act were recorded within the Activity area or are likely to occur. Therefore, threatened flora are not considered further as part of this assessment.

Table 6.1 Plant Communities at the Site

Plant Community Type	Comments	Photo
PCT 4070 Far North River Oak Wet Forest		
Vegetation Formation: Forested Wetlands Vegetation Class: Eastern Riverine Forest Canopy is dominated by River Oak (*Casuarina cunninghamiana*). Occasional Whalebone Tree (*Streblus brunonianus*), Silky Oak (*Grevillea robusta*), Red Kamala (*Mallotus philippensis*), Camphor Laurel (*Cinnamomum camphora**), Forest Red Gum (*Eucalyptus tereticornis*), Blue Quandong (*Elaeocarpus grandis*) and Water Gum (*Tristaniopsis laurina)* also occur. Midstorey comprises Creek Sandpaper Fig (*Ficus coronata*), Cheese Tree (*Glochidion ferdinandi*), Guava (*Psidium guajava**), Rough-leaved Elm (*Aphananthe philippinensis*), Lantana (*Lantana camara**), Coast Morning Glory (*Ipomoea cairica**), Small-leaved Privert (*Ligustrum sinense**) and Shrub Cherry (*Syzygium australe*). Ground cover comprises Common Reed (*Phragmites australis*), Giant Sedge (*Cyperus exaltatus*), Broad-leaved Paspalum (*Paspalum mandiocanum**), Molasses Grass (*Melinis minutiflora**), Trad (*Tradescantia fluminensis**), Spotted Knotweed (*Persicaria strigosa*), Basket Grass (*Oplismenus aemulus*), Slender Knotweed (*Persicaria decipiens*), Water Pepper (*Persicaria hydropiper*), Curled Dock (*Rumex crispus**), Scrambling Lily (*Geitonoplesium cymosum*) and Pin Rush (*Juncus usitatus*).	Moderate condition. Features disturbance from clearing, erosion, grazing and weed incursions throughout.	 **Plate 6.1 View west of PCT 4070 within the survey area**

Plant Community Type	Comments	Photo
PCT 3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest		
Vegetation Formation: Dry Sclerophyll Forests (shrub/ grass sub-formation) Vegetation Class: Clarence Dry Sclerophyll Forests Canopy is dominated by Forest Red Gum (*E. tereticornis*) with occasional Swamp Turpentine (*Lophostemon suaveolens*), Swamp Oak (*Casuarina glauca*) and Red Ash (*Alphitonia excelsa*). Midstorey comprises Curracabah (*Acacia concurrens*), Cheese Tree (*G. ferdinandi*), Monkey Rope (*Parsonsia straminea*), Guava (*P. guajava*)* and Lantana (*L. camara**). Ground cover companies Bahia Grass (*Paspalum notatum*),* Kikuyu (*Cenchrus clandestinus**), Common Couch (*Cynodon dactylon*), Blady Grass (*Imperata cylindrica*), Spiny-headed Mat-rush (*Lomandra longifolia*) and Basket Grass (*O. aemulus*).	Moderate condition. Features disturbance from clearing, erosion, grazing and weed incursions throughout.	 **Plate 6.2 View west of PCT 3428 within the survey area**
Miscellaneous Ecosystem (does not align with a PCT)		
Disturbed Grassland (no PCT) Highly disturbed areas including the road reserves and adjacent paddocks. Comprises Bahia Grass (*P. notatum**), South African Pigeon Grass (*Setaria sphacelata**), Common Couch (*C. dactylon*), Kikuyu (*C. clandestinus**), Rhodes Grass (*Chloris gayana**), White Clover (*Trifolium repens**), Common Vetch (*Vicia sativa subsp. sativa**), Fireweed (*Senecio madagascariensis**), Blue Billygoat Weed (*Ageratum houstonianum**), Slender Celery (*Cyclospermum leptophyllum**), Pennywort (*Centella asiatica*), Stinking Roger (*Tagetes minuta**) and Purpletop (*Verbena bonariensis**) Ballon Cotton Bush (*Gomphocarpus physocarpus**), and Johnson Grass (*Sorghum halepense**).	Disturbed vegetation subject to frequent grazing and slashing.	 **Plate 6.3 View north of Disturbed Grassland within the survey area**
* Denotes exotic species		

6.1.1.3 Threatened Ecological Communities

Biodiversity Conservation Act 2016

PCT 3428 is associated with the characteristics for the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*, as listed under the NSW scientific committee – minor amendment Determination (refer to **Table 6.2** and **Illustration 6.1**).

Tests of significance ('five-part tests') under Section 7.3 of the BC Act have been completed for this TEC and are provided in **Appendix E**.

Table 6.2 Correlation of PCT 3323 Against Scientific Determination Criteria for Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion

Final Determination Listing Criteria	PCT 3428
Location: *occurs within the NSW North Coast bioregion.*	**Yes** – the patch occurs within the Richmond Valley LGA within the NSW north coast bioregion.
Altitude: *generally, occurs below 50 m but may occur on localised river flats up to 250 m elevation.*	**Yes** – patch occurs at approximately 11 m ASL.
Topography and geology: *associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.*	**Yes** – patch occurs on clay loams, on waterlogged or periodically inundated alluvial plains with the coastal floodplain.
Structure: *may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. It has a tall open tree layer of eucalypts, angophoras, melaleucas and bloodwoods.*	**Yes** – patch occurs as open forest with Forest Red Gum (*Eucalyptus tereticornis*) dominant canopy.
Floristic canopy composition: *typically dominated with a canopy of Eucalyptus tereticornis (Forest Red Gum), E. siderophloia (Grey Ironbark), Corymbia intermedia (Pink Bloodwood) and, north of the Macleay floodplain, Lophostemon suaveolens (Swamp Turpentine).* *It characterised by a mixed eucalypt canopy, often with Lophostemon suaveolens; the presence of rainforest elements as scattered trees or understorey plants; the relatively low abundance or sub-dominance of Casuarina and Melaleuca species; the relatively low abundance of Eucalyptus robusta; and the prominent groundcover of soft-leaved forbs and grasses. Species assemblage is outlined in paragraph 1 of the scientific determination.*	**Yes** – are floristically analogous with species outlined in paragraph 1 of the scientific determination. The patch has a dominance of *Eucalyptus tereticornis* in addition to *Lophostemon suaveolens, Acacia concurrens, Alphitonia excelsa, Casuarina glauca, Glochidion ferdinandii, Lomandra longifolia, Parsonsia straminea* and *Oplismenus aemulus.*
Meet TEC determination	**Yes, meets scientific determination**

Environment Protection and Biodiversity Conservation Act 1999

Characteristics of the upper strata species within PCT 3428 align with those of the EPBC Act listed TEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions***,** which occurs within the survey area. However, due to the patch size of PCT 3428 it does not fit all the key diagnostics of the is TEC (refer to **Table 6.3**).

An assessment of significance has been completed for this TEC in accordance with the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment 2013). This assessment is provided in **Appendix E**.

Table 6.3 Subtropical Eucalypt Floodplain Forest and Woodland of the New South Wales North Coast and South East Queensland Bioregions Key Diagnostic Characteristics

Key Diagnostic Characteristics	PCT 3428
Location: *occurs within the NSW North Coast, South Eastern Queensland bioregions*.	**Yes** – the patch/s occur within SE QLD bioregion.
Topography and geology: *occurs on alluvial soils of various textures including silts, clay loams, sandy loams, gravel and cobbles.*	**Yes** – patch/s occur on clay loams, on waterlogged or periodically inundated alluvial plains with the coastal floodplain.
Altitude: *occurs at elevations up to 250 m above sea-level (ASL), most typically below 50 m ASL.*	**Yes** – patch/s occur at approximately 11 m ASL.
Structure: It occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland. The canopy has a crown cover of at least 20%	**Yes** – patch/s occur as an open forest of Forest Red Gum.
Floristic composition: *It has a canopy dominated by one or a combination of Angophora, Corymbia, Eucalyptus, Lophostemon and/or Syncarpia tree species, but NOT dominated by Eucalyptus robusta (Swamp Mahogany). Other canopy tree species may be present, and in some areas rainforest trees may be prominent.*	**Yes** – Floristic composition is modified from past clearing; however, it is dominated by Forest Red Gum. Additionally, midstorey is disturbed and groundcover is dominated by exotic species. However, if left to regenerate it would form a dominant canopy of *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and/ or *Syncarpia* tree species.
Patch size: *A patch is a discrete and mostly continuous area of the ecological community, as defined by the key diagnostic characteristics, but it can include small-scale variations, gaps and disturbances. The smallest patch size that can be identified is 0.5 ha, because the key diagnostic characteristics cannot reliably be identified for smaller areas.*	**No** - The patch sizes of PCT 3428 within the survey area are <0.5 ha. Additionally, there are breaks greater than 30 m or artificial barriers (such as roads) separating additionally mapped areas of PCT 3428 outside of the survey area and locality.
Meet EPBC Act diagnostics	**No, does not meet key diagnostic characteristics.**

6.1.1.4 Priority Weeds

Lantana and Fireweed are *Biosecurity Act 2015* listed species that occur within the Activity area. In addition to *General Biosecurity Duties* to prevent, eliminate or minimise any biosecurity risk they may pose; specific duties under the Act for these species in the region are: 'Prohibition on certain dealings' and "*Must not be imported into the state, sold, bartered, exchanged or offered for sale"*

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6.1.1.5 Waterways

Both Shannon Brook and Spring Creek are 3rd order streams, that flow into the upper catchments of the Richmond River which is located approximately 300 m to the north-east (refer to **Plate 6.4** and **Plate 6.5**). Note. At the time of the site inspection Spring Creek had very low water levels present within the survey area. Both waterways showed disturbance from livestock, sedimentation, erosion and rubbish.

These waterways may provide habitat for locally occurring freshwater fish, invertebrates, birds, and amphibians.

Plate 6.4 View north-west of Shannon Brook

Plate 6.5 View north-west of Spring Creek

6.1.1.6 Threatened Fauna

No threatened fauna species listed under the BC Act and/ or EPBC Act were recorded within the survey area during the site inspection. A range of common fauna species were observed during the site inspection (**Appendix D**).

A SAT survey undertaken during the site inspection detected no Koala scats.

Two stick nests were observed in a Forest Red Gum at the southern section of the survey area (refer to **Illustration 6.1**). Due to the shape and size of these nests, they are likely used by either Australian Magpie or Torresan Crow.

Deep Creek and Spring Gully bridges, located over Shannon Brook and Spring Creek, were inspected for the presence of microbats and suitability of microbat habitat. Inspection was undertaken using a handheld torch and systematically inspecting any gaps or crevices present in each bridge. No microbats were observed in either bridge or evidence of use (guano or staining). Some potential habitat exists in the form of crevices in concrete sections and some gaps adjacent wood girders (refer to **Plate 6.6** and **Plate 6.7**). Additionally, several Welcome Swallow nests were observed under both bridges during the inspections.

Plate 6.6 View of crevice in concrete underneath Spring Creek bridge

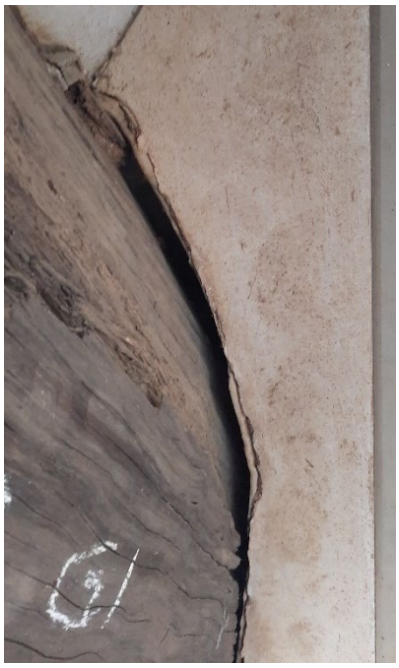


Plate 6.7 View of a gap next to a wooden girder underneath Spring Creek bridge

6.1.1.7 Tests of Significance

Based on the desktop analysis and habitat present, five-part tests of significance were prepared in accordance with Section 7.3 of the BC Act for those species assessed as having a moderate likelihood of occurrence within the survey area (refer to **Table 6.4**, **Appendix C** and **Appendix E**).

For threatened species listed under the EPBC Act, significance assessments have been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of Environment, 2013) (refer to **Appendix E**).

Several other threatened fauna species may use parts of the site for foraging, or on an opportunistic or seasonal basis. However, these species would complete much of their life cycle off-site and be sufficiently mobile to avoid any short-term construction impacts.

Table 6.4 Threatened Fauna Assessed as Moderate Likelihood of Occurrence

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Birds				
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	**Moderate –** No BioNet records within the locality. However potential foraging habitat occurs within the site and the locality.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	**Moderate –** Potential foraging habitat across the survey area. BioNet records in the locality.
Glossopsitta pusilla	Little Lorikeet	V	-	
Grus rubicunda	Brolga	V	-	
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-	
Microbats				
Myotis macropus	Southern Myotis	V	-	**Moderate –** Potential foraging habitat and roosting habitat across the survey area. BioNet records in the locality.
Mammals				
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	**Moderate –** Potential foraging habitat across the survey area. BioNet records in the locality.
Phascolarctos cinereus	Koala	E	E	

V = Vulnerable; E = Endangered

6.1.2 Potential Impacts

The potential direct impacts from the Activity include:

- The direct removal of 3.18 ha of vegetation in the form of the following:
  - 0.01 ha of PCT 3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest (this PCT is indicative of the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*).
  - 0.38 ha of PCT Far North River Oak Wet Forest.
  - 2.79 h of roadside vegetation
- The direct removal of three regrowth Forest Red Gum, which are Koala feed trees.
- The complete removal of the existing Deep Creek and Spring Creek bridge structures directly impacts potential threatened microbat habitat.
- Topsoil stripping and earthworks within the channel will impact both Shannon Brook and Spring Creek as part of the new bridges and abutment construction.

Indirect impacts may include:

- Minor temporary impacts on water quality within the waterway by way of potential sediment runoff.
- Direct mortality or injury to fauna during vegetation clearing or bridge removal.
- Habitat degradation of adjacent habitat due to potential clearing phase impacts (e.g. erosion and sedimentation impacts or chemical spills).
- Unintentional damage to adjacent habitat during clearing.

6.1.3 Mitigation Measures

The following mitigation measures would be implemented to minimise potential adverse impacts relating to biodiversity:

1. Consideration should be given to providing replacement microbat habitat within the new bridges Should microbat habitat be installed the final design would be agreed on between RVC and an ecologist prior to construction.
2. To maintain fish passage, permanent and temporary crossing design and construction will be undertaken in accordance with the NSW DPI Fisheries requirements.
3. Any required dewatering would be undertaken in accordance with NSW DPI Fisheries requirements and in accordance with an approved dewatering strategy.
4. Removal of native vegetation will be kept to the minimum required to complete the Activity.
5. Prior to works commencing, mark the limit of work and clearing limits at the site, as per the site boundary/ extent of works in **Illustration 6.1**.
6. A pre-clearing survey will be undertaken daily by a suitably experienced ecologist or RVC environmental representative for fauna (including Koala) or habitat features including Ringtail Possum dreys or active bird nests prior to vegetation removal.
7. If a Koala is located within any tree to be removed (or within 50 m of an area to be cleared/ disturbed), then works would be delayed in that area until the Koala disperses of its own volition. An exclusion area would be established around the subject tree based on advice from a suitably qualified ecologist.
8. An ecologist or RVC environmental representative will undertake a survey of the bridge 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 (where possible) within any unoccupied cavities to prevent later construction disruptions.

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

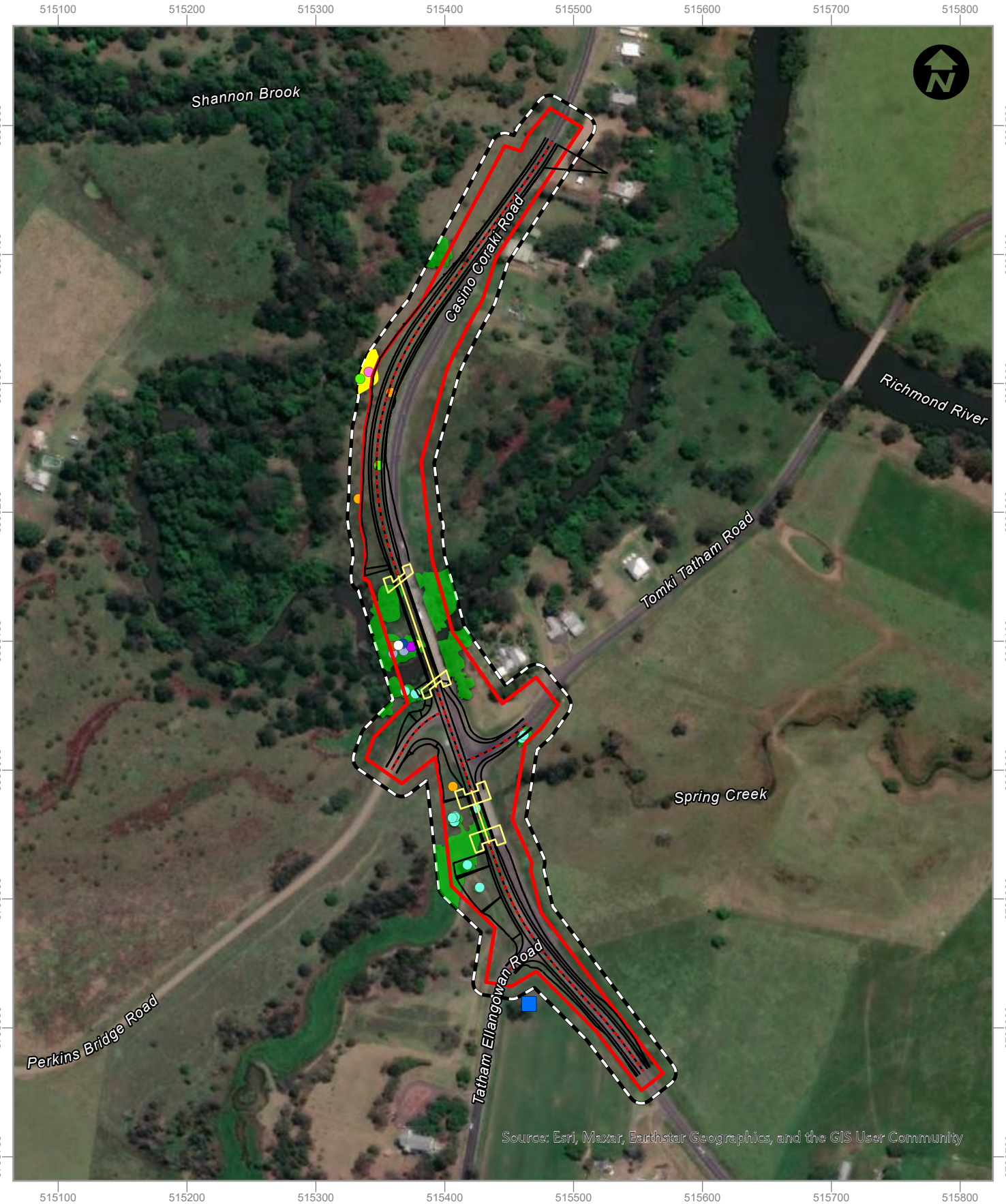
        - Determine the species, number of bats and breeding status.
        - Determine in consultation with RVC construction personnel, the appropriate management pathway.

    - 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 timber bridge for microbats:

        - On each day below deck bridge works are undertaken (e.g. 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 split corbels or other cavities.

9. In the event that threatened fauna (e.g. frogs/ tadpoles, microbats, Koala) are observed on site, stop works and notify the RVC environmental representative who will contact an experienced ecologist for further advice.
10. Injured fauna will be taken to the nearest vet or wildlife care organisation. The contact details of Wauchope Veterinary Clinic (02 6585 1626), FAWNA (02 6581 4141) and WIRES (1300 094 737) will be known to the site supervisor and ecologist.
11. Any uninjured captured fauna would be released by the ecologist within 50 m of the subject works area where the animal was captured, as far away as possible from threats such as clearing and road traffic. Timing of releases would coincide with dusk for nocturnal species.
12. For bridge abutment works sediment booms may be placed parallel to the banks to encompass the abutments to retain sediments while allowing water flow through the centre of the creek channel.

13. Works would be undertaken in accordance with conditions outlined within an approved DPI Fisheries Permit (the DPI Fisheries Permit application will be prepared and submitted by RVC prior to the work proceeding).
14. To minimise pollution and spread of pathogens and weeds; tools, machinery and plant to cleaned, degreased and inspected for oil/ fuel leaks before commencing work on site. Soil, vegetation and/ or foreign material from other sites to be removed from plant before plant is delivered to site.
15. Declared weeds (Lantana and Fireweed) will be managed according to requirements under the Biosecurity Act 2015. In addition to General Biosecurity Duties to prevent, eliminate or minimise any biosecurity risk they may pose, specific duties for these species are: ‘‘Prohibition on certain dealings’ and “Must not be imported into the state, sold, bartered, exchanged or offered for sale”.
16. All vegetation removal must be undertaken by an approved vegetation clearing contractor or competent persons within a RVC work crew. Vegetation removed from the site will be mulched and either reused on site for erosion and sediment control or beneficially reused in accordance with waste resource recovery orders and exemptions (as priority) or taken off-site to an appropriately licenced waste facility.
17. Parking of vehicles and storage of plant/ equipment is to occur on existing hardstand areas. Where this is not possible, vehicles and plant/ equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.
18. There is to be no disturbance beyond the marked limits without prior approval from the RVC environmental representative.



LEGEND

- Extent of works
- Alignment
- Bridge design
- Road design
- Survey area
- PCT 3428 - Northern Lowland Red Gum-Swamp Turpentine Grassy Forest **BC ACT TEC** Subtropical Coastal Floodplain
- PCT 4070 - Far North River Oak Wet Forest
- Nest Tree

Trees to be Removed/ Disturbed

- Camphor Laurel
- Cheese Tree
- Curracabah
- Forest Red Gum
- Hard Quandong
- Red Kamala
- River Oak
- Swamp Oak
- Water Gum
- Whalebone Tree

0 80 Metres

Vegetation and Biodiversity Constraints - Illustration 6.1

GeoLINK environment | engineering | planning | design

Deep Creek and Spring Gully Bridge Replacements, Casino Coraki Road, Tatham
5060-1005

Information shown is for illustrative purposes only
Drawn by: QAG Checked by: AB Reviewed by: SS
Source of base data: ESRI World Imagery
Date: 3/09/2024

6.2 Non-Aboriginal Heritage

A Heritage Assessment has been prepared for the proposed Activity by Heritage Management and Planning Pty Ltd (refer to **Appendix F**).

Searches of the Australian Heritage database, Heritage NSW State Heritage Inventory database and Schedule 5 of RVLEP were undertaken. The searches found that there are two locally listed heritage places near the Activity area (refer to **Figure 6.1**). These items are the Killarney Homestead (Item 159) at 50 Perkins Bridge Road, Tatham (Lot 2 Section 2 DP1494) and the former Tatham Church (Item 160) at 10 Tatham Ellangowan Road, Tatham (Lot 202 DP815264). Both of these heritage places are listed in Schedule 5 of the LEP. Both of these heritage places are set back from the road.

The location of the replacement bridges is within the previously disturbed footprint of the existing bridges and road corridor and would not impact on the nearby listed heritage places.

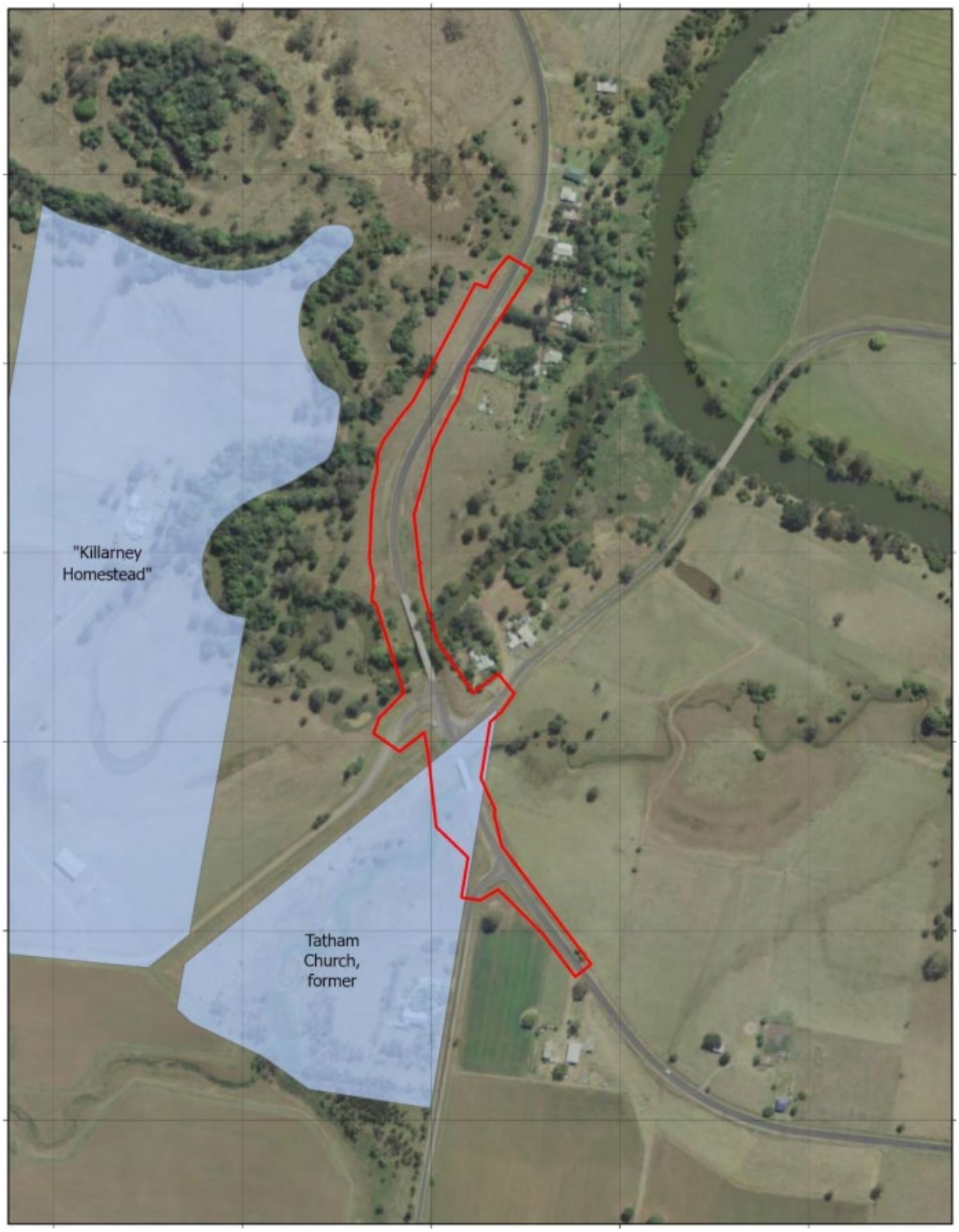
The Activity would not impact any known non-Aboriginal heritage sites or items. The main potential non-Aboriginal heritage impact is associated with unexpected finds. The risk of unexpected non-Aboriginal heritage items occurring on site is low due to the disturbed nature of the site.

The following statements summarise the outcomes of the desktop assessment relating to historic (non-Aboriginal) heritage:

- The Subject Site comprises the eastern portion of the 'Tatham Church, Former' local heritage site- the curtilage includes a portion of the road reserve which includes Spring Creek bridge which would be assessed as being of low/ intrusive heritage significance.
- The church building and gardens are located back from the road reserve and are partially obscured by ornamental tree rows- the replacement of the bridge will not have a significant impact on the agricultural landscape/ setting of the church.
- The physical remains of the two original (pre 1990's) bridges are located to the east of the Subject Site, the current alignment portion of the Coraki Casino Road post-dates the 1990s and the existing bridges have no heritage significance.

6.2.1 Mitigation Measures

19. Should non-Aboriginal heritage items be uncovered during works, all works in the vicinity of the find will cease and RVC and NSW Heritage will be contacted. Works will not re-commence until appropriate clearance has been received.
20. If any items defined as relics under the NSW Heritage Act 1977 are uncovered during the works, all works will cease in the vicinity of the find and RVC Project Manager will be contacted immediately. Works will not re-commence until appropriate clearance has been received.



*source: extract from Heritage Assessment Report in Appendix F.

Figure 6.1 RVLEP Mapped Heritage Areas

6.3 Aboriginal Heritage

An Aboriginal Cultural Heritage Assessment has been prepared for the proposed Activity by Heritage Management and Planning Pty Ltd (refer to **Appendix F**).

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 will likely be located within and around the Survey Area. A search of AHIMS was undertaken on 11 September 2024 (#929446) for the Subject Site which returned no previously recorded Aboriginal sites or places in the proposed Activity site.

The Due Diligence Code of Practice (Step 2b) identifies some landforms as having an increased potential to contain Aboriginal objects. The Subject Site is located on the broader Richmond River floodplain, as such additional investigation is required to comply with the Due Diligence Code of Practice.

The impact of previous ground disturbance is an important consideration in the Due Diligence assessment, particularly where ground disturbance removes Aboriginal objects from the soil profile or disturbs the objects to a degree that the interpretation of the archaeological survey results is significantly compromised. The impacts of previous ground disturbance is an important consideration in the Due Diligence assessment (Step 2C), particularly where ground disturbance removes Aboriginal objects from the soil profile or disturbs the objects to a degree that the interpretation of the archaeological survey results is significantly compromised. Based on the Crown Plans and historic aerial photos it is possible to proceed with the assessment on the basis that the current road and bridges have been constructed within the past 30 years. This construction will have resulted in soil/ ground disturbance which is clear and observable- including cut and fill earthworks by civil machinery.

The results of the desktop assessment are within the range of ‘normal’ for archaeological investigations on the NSW north coast where the ability to identify sites closely correlates with landforms, the amount of grass cover and the extent of historic disturbance to topsoils from forestry and farming. The nature of the Subject Site, being actively accreting/ eroding floodplain and the history of ground disturbance associated with post 1990’s road and bridge works means that there is not a ‘high probability’ that the Survey Area will contain stone artefact scatters.

In northern NSW, there are numerous sites which are considered to have ‘conservation value’. Stone artefact scatters are relatively common in this area and would not be considered to be of high conservation value. As such, the Activity site does not meet the criteria or threshold for archaeological excavation on the grounds of conservation value.

In the unlikely event that a isolated artefact or a low density stone artefact scatter is identified during the civil works the alignment of the crossing within the road reserve will provide sufficient space for the management of topsoils with archaeological values.

The following statements summarise the outcomes of the desktop assessment relating to Aboriginal heritage:

- The Subject Site is located across two tributaries of the Richmond River- the most likely location for Aboriginal archaeological sites are on elevated ridges and crests terminating near the floodplain but above approximately 10 metres above sea level.
- Aboriginal archaeological sites associated with floodplain environments are typically restricted to isolated stone artefacts and low-density stone artefact scatters- these types of sites are not easily identified using standard archaeological excavation methods.
- As the broad landscape has been cleared for forestry and agriculture there is no potential for scarred/ modified trees- it is not likely that Aboriginal objects associated with ceremonial/ spiritual or

burial 22 places will be located within the Subject Site as this area has been subject to significant ground disturbance since the 1990's.

- The bridge replacement works will be consistent with the historic ground disturbance- the cut and fill earthworks post 1990 and are 'clear and observable' within a floodplain environment.
- Floodplain environments have been exposed to significant accretion and erosion of soils which have the effect of reducing the spatial integrity of Aboriginal archaeological sites- the impact of geomorphological process on archaeological sites has increased significantly with heavy flooding.

6.3.1 Mitigation Measures

21. An unexpected finds procedure is to be developed as part of the Construction Management Plan package for the proposed Activity works prior to the commencement of construction.
22. All personnel working on site will be inducted and receive information on the required process, should a potential heritage item be found.
23. If Aboriginal cultural material is identified on site, a Stop Work Procedure will be followed, which includes:

    - Works will cease immediately.
    - A temporary exclusion zone established.
    - Incident reporting completed.
    - Council's project manager and the Local Aboriginal Land Council contacted immediately.
    - Heritage NSW contacted immediately.
    - An appropriately qualified archaeological consultant and a representative of the Bandjalang People #2 / NTS Corp are to be 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.
    - 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.

24. Aboriginal human remains – should skeletal material be exposed during ground disturbance:

    a. work will cease immediately.
    b. The nearest Police Local Area Command (Woolgoolga), Bandjalang People #2 / NTS Corp and the Heritage NSW (Parramatta) are all to be notified as soon as possible.
    c. The site should be cordoned off and the remains themselves should be left untouched.
    d. 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.
    e. Work may only resume after agreement is reached between all parties, provided it is in accordance with all parties' statutory obligations.

25. Notifying Heritage NSW – it is a legislative requirement that cultural heritage materials uncovered as a result of the Activity are registered as Aboriginal sites on the AHIMS database within the required timeframe.

6.4 Visual

6.4.1 Existing Environment

The existing environment within the immediate vicinity of the Activity is cleared rural grazing land, typical of the locality. There are views of some rural homesteads and there is some remnant vegetation along Shannon Brook and Spring Creek. There are no views of the former Tatham Church or Killarney Homestead from the Activity area.

Currently, the quality of views of the rural landscape are reduced by the state of the road and bridges, including the traffic control devices that are currently in place to restrict the road to one way traffic.

The quality of the visual environment associated with the works area is moderate with value at a local scale.

6.4.2 Potential Impacts

There will be temporary local visual impacts during the works from construction activities. Upon completion of the works, the visual amenity of the Activity area will be slightly improved. The existing bridges are not highly visible and do not provide a significant amount of amenity value. The traffic control devices that currently detract from the visual amenity of the area will be removed.

Some of the vegetation within the site will be removed and areas that are disturbed from erosion will be rehabilitated. Upon removal of the existing bridges, these areas will be rehabilitated, with potential for improvements to the visual environment.

Overall, the visual quality of the environment will not significantly change, and the quality of the visual environment will remain moderate with value at a local scale.

6.4.3 Mitigation Measures

The following measures will be implemented to prevent and/ or minimise adverse impacts relating to visual amenity:

26. Upon completion of the works, any works areas will be restored to an acceptable visual state.
27. All sites will be maintained, kept free of rubbish and cleaned up at the end of each work day.

6.5 Soils and Geology

6.5.1 Geotechnical Assessment

Regional Geotechnical Solutions Pty Ltd (RGS) have undertaken a geotechnical assessment of the Shannon Brook site, to inform the design of the Activity (see **Appendix K**). At the time of assessment, the scope of work did not include replacement of the Spring Creek bridge.

Field work for the assessment was undertaken by a Geotechnical Engineer from RGS in November 2021, and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- Drilling of three boreholes (one at each abutment and one for the midspan of the Spring Creek Bridge). The boreholes were drilled using auger and wash bore drilling techniques, and advanced

with NMLC coring to recover rock core. Standard Penetration Tests (SPTs) were undertaken at regular intervals through the soil and upper weathered rock profiles; and

- Collection of soil samples for subsequent laboratory testing.

The assessment found that due to the presence of deep alluvial soils with the potential for scour in the upper profile, shallow foundations are not feasible for the support of the new bridges, and it is recommended that the bridges be supported on piles. Pile types suitable for the site include bored piles (socketed into the basalt rock, or driven piles (designed as friction piles) founded in the alluvium above the bedrock. The use of bored piles will require steel liners to support the walls through the sand layers. Driven piles may include steel H-Sections, large diameter steel tubes with concrete infill plugs, or precast concrete piles.

The excavation of open bored piles is not recommended due to the potential for groundwater inflows and collapse of the alluvial sand. Temporary or permanent casing that extends to socket within the residual clay or upper weathered rock profile is recommended.

Temporary or permanent granular working platforms must be constructed to support the piling rig. The platforms 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 design of the new bridges reflects the findings of the geotechnical assessment.

6.5.2 Acid Sulfate Soil

In accordance with RVLEP 2012, the site is not mapped as being within an area identified as containing Acid Sulfate Soils (ASS). Land situated 250 m to the west of the site is mapped as Class 5 Acid Sulfate Soils. An Acid Sulfate Soils Management Plan is not required for the Activity.

6.5.3 Land Contamination

A search of the NSW Environmental Protection Authority contaminated land database found no records of contaminated land in the locality of Tatham. The nearest identified contaminated site is located at 86 Johnston Street, Casino (see **Appendix H**).

A search of the Department of Primary Industry Dip Sites found that there are five former cattle dip sites within Tatham (refer to **Appendix H** and **Figure 6.2**). The nearest historical dip site is approximately 750 m to the north west (Cowans Cattle Dip) of the proposed Activity site. Given the area is prone to flood and the site of the dip would drain into Shannon Brook (i.e. it is located upstream of the Activity area), there is potential that contaminants may be present in the soils and water at the Activity site. Any materials excavated as part of the Activity works and not to be re-used on site as part of the Activity works should be assessed for contaminants prior to disposal off site.

The Activity would impact a previously modified area that has historically been disturbed for the construction of the existing bridges and road. There is no proposed change in land use, nor evidence to suggest that contamination is likely to be present. Standard construction measures and safeguards would be implemented to ensure that any unexpected potential exposure of contaminated material would be dealt with effectively and in accordance with EPA and/ or RVC policy and guidelines.

6.5.4 Soil and Erosion Control

The site is situated within a region of alluvial floodplain associated with the Richmond River, Shannon Brook and Spring Creek. The alluvial floodplain is very flat terrain and unlikely to result in substantial sedimentary runoff during inclement weather.

The 1:250,000 Tweed Heads Geological Map indicates that the site is underlain by quaternary alluvial soils consisting of river gravels, alluvium, sand and clay. Lismore Basalt is mapped as being within 2 km to the southwest of the site.

It is anticipated that the Activity to impact soils and water resources throughout construction of the Activity. There is a substantial amount of work proposed within the waterways, including construction of the two new bridges and demolition of the two existing bridges.

Safeguards are required to manage erosion and sedimentation risks associated with the construction phase of the works. An erosion and sediment control plan would be prepared for the Activity and implemented before the works commence.

Figure 6.2 Cattle Dip Search - Tatham Locality

6.5.5 Mitigation Measures

28. A site-specific erosion and sediment control plan will be developed by a suitably qualified professional, approved by Council, and implemented prior to commencement of the road construction works.
29. Erosion and sediment controls will be implemented in accordance with Managing Urban Stormwater, Soils and Construction (the Blue Book) (Landcom, 2004) and will be maintained to prevent sediment moving off-site and sediment laden water entering any water course during the construction process.
30. Works will only commence once all erosion and sediment controls have been established. The controls will be maintained in place until the works are complete, and all exposed erodible materials are stabilised.
31. Where possible, avoid works during forecast high rainfall events.
32. Disturbed areas will be progressively stabilised and or rehabilitated following construction.
33. Permanent rehabilitation will achieve a C-factor of less than 0.1 (i.e., greater than 60% ground cover) and set in motion a program that should ensure it will drop permanently to less than 0.05 (i.e., greater than 70% ground cover) within a further 60 days.
34. Regularly check and maintain erosion, sedimentation and stormwater control measures.
35. Any exposure or disturbance of potentially/ suspected contaminated soil or material would be managed in accordance with relevant EPA and Council policy and guidelines.
36. An excavated material management procedure should be developed by a suitably qualified professional and implemented during construction works to ensure all excavated material is suitably handled, stored and disposed during construction works. This procedure should include safety aspects for handling potentially contaminated materials.
37. All excavated material will be placed in a designated stockpile area that is suitably contained to ensure materials can be tested prior to re-use or off-site disposal.
38. Any testing of excavated material should be carried out in accordance with the NSW excavated natural material order and/ or the NSW Waste Classification guidelines. Due to the potential presence of contamination from historical dip sites, soils testing should also include assessment of potential contamination.
39. Only clean equipment and vehicles will be used, with equipment being cleaned down before being brought to the site.

6.6 Water

The Activity involves construction of two bridges over Shannon Brook and Spring Creek. Shannon Brook and Spring Creek are tributaries of the Richmond River, and respectively join the Richmond River 400 m and 800 m downstream from the bridges.

6.6.1 Hydrology

BMT has prepared a Flood Impact Assessment for the proposed Activity (see **Appendix G**). the Flood Impact Assessment was prepared on the basis that new widened and raised bridges would be constructed, followed by the removal of the existing bridges. The new bridges would be immediately upstream of the existing. The new bridges have greater span lengths and so require less piers within the waterway area. It should be noted that since the Flood Impact Assessment was completed, the design of the new bridges has continued to evolve and there are now more piers in the waterways than was assessed; however, the revised structures are more slender, resulting in a net decrease in the amount of structure within the waterway, during a flood event. As such, the findings of the Flood Impact Assessment remain relevant. The existing and proposed bridges are described in the tables below.

Table 6.5 Existing Bridge Details

Bridge Detail	*Shannon Brook Bridge*	*Spring Creek Bridge*
Bridge length (m)	96	36
Bridge deck elevation (mAHD)	8.20 to 8.75	8.36 to 8.69
No. of Piers	7	2

Table 6.6 Proposed Bridge Details

Bridge Detail	*Shannon Brook Bridge*	*Spring Creek Bridge*
Bridge length (m)	96	38
Bridge deck elevation (mAHD)	10	10
No. of Piers	3	1

The peak flood levels in the 5% AEP and 1% AEP events are approximately 11.5 mAHD and 12.0 mAHD; as such, the proposed bridge decks are overtopped in both events. As the bridge and approach embankments are significantly overtopped (by a depth of 2 m or more in the 1% AEP event) the bridges will have minimal impact on flood behaviour.

There are localised changes in peak velocity near the embankment between the two bridges. This is associated with the updated approach road connections to Perkins Bridge Road and Tomki Tatham Road. These impacts are mostly contained within the road corridor.

In the 5% AEP event there are small areas where the flood extent has increased. These areas are highly localised and the depth of flooding in these areas is very shallow (less than 10 mm).

The BMT report provides the increase in flood level for the 15 surrounding properties in Tatham, as a result of the Activity. As can be seen in Table 1.3 and Table 1.4 of the BMT report, the impacts at all properties are minor (no more than 3 mm increase in flood depth). The floor levels for all 15 properties are above the 5% AEP flood level. Only four properties have 1% AEP flood levels above the property floor level.

BMT conclude that the flood impact of the Activity is minimal (maximum of 3 mm increase in flood depth); however, impacts may be greater than those reported by BMT during construction, particularly when the new bridges are near completion and the old bridges have not yet been removed. Mitigation measures are provided to manage this potential impact.

6.6.2 Water Quality

The Activity may present risks to water quality in Shannon Brook and Spring Creek if not managed effectively. As discussed in **Section 6.1**, the NSW DPI Fisheries Spatial Data Portal indicates that Shannon Brook and Spring Creek are 3rd order streams and are mapped as Key Fish Habitat. Construction activities that could present a risk to sensitive environments in the broader landscape include:

- Erosion and sediment disturbance that could disperse from the site and impact local drainage lines and waterways.
- Turbidity and sedimentation of local aquatic habitats and waterways.
- Pollution of local water quality (both ground and surface water) from pollutants from machinery and construction materials and spills.

- A variety of dispersible liquid materials would be used which pose a potential pollutant threat to local water quality. These liquids include, but are not limited to, diesel, unleaded petrol, machinery oils and lubricants. The nature of these liquids and their ability to disperse away from the work site means that they could have a negative impact on ground or surface water on or adjacent to the site, especially during rain.
- Periods of high rainfall or flood could exacerbate potential water quality impacts if works are in progress during such an event.

Whilst the works could pose these risks, such risks can be suitably avoided, minimised and managed by implementing appropriate mitigation measures. With appropriate mitigation measures in place during construction, the Activity is considered unlikely to present significant risk to nearby water environments in the surrounding area. The Activity would not adversely affect the biophysical, hydrological or ecological integrity of the waterways in the surrounding area, nor would it significantly impact or alter the quantity and quality of surface and ground water flows to and from such. Post construction, the Activity would not negatively impact water quality, nor riparian or wetland environments.

6.6.3 Mitigation Measures

The following mitigation measures will be implemented to minimise the risk of adverse impacts relating to water quality:

40. A flood risk and response management plan, or emergency event contingency plan, should be developed as part of the CEMP for this Activity.
41. Construction of the Activity is timed to ensure that the new bridges and existing bridges are not in place during the peak time for flooding in the Northern Rivers (October to April) and that the duration of time when both the new bridges and existing bridges are in place is minimised.
42. The final design would ensure that there are no changes to hydrology that would result in negative impacts to the waterway (e.g. restriction of flow, scouring) and that flood level increase is limited to 3 mm, as per the BMT Flood Impact Assessment.
43. All machinery, equipment, vehicles, materials and chemicals must be stored outside of flood prone areas.
44. Stockpile and laydown areas, which could result in pollution to a watercourse, are to be located a minimum of 50 m away from the watercourse and within already cleared areas of the road corridor requiring no additional vegetation removal.
45. Where possible, avoid works during forecast high rainfall events and plan works to occur during periods of no or low flow.
46. Any de-watering of accumulated water on site will be required to be completed in accordance with an approved dewatering management plan.
47. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/ slicks) within construction site and adjacent area will be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls during construction.
48. Spill containment kits will be available at all times on site in all active work areas. All personnel will be made aware of the location of the kit and trained in its effective deployment.
49. Any required fuels and other liquids will be stored in self-safe chemical storage containers.
50. All refuelling of plant and equipment will be in appropriately designated areas away from drainage lines or watercourses (at least 50 m) and managed in order to prevent any potential spills leaving the refuelling area (e.g. use of bunded areas).
51. Cleaning or washing is not to occur near waterways or drainage lines.
52. A concrete washout area and facilities will be located away from waterways and drainage lines and wash down water is to be contained within a designated impervious bund. Excess concrete is to be removed from site.
53. All equipment will be maintained in good working order and operated according to manufacturer's specification.

54. No waste and/ or wastewater will be discharged directly or indirectly in drains or waterways.
55. The RVC and EPA will be notified immediately in response to incidents causing or threatening actual or potential harm to the environment in accordance with section 148 of the POEO Act (via EPA Environment Line on 131 555).
56. Workers and people using the site during and after construction of the bridge will be made aware of the flood risk at the site e.g. through signage.

6.7 Noise and Vibration

6.7.1 Existing Environment

The site is located within a rural locality and subject to existing noise associated with agricultural activities and traffic noise from Casino Coraki Road. There are several dwellings in close proximity to the Activity area. These are described in **Table 6.7** below and shown in **Figure 6.3**. The dwelling at Lot 1 DP 594704 is the closest to the proposed bridge works, which are anticipated to result in the most noise nuisance for the overall Activity works.

Table 6.7 Nearby Sensitive Receivers

Receptor Number	Address	Lot and DP	Distance to Road Works (approx.) (m)	Distance to Bridge Works (approx.) m	Distance to Compound / Stockpile Area (approx.) (m)
1	3225 Casino Coraki Road	Lot 3 DP 706888	80	270	50
2	10 Tatham Ellangowan Road	Lot 202 DP 815264	135	220	150
3	930 Tomki Tatham Road	Lot 1 DP 309182 Lot 1 DP 437983	45	85	250
4	3265 Casino Coraki Road	Lot 1 DP 594704	25	30	220
5	920 Tomki Tatham Road	Lot 1 DP706888	170	160	315
6	3290 Casino Coraki Road	Lot 14 Section 1 DP 1494	32	205	505
7	3300 Casino Coraki Road	Lot 18 Section 1 DP 1494 Lot 19 Section 1 DP 1494	10	250	550
8	3306 Casino Coraki Road	Lot 120 and 121 DP 136466	20	270	570
9	3310 Casino Coraki Road	Lot 32 Section 1 DP 1494	70	285	560
10	3320 Casino Coraki Road	Lot 26 Section 6 DP 1494	50	330	605
11	3330 Casino Coraki Road	Lot 1 Section 6 DP 1494 Lot 25 Section 6 DP 1494	50	390	670

Receptor Number	Address	Lot and DP	Distance to Road Works (approx.) (m)	Distance to Bridge Works (approx.) m	Distance to Compound / Stockpile Area (approx.) (m)
12	3338 Casino Coraki Road	Lot 2 and 3 DP 1494	85	430	715
13	3340 Casino Coraki Road	Lot 3 Section 6 DP1494, and Lot 1 DP 1071529	100	440	730
14	3350 Casino Coraki Road	Lot 1 DP 1071529	125	470	760
15	3360 Casino Coraki Road	Lot 9 and 10 Section 6 DP1494	225	570	855
16	3200 Casino Coraki Road	Lot 202 DP 815264	250	450	360
17	3160 Casino Coraki Road	Lot 28 DP755630	620	775	720
18	50 Perkins Bridge Road	Lot 1 DP 11604441	225	270	535

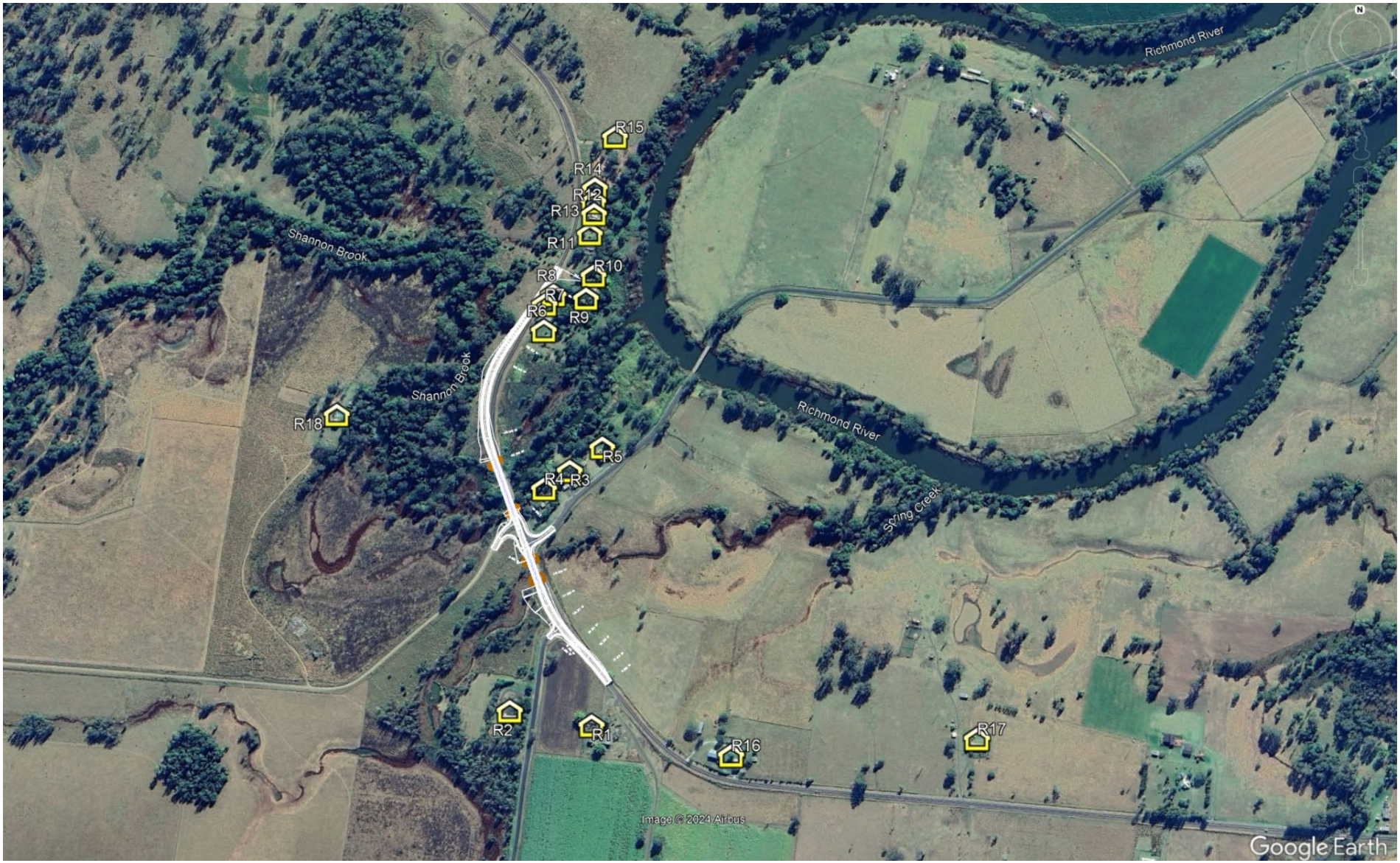


Figure 6.3 Nearby Receptors

6.7.2 Potential Impacts

Noise from the Activity would be typical of that associated with road construction work and would result from the use of plant and machinery, work vehicles, earthworks, and infrastructure installation.

Under the EPA's Interim Construction Noise Guidelines:

- The noise management level for works during the recommended standard hours is background + 10 dB(A). Above this noise level, the proponent needs to implement all feasible and reasonable work practices, as defined in the Guideline, to minimise noise impacts.
- For works outside the recommended standard hours, the noise management level is background + 5 dB(A).
- The highly noise-affected level of LAeq 75 dB(A) represents the point above which there may be strong community reaction to noise and indicates a need to consider other feasible and reasonable ways to reduce noise, such as restricting the times of very noisy works to provide respite to affected residences.

A distance-based assessment of noise has been undertaken using the Transport for NSW Construction and Maintenance Noise Estimator Tool (TfNSW 2022; refer to **Appendix I**). The allocated background noise was determined to be 40 dB(A). Some of the Activity works are anticipated to be Moderately Intrusive to Highly Intrusive to some of the nearby receptors (TfNSW 2023; refer to **Appendix I**)..

The assessment identified that aspects of the works associated with the proposed activity will have noise impacts for several residential receptors that are in close proximity to the work areas (refer to **Table 6.7**).

Under the TfNSW guideline (Transport for NSW, 2023), plant items utilised for road construction works that may impact receptors and anticipated impact distance is shown in **Table 6.8**. From **Table 6.7** it can be seen that there are several receptors that are located inside this stated "affected distance" for plant items that are anticipated to be utilised for these Activity works.

The required management measures for the anticipated exceedances in noise criteria for each affected receptor are shown in **Table 6.9** below.

Table 6.8 Affected Distances for Individual Plant Items

Individual Plant Item	No. Units	Affected Distance (m)				
Mitigation Level (dBA)		**35**	**45**	**55**	**65**	**75**
Power generator / concrete pump	1	390	185	85	30	15
30Vibratory roller / concrete truck	1	525	250	120	45	20
Chainsaw / CMI SF400 paver / jack hammer / bored piling rig	1	760	365	175	75	25
Concrete saw / asphalt profiler / CAT D10	1	1010	490	235	110	40
Air-track drill / diamond grinding	1	1750	875	420	200	95

* source: (Transport for NSW, 2023), values shown are for rural community areas.

Table 6.9 Required Management Measures for Work Types

Receptor	Work Type	Standard Hours	Day (OOHW)	OOHW Evening	OOHW Night
R4	Bridge Works	N, V, PC, RO	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R3, R5	Bridge Works	N, V	V, N, R1, DR	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
All other receptors	Bridge Works	-	V, N, R1, DR	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R3, R4, R6, R7, R8,	Clear and Grubbing	N, V, PC, RO	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R1, R5, R10, R11, R12, R13, R14	Clear and Grubbing	N, V	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R2	Clear and Grubbing	N, V	N, R1, DR	N, R1, DR	V, N, R2, DR
All other receptors	Clear and Grubbing	-	N, R1, DR	V, N, R1, DR	V, IB, N, PC, SN, R2, DR
R3, R4, R6, R7, R8, R10, R11	Earthworks	N, V, PC, RO	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R1, R9, R12, R13, R14	Earthworks	N, V	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R15, R5, R18	Earthworks	N, V	V, N, R1, DR	V, N, R1, DR	AA, V, IB, N, PC, SN, R2, DR
All other receptors	Earthworks	-	N, R1, DR	V, N, R1, DR	V, IB, N, PC, SN, R2, DR
R2	Earthworks	N, V	N, R1, DR	N, R1, DR	V, N, R2, DR
R7	Pavement works (asphalt)	N, V, PC, RO	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R4, R8	Pavement works (asphalt)	N, V	V, IB, N, R1, DR, PC, SN	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R3, R6, R10, R11	Pavement works (asphalt)	N, V	V, N, R1, DR	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
R1, R9, R12, R13	Pavement works (asphalt)	N, V	N, R1, DR	N, R1, DR	AA, V, IB, N, PC, SN, R2, DR
All other receptors	Pavement works (asphalt)	-	N, R1, DR	V, N, R1, DR	V, IB, N, PC, SN, R2, DR
R1	Site Compound Operations	N, V	V, N, R1, DR	V, IB, N, R1, DR, PC, SN	AA, V, IB, N, PC, SN, R2, DR
All other receptors	Site Compound Operations	-	N, R1, DR	N, R1, DR	V, IB, N, PC, SN, R2, DR

*Notes:

- Standard Hours include: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm.
- Out of Hours Work (OOHW) Day includes: Saturday 7 am to 8 am, and 1 pm to 6 pm, Sunday 8 am to 6 pm.
- Out of Hours Work (OOHW) Evening includes: Monday to Sunday 6 pm to 10 pm.
- Out of Hours Work (OOHW) Night includes: Monday to Friday 10 pm to 7 am, Saturday 10 pm to 8 am, and Sunday 6 pm to 7 am.
- Abbreviations for Management Measures per below table:

Abbreviation	Management Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

When short-term works such as piling, demolition and construction give rise to impulsive vibrations, undue restriction on vibration values may significantly prolong these operations and result in greater annoyance. Short-term works are works that occur for a duration of approximately one week. In circumstances where work is short term, feasible and reasonable mitigation measures have been applied, and the project has a demonstrated high level of social worth and broad community benefits, then higher vibration values (above the maximum) may apply. In such cases, best management practices should be used to reduce values as far as practicable, and a comprehensive community consultation program should be implemented.

The minimum working distances from sensitive receivers for typical items of vibration intensive plant are shown in **Table 6.10** below (Transport for NSW, 2023). The minimum distances are quoted for both cosmetic damage (refer to BS 7385:2-1993 for light-framed residential type structures and DIN 4150-3:2016 for fragile or heritage type structures) and human comfort (refer to EPA's Assessing Vibration - a technical guideline). The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by Council or under the environmental license as relevant.

In accordance with TfNSW guideline (Transport for NSW, 2023), should predicted vibration levels exceed maximum levels, then the construction contractor will need to:

- Validate predicted noise levels;
- Notify affected receptors; and
- Allow for respite offers to affected receptors.

Given the location of numerous residential receptors to proposed work areas for this Activity, it is likely that the minimum working distances for vibration intensive plan from sensitive receivers will be exceeded (refer to **Table 6.10**); as such, a noise and vibration management plan will be required to be developed and implemented as part of these Activity works. The noise and vibration management plan will be required to address (including but not limited to):

- A vibration risk assessment to be completed for all residential dwellings inside the minimum working distances from sensitive receivers for typical items of vibration intensive plant (refer to **Table 6.10**). The risk assessment is to identify the type of equipment expected to be utilised, the approximate distance to the residential dwelling, the anticipated risk for damage or human health impacts, and consideration for alternatives if residential dwelling is high risk for impact.

- The requirement (if any) for pre-construction surveys of the structural integrity of vibration sensitive buildings for residential buildings within the limits specified in **Table 6.10** and in areas where designated equipment is intended to be utilised.
- The requirement (if any) for vibration monitoring at high risk receptors.
- Community notification requirements.

Table 6.10 Recommended Minimum Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human Response EPA's Vibration Guideline
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	N/A
Pile Rig - Hammer	12 t down force	15 m	50 m
Jackhammer	Handheld	1 m (nominal)	Avoid contact with structure

*source: (Transport for NSW, 2023)

It is anticipated that all works would be undertaken during standard construction hours. Appropriate noise and vibration management measures would be documented in a Noise and Vibration Management Plan that would form part of the Construction Environmental Management Plan (CEMP) and implemented to minimise the impact and ensure receivers are informed of the works.

No long-term adverse noise and vibration impacts are expected to result from the Activity.

6.7.3 Mitigation Measures

The following mitigation measures will be implemented in order to avoid and minimise any potential adverse impacts relating to noise and vibration:

57. A Noise and Vibration Management Plan is to be developed prior to commencement of works and implemented for the duration of the construction works associated with this Activity. The Noise and Vibration Management Plan should form part of the Construction Environmental Management Plan (CEMP) for the Activity works. The Noise and Vibration Management Plan is to include (but not be limited to):

    a. Noise and Vibration risk assessment for all works / equipment proposed to be utilised.
    b. Specification of appropriate noise and vibration mitigation and management measures for the project works (inclusion for pre-construction / dilapidation surveys, and noise and vibration monitoring, if risk assessment deems they are required).
    c. Details of community consultation requirements.
    d. Complaints management procedure.

58. Construction activities are to be undertaken in accordance with EPA recommended standard construction hours:

Monday to Friday	7:00 am to 6:00 pm
Saturday	8:00 am to 1:00 pm
Sundays or public holidays	No work.

59. Any noise complaints will be recorded and include suitable identification/ description of the noise source (e.g. continual/ impulsive) and general location of the complaint. Any noise complaints will be investigated and actioned as required.
60. The most appropriately sized tool for the respective job would be used, keeping in mind that the smaller the tool, the less potential noise generated.
61. All vehicles and equipment will be turned off and not left idling when not required for work uses.
62. All plant will be fitted with appropriate exhaust systems to ensure compliance with pollution and noise emission standards.

6.8 Air Quality

6.8.1 Existing Environment

The Activity is located in a rural environment. Potential airborne particles within the locality are largely restricted to minor dust generated by vehicle movements and agricultural activities in the broader landscape.

6.8.2 Potential Impacts

The Activity will temporarily affect air quality through exhaust emissions from machinery and associated transportation. There may also be minor dust generated during the road resurfacing works, bridge

installation and bridge demolition works. Given the temporary duration of the works and nature of the Activity, the level of potential impact is not considered significant and can be managed or minimised through implementation of standard mitigation measures.

The Activity will contribute to greenhouse gas emissions to a minor extent via the emissions from construction vehicles, as well as the consumption of materials requiring carbon emissions. Given the scale of the works, the influence on greenhouse gas emissions will be negligible. However, it is appropriate to implement measures that can reduce or minimise such effects.

6.8.3 Mitigation Measures

The following mitigation measures will be implemented to minimise adverse impacts relating to air quality:

63. Vegetation or other materials will not to be burnt on site.
64. Vehicles transporting waste or other materials that may produce odours, or dust will be covered during transportation.
65. Construction works will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.
66. Machinery and vehicles not in use during construction will be turned off and not left to unnecessarily run idle.
67. Vehicles, machinery and equipment will be maintained in accordance with manufacturer's specifications in order to meet the requirements of the Protection of the Environment Operations Act 1997 and associated regulation.
68. Dust suppression techniques would be utilised to minimise the potential for dust generation/ dispersal during works, as required.
69. Disturbed soils would be progressively stabilised.

6.9 Socio-economic

6.9.1 Existing Environment

The site comprises the existing Casino Coraki Road including the Deep Creek and Spring Gully bridges, and the intersections with Perkins Bridge Road and Tomki-Tatham Road. The site is situated to the south of the main cluster of dwellings at Tatham. The road alignment is not within the formal road reserve and traverses several private properties.

The Deep Creek and Spring Gully bridges have been assessed and identified as being in poor condition. As such, Council has restricted the bridges to one-way traffic only and imposed a 5-tonne load limit. This has resulted in heavy vehicles utilising other rural roads to detour around Tatham.

6.9.2 Potential Impacts

The new bridges will be constructed off-line, allowing the existing bridges to continue being utilised, albeit under the existing traffic control regime that restricts vehicle movements to one-way only. This will minimise the traffic impact of the Activity and remove the need for a detour. There may be some minor traffic delay when the new road is tied in to the existing.

The Activity includes some road realignment and land acquisition to rectify the road reserve. Council is currently undertaking the process of acquiring the affected land.

Given the nature of the Activity and the site context, no other adverse long-term socio-economic impacts are anticipated. Construction staff are required to use appropriate personal protective equipment (PPE) and follow construction management protocols to prevent injury and incidents within the works area.

Overall, the Activity would have a positive socio-economic impact by providing critical road infrastructure used by the local community.

6.9.3 Mitigation Measures

The following mitigation measures will be implemented in minimise adverse socio-economic impacts:

70. Contractors/ workers will be mindful of the needs of the local community.
71. Any potentially impacted parties or landholders will be consulted prior to construction with a goal of minimising or eliminating any adverse impacts.
72. Any changes to public or private roads (including private driveways) as a result of the works will be reinstated to an acceptable standard upon completion of the works.
73. In accordance with the Work Health and Safety Act 2011, workers will be provided with appropriate safety clothing and equipment. Supervisory staff and any visitors to the work area will also be required to wear protective clothing. Works personnel will be provided with or expected to have protective equipment and appropriate construction training.

6.10 Waste

Waste (litter) was observed in an around the waterways during the site assessment.

6.10.1 Potential Impacts

Waste generated from the construction of the Activity may include, but is not limited to:

- demolished road furniture materials;
- packaging materials;
- construction and concrete wastes;
- spoil material from excavation;
- oils and grease from machinery;
- general site rubbish; and
- removed vegetation.

As well as negatively impacting soils and water quality, improperly managed construction waste may place additional strain on existing infrastructure. Where re-use or reprocessing is not nominated as a preferred waste management option, waste materials must be transported by road to landfill, and additional materials must be manufactured and transported in their place.

As discussed in **Section 6.5.3**, there is mapped potentially contaminated material in land up stream to the Activity site, which is registered as a historical arsenic and DDT cattle dip. As such, any excavated material may contain elevated levels of arsenic or DDT. Any excavated material to be moved off site and not reused in road construction related activities within the Activity road corridor would require testing to demonstrate compliance with the *Excavated Natural Material Order 2014* and/or Waste Classification Guidelines.

Activities such as road and bridge construction may produce small amounts of contaminated waste due to spills, leaks, or escapes of hydrocarbons, lubricants, and construction materials. The improper disposal of contaminated waste may lead to the contamination of soils, waterbodies, and ecosystems in the vicinity of disposal.

As well as impacting on visual amenity, the improper storage of general site rubbish may encourage wildlife to access rubbish receptacles and damage containers, potentially leading to the migration of general site rubbish off-site.

The potential waste impacts as a result of the Activity are limited to the construction phase, and no impacts due to waste are anticipated as a result of the Activity post construction.

6.10.2 Mitigation Measures

The following mitigation measures will be implemented to minimise adverse impacts in relation to waste generated by the Activity:

74. All existing waste in the Activity area is to be cleaned up and appropriately disposed of prior to the commencement of works.
75. A Construction Environmental Management Plan should be developed and implemented to ensure that waste materials are adequately managed and handled throughout the construction process.
76. Resource management hierarchy principles are to be followed:
77. Avoid unnecessary resource consumption as a priority.
78. Avoidance is followed by resource recovery (including re-use of materials, reprocessing, recycling, and energy recovery).
79. Disposal is undertaken as a last resort.
80. Any contaminated waste generated would be disposed of in accordance with the EPA approved methods of waste disposal.
81. Appropriately sized waste receptacles (bins) will be utilised on site.
82. Waste storage facilities and spoil placement areas shall be located in easily accessible locations, away from existing drainage lines and have appropriate secondary containment systems and drainage controls.
83. Lids and seals shall be maintained on all odour generating waste material; and all domestic and food scrap waste shall be secured to prevent wildlife access.
84. Waste will be disposed of at a licensed waste or recycling facility.
85. If excavated material is to be moved off site and not reused in road construction related activities within the road corridor, additional testing would be undertaken to demonstrate compliance with the Excavated Natural Material Order 2014 and/or Waste Classification Guidelines.
86. Working areas will be maintained, kept free of rubbish and cleaned up at the end of each day.
87. Waste material will not be left on-site once the works have been completed.
88. Ensure the responsible environmental management of wastes that cannot be avoided and promote opportunities for the re-use of waste products where appropriate.

6.11 Traffic and Access

6.11.1 Existing Environment

The proposed Activity includes replacing the Deep Creek and Spring Gully bridges, on the Casino Coraki Road at Tatham. Casino Coraki Road is a two-way sealed road with appropriately line markings (refer to **Plate 6.8**).

The existing bridges have been assessed and identified as being in poor condition, resulting in the speed limit being reduced from 100 km/hr to 60 km/hr, with traffic restricted to one-way at a time, causing heavy vehicles to detour away from using the existing bridges (refer to **Plate 2.1** and **Plate 2.3**).

Plate 6.8 Casino Coraki Road - North of Deep Creek Bridge

6.11.2 Potential Impacts

The bridges and new roadway will be constructed off-line, adjacent to live traffic, enabling the existing road and bridges to continue to function as they currently are.

A Traffic Management Plan will be required to manage the traffic control aspects of the proposed Activity, including the switch over to the new roadway. Traffic control will be required at times during the construction works when there are frequent heavy vehicle movements and heavy equipment entering and exiting the site.

Once operational, the Activity will have a positive impact whereby the speed limit can be increased, and the bridges will cater to two-way traffic and larger truck movements.

6.11.3 Mitigation Measures

89. All works would be undertaken under an approved Traffic Management Plan and Traffic Guidance Scheme.
90. Regard to public safety would be maintained at all times.
91. Advanced warning signage would be established at appropriate and strategic locations, prior to and during the work to ensure road users and pedestrians are made aware of changed traffic/ access conditions.
92. Sufficient and appropriate notification will be provided to the affected road users and local bus operators.
93. All surrounding roads damaged as a result of the works will be repaired to an acceptable condition following completion of construction works.

6.12 Climate Change

6.12.1 Existing Environment

Anthropogenic climate change associated with global warming is the result of human activities creating greenhouse gas emissions which in turn affects the environment. Anthropogenic climate change and the need to reduce emissions is a key issue of global, national and local importance.

6.12.2 Potential Impacts

The Activity would contribute to carbon emissions and anthropogenic climate change to a minor extent via the production of greenhouse gas emissions by construction equipment and traffic as well as the consumption of materials requiring carbon emissions and the removal of vegetation that may otherwise act as a carbon sink. Given the scale of the works however, the influence on emissions and climate change would be negligible. However, it is appropriate to implement measures that can reduce or minimise cumulative emissions and related effects.

6.12.3 Mitigation Measures

Mitigation measures to minimise impacts in relation to climate change include:

94. Vehicles and equipment will be switched off when not required for direct construction activities.
95. Waste will be minimised and is otherwise to be recycled or disposed of appropriately.
96. Vegetation removal would be minimised as far as practical.

6.13 Cumulative Impacts

Under Section 171 of the EP&A Regulation 2021, any cumulative environmental effect with other existing or likely future activities must be taken into account when assessing the impact of an activity for the purposes of Part 5 of the EP&A Act.

The Activity is expected to add to a number of cumulative impacts including resource consumption, vegetation clearing and generation of greenhouse gas emissions (e.g. through operation of vehicles and equipment, use of resources). However, the relevant mitigation measures stated throughout **Section 6** and the methodology for completion of the Activity aim to minimise the extent to which it contributes to cumulative adverse environmental impacts. There are no other known significant developments or works that would coincide with the proposed Activity and have the potential to result in adverse cumulative amenity and environmental impacts. No significant cumulative impacts are expected.

6.14 Ecologically Sustainable Development

The objectives of the EP&A Act require that the principles of Ecologically Sustainable Development (ESD) are considered and evaluated in the environmental assessment process and in the determination of a development application. Whilst a development application is not required for this project, consideration of these principles is useful.

6.14.1 Precautionary Principle

The EP&A Regulations 2021 defines the precautionary principle as the following:

If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

To satisfy the precautionary principle, this REF has conducted a thorough analysis of potential environmental, economic and social concerns. This assessment has identified and examined potential impacts and developed appropriate mitigation measures and safeguards to help avoid and/ or minimise impacts and safeguard the environment. Considering this assessment's findings, the Activity is unlikely to impose significant and/ or long-term adverse impacts on the environment, economy, or community. The mitigation measures and safeguards outlined in this REF would be implemented to ensure sound environmental outcomes in all aspects of the Activity.

6.14.2 Inter-generational Equity

The EP&A Regulations 2021 defines the inter-generational equity as the following:

That 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 Activity would not significantly affect the viability of threatened species, or any TECs or other environmental resources including water, soil and air. Therefore, local environmental values would not be substantially adversely affected by the Activity and would be maintained for future generations. The Activity would have positive socio-economic effects in relation to maintenance of access and existing road infrastructure.

6.14.3 Conservation of Biological Diversity and Ecological Integrity

The EP&A Regulations 2021 defines the conservation of biological diversity and ecological integrity as the following:

That conservation of biological diversity and ecological integrity should be a fundamental consideration.

The impacts to ecological integrity and conservation of biological diversity at the site have been assessed as part of this REF. No threatened species, endangered populations or TECs are likely to be significantly affected by the Activity. No populations of native species are likely to be made locally rare or unviable as a result of the Activity. Consequently, the ecological integrity and biological diversity would be maintained locally.

6.14.4 Improved Valuation, Pricing and Incentive Mechanisms

The EP&A Regulations 2021 defines improved valuation, pricing and incentive mechanisms as the following:

That environmental factors should be included in the valuation of assets and services.

It is difficult, however, to assign a monetary value to the environment of a locality or to environmental resources not considered for commercial use. The proponent has taken an approach to manage the potential environmental impacts of the Activity by identifying appropriate measures and safeguards to avoid or mitigate adverse environmental effects. This would ensure that the integrity of the environment is not degraded, is managed and where possible enhanced.

7 Environmental Management

7.1 Summary of Safeguards and Management Measures

The following table provides a summary of the mitigation measures detailed in this report that would be implemented for the Activity.

The identified measures would be incorporated by the Contractor into a detailed CEMP prior to commencement of works, which also outlines how risks would be minimised, and the construction processes would be undertaken and managed.

The objective of the CEMP is to outline parameters for site management practices during construction. All construction staff and site personnel would be inducted and made aware of their obligations working on the project, their environmental responsibilities, and the safeguard measures to avoid and minimise potential impacts. Induction and toolbox talks would commence early in the program and continue as new personnel/ contractors are engaged.

Table 7.1 Summary of Mitigation Measures

Environmental Attribute	Mitigation Measures/ Safeguards
Biodiversity	1. Consideration should be given to providing replacement microbat habitat within the new bridges Should microbat habitat be installed the final design would be agreed on between RVC and an ecologist prior to construction. 2. To maintain fish passage, permanent and temporary crossing design and construction will be undertaken in accordance with the NSW DPI Fisheries requirements. 3. Any required dewatering would be undertaken in accordance with NSW DPI Fisheries requirements and in accordance with an approved dewatering strategy. 4. Removal of native vegetation will be kept to the minimum required to complete the Activity. 5. Prior to works commencing, mark the limit of work and clearing limits at the site, as per the site boundary/ extent of works in Illustration 6.1. 6. A pre-clearing survey will be undertaken daily by a suitably experienced ecologist or RVC environmental representative for fauna (including Koala) or habitat features including Ringtail Possum dreys or active bird nests prior to vegetation removal. 7. If a Koala is located within any tree to be removed (or within 50 m of an area to be cleared/ disturbed), then works would be delayed in that area until the Koala disperses of its own volition. An exclusion area would be established around the subject tree based on advice from a suitably qualified ecologist. 8. An ecologist or RVC environmental representative will undertake a survey of the bridge 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 (where possible) 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 RVC construction personnel, the appropriate management pathway. – Should threatened microbats be present, review project statutory assessments and update if appropriate. Daily inspections will be

Environmental Attribute	Mitigation Measures/ Safeguards
	undertaken by the work crew of the existing timber bridge for microbats: – On each day below deck bridge works are undertaken (e.g. 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 split corbels or other cavities. 9. In the event that threatened fauna (e.g. frogs/ tadpoles, microbats, Koala) are observed on site, stop works and notify the RVC environmental representative who will contact an experienced ecologist for further advice. 10. Injured fauna will be taken to the nearest vet or wildlife care organisation. The contact details of Wauchope Veterinary Clinic (02 6585 1626), FAWNA (02 6581 4141) and WIRES (1300 094 737) will be known to the site supervisor and ecologist. 11. Any uninjured captured fauna would be released by the ecologist within 50 m of the subject works area where the animal was captured, as far away as possible from threats such as clearing and road traffic. Timing of releases would coincide with dusk for nocturnal species. 12. For bridge abutment works sediment booms may be placed parallel to the banks to encompass the abutments to retain sediments while allowing water flow through the centre of the creek channel. 13. Works would be undertaken in accordance with conditions outlined within an approved DPI Fisheries Permit (the DPI Fisheries Permit application will be prepared and submitted by RVC prior to the work proceeding). 14. To minimise pollution and spread of pathogens and weeds; tools, machinery and plant to cleaned, degreased and inspected for oil/ fuel leaks before commencing work on site. Soil, vegetation and/ or foreign material from other sites to be removed from plant before plant is delivered to site. 15. Declared weeds (Lantana and Fireweed) will be managed according to requirements under the Biosecurity Act 2015. In addition to General Biosecurity Duties to prevent, eliminate or minimise any biosecurity risk they may pose, specific duties for these species are: ‘‘Prohibition on certain dealings’ and “Must not be imported into the state, sold, bartered, exchanged or offered for sale”. 16. All vegetation removal must be undertaken by an approved vegetation clearing contractor or competent persons within a RVC work crew. Vegetation removed from the site will be mulched and either reused on site for erosion and sediment control or beneficially reused in accordance with waste resource recovery orders and exemptions (as priority) or taken off-site to an appropriately licenced waste facility. 17. Parking of vehicles and storage of plant/ equipment is to occur on existing hardstand areas. Where this is not possible, vehicles and plant/ equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees. 18. There is to be no disturbance beyond the marked limits without prior approval from the RVC environmental representative.
Non-Aboriginal Heritage	19. Should non-Aboriginal heritage items be uncovered during works, all works in the vicinity of the find will cease and RVC and NSW Heritage will be contacted. Works will not re-commence until appropriate clearance has been received. 20. If any items defined as relics under the NSW Heritage Act 1977 are uncovered during the works, all works will cease in the vicinity of the find and RVC Project Manager will be contacted immediately. Works will not re-commence until appropriate clearance has been received.

Environmental Attribute	Mitigation Measures/ Safeguards
Aboriginal Heritage	21. An unexpected finds procedure is to be developed as part of the Construction Management Plan package for the proposed Activity works prior to the commencement of construction. 22. All personnel working on site will be inducted and receive information on the required process, should a potential heritage item be found. 23. If Aboriginal cultural material is identified on site, a Stop Work Procedure will be followed, which includes: – Works will cease immediately. – A temporary exclusion zone established. – Incident reporting completed. – Council's project manager and the Local Aboriginal Land Council contacted immediately. – Heritage NSW contacted immediately. – An appropriately qualified archaeological consultant and a representative of the Bandjalang People #2 / NTS Corp are to be 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. – 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. 24. Aboriginal human remains – should skeletal material be exposed during ground disturbance: – Work will cease immediately. – The nearest Police Local Area Command (Woolgoolga), Bandjalang People #2 / NTS Corp and the Heritage NSW (Parramatta) are all to be notified as soon as possible. – The site should be cordoned off and the remains themselves should be left untouched. – 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. 25. Notifying Heritage NSW – it is a legislative requirement that cultural heritage materials uncovered as a result of the Activity are registered as Aboriginal sites on the AHIMS database within the required timeframe.
Visual	26. Upon completion of the works, any works areas will be restored to an acceptable visual state. 27. All sites will be maintained, kept free of rubbish and cleaned up at the end of each work day.
Soils and Geology	28. A site-specific erosion and sediment control plan will be developed by a suitably qualified professional, approved by Council, and implemented prior to commencement of the road construction works. 29. Erosion and sediment controls will be implemented in accordance with Managing Urban Stormwater, Soils and Construction (the Blue Book) (Landcom, 2004) and will be maintained to prevent sediment moving off-site and sediment laden water entering any water course during the construction process.

Environmental Attribute	Mitigation Measures/ Safeguards
	30. Works will only commence once all erosion and sediment controls have been established. The controls will be maintained in place until the works are complete, and all exposed erodible materials are stabilised. 31. Where possible, avoid works during forecast high rainfall events. 32. Disturbed areas will be progressively stabilised and or rehabilitated following construction. 33. Permanent rehabilitation will achieve a C-factor of less than 0.1 (i.e., greater than 60% ground cover) and set in motion a program that should ensure it will drop permanently to less than 0.05 (i.e., greater than 70% ground cover) within a further 60 days. 34. Regularly check and maintain erosion, sedimentation and stormwater control measures. 35. Any exposure or disturbance of potentially/ suspected contaminated soil or material would be managed in accordance with relevant EPA and Council policy and guidelines. 36. An excavated material management procedure should be developed by a suitably qualified professional and implemented during construction works to ensure all excavated material is suitably handled, stored and disposed during construction works. This procedure should include safety aspects for handling potentially contaminated materials. 37. All excavated material will be placed in a designated stockpile area that is suitably contained to ensure materials can be tested prior to re-use or off-site disposal. 38. Any testing of excavated material should be carried out in accordance with the NSW excavated natural material order and/ or the NSW Waste Classification guidelines. Due to the potential presence of contamination from historical dip sites, soils testing should also include assessment of potential contamination. 39. Only clean equipment and vehicles will be used, with equipment being cleaned down before being brought to the site.
Water	40. A flood risk and response management plan, or emergency event contingency plan, should be developed as part of the CEMP for this Activity. 41. Construction of the Activity is timed to ensure that the new bridges and existing bridges are not in place during the peak time for flooding in the Northern Rivers (October to April) and that the duration of time when both the new bridges and existing bridges are in place is minimised. 42. The final design would ensure that there are no changes to hydrology that would result in negative impacts to the waterway (e.g. restriction of flow, scouring) and that flood level increase is limited to 3 mm, as per the BMT Flood Impact Assessment. 43. All machinery, equipment, vehicles, materials and chemicals must be stored outside of flood prone areas. 44. Stockpile and laydown areas, which could result in pollution to a watercourse, are to be located a minimum of 50 m away from the watercourse and within already cleared areas of the road corridor requiring no additional vegetation removal. 45. Where possible, avoid works during forecast high rainfall events and plan works to occur during periods of no or low flow. 46. Any de-watering of accumulated water on site will be required to be completed in accordance with an approved dewatering management plan. 47. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/ slicks) within construction site and adjacent area will be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls during construction. 48. Spill containment kits will be available at all times on site in all active work areas. All personnel will be made aware of the location of the kit and trained in its effective deployment.

Environmental Attribute	Mitigation Measures/ Safeguards
	49. Any required fuels and other liquids will be stored in self-safe chemical storage containers. 50. All refuelling of plant and equipment will be in appropriately designated areas away from drainage lines or watercourses (at least 50 m) and managed in order to prevent any potential spills leaving the refuelling area (e.g. use of bunded areas). 51. Cleaning or washing is not to occur near waterways or drainage lines. 52. A concrete washout area and facilities will be located away from waterways and drainage lines and wash down water is to be contained within a designated impervious bund. Excess concrete is to be removed from site. 53. All equipment will be maintained in good working order and operated according to manufacturer's specification. 54. No waste and/ or wastewater will be discharged directly or indirectly in drains or waterways. 55. The RVC and EPA will be notified immediately in response to incidents causing or threatening actual or potential harm to the environment in accordance with section 148 of the POEO Act (via EPA Environment Line on 131 555). 56. Workers and people using the site during and after construction of the bridge will be made aware of the flood risk at the site e.g. through signage.
Noise and Vibration	57. A Noise and Vibration Management Plan is to be developed prior to commencement of works and implemented for the duration of the construction works associated with this Activity. The Noise and Vibration Management Plan should form part of the Construction Environmental Management Plan (CEMP) for the Activity works. The Noise and Vibration Management Plan is to include (but not be limited to): a. Noise and Vibration risk assessment for all works / equipment proposed to be utilised. b. Specification of appropriate noise and vibration mitigation and management measures for the project works (inclusion for pre-construction / dilapidation surveys, and noise and vibration monitoring, if risk assessment deems they are required). c. Details of community consultation requirements. d. Complaints management procedure. 58. Construction activities are to be undertaken in accordance with EPA recommended standard construction hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm Sundays or public holidays No work. 59. Any noise complaints will be recorded and include suitable identification/ description of the noise source (e.g. continual/ impulsive) and general location of the complaint. Any noise complaints will be investigated and actioned as required. 60. The most appropriately sized tool for the respective job would be used, keeping in mind that the smaller the tool, the less potential noise generated. 61. All vehicles and equipment will be turned off and not left idling when not required for work uses. 62. All plant will be fitted with appropriate exhaust systems to ensure compliance with pollution and noise emission standards.
Air Quality	63. Vegetation or other materials will not to be burnt on site. 64. Vehicles transporting waste or other materials that may produce odours, or dust will be covered during transportation.

Environmental Attribute	Mitigation Measures/ Safeguards
	65. Construction works will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. 66. Machinery and vehicles not in use during construction will be turned off and not left to unnecessarily run idle. 67. Vehicles, machinery and equipment will be maintained in accordance with manufacturer's specifications in order to meet the requirements of the Protection of the Environment Operations Act 1997 and associated regulation. 68. Dust suppression techniques would be utilised to minimise the potential for dust generation/ dispersal during works, as required. 69. Disturbed soils would be progressively stabilised.
Socio-economic	70. Contractors/ workers will be mindful of the needs of the local community. 71. Any potentially impacted parties or landholders will be consulted prior to construction with a goal of minimising or eliminating any adverse impacts. 72. Any changes to public or private roads (including private driveways) as a result of the works will be reinstated to an acceptable standard upon completion of the works. 73. In accordance with the Work Health and Safety Act 2011, workers will be provided with appropriate safety clothing and equipment. Supervisory staff and any visitors to the work area will also be required to wear protective clothing. Works personnel will be provided with or expected to have protective equipment and appropriate construction training.
Waste	74. All existing waste in the Activity area is to be cleaned up and appropriately disposed of prior to the commencement of works. 75. A Construction Environmental Management Plan should be developed and implemented to ensure that waste materials are adequately managed and handled throughout the construction process. 76. Resource management hierarchy principles are to be followed: 77. Avoid unnecessary resource consumption as a priority. 78. Avoidance is followed by resource recovery (including re-use of materials, reprocessing, recycling, and energy recovery). 79. Disposal is undertaken as a last resort. 80. Any contaminated waste generated would be disposed of in accordance with the EPA approved methods of waste disposal. 81. Appropriately sized waste receptacles (bins) will be utilised on site. 82. Waste storage facilities and spoil placement areas shall be located in easily accessible locations, away from existing drainage lines and have appropriate secondary containment systems and drainage controls. 83. Lids and seals shall be maintained on all odour generating waste material; and all domestic and food scrap waste shall be secured to prevent wildlife access. 84. Waste will be disposed of at a licensed waste or recycling facility. 85. If excavated material is to be moved off site and not reused in road construction related activities within the road corridor, additional testing would be undertaken to demonstrate compliance with the Excavated Natural Material Order 2014 and/or Waste Classification Guidelines. 86. Working areas will be maintained, kept free of rubbish and cleaned up at the end of each day. 87. Waste material will not be left on-site once the works have been completed. 88. Ensure the responsible environmental management of wastes that cannot be avoided and promote opportunities for the re-use of waste products where appropriate.
Traffic and Access	89. All works would be undertaken under an approved Traffic Management Plan and Traffic Guidance Scheme.

Environmental Attribute	Mitigation Measures/ Safeguards
	90. Regard to public safety would be maintained at all times. 91. Advanced warning signage would be established at appropriate and strategic locations, prior to and during the work to ensure road users and pedestrians are made aware of changed traffic/ access conditions. 92. Sufficient and appropriate notification will be provided to the affected road users and local bus operators. 93. All surrounding roads damaged as a result of the works will be repaired to an acceptable condition following completion of construction works.
Climate Change	94. Vehicles and equipment will be switched off when not required for direct construction activities. 95. Waste will be minimised and is otherwise to be recycled or disposed of appropriately. 96. Vegetation removal would be minimised as far as practical.

7.2 Licensing and Approvals

The following permits would be required prior to commencement of the Activity:

- *Fisheries Management Act 1994*, Part 7, Section 200: A permit is required to carry out dredging and reclamation work on water land (key fish habitat). If fish passage cannot be maintained during works, this too requires a Permit under part 7.

8 Summary of Consideration of Environmental Factors

8.1 Environmental Factors to be Considered

As part of its obligation under Section 5.5 of the EP&A Act, the determining authority is required to take into account, to the fullest extent possible, all matters likely to affect the environment. This REF has considered the relevant assessment considerations in the Division 5.1 Guidelines approved under Section 170, as required by Section 171(1) of the EP&A Regulation and provided below. **Table 8.1** provides a summary of the key issues relevant to each factor and a summarised assessment.

Table 8.1 Environmental Factors for Consideration as per the Division 5.1 Guidelines

	Factor	Impact
a	**The Environmental Impact on a Community**	
	The community would not be affected by declines in the local environment as a result of the Activity. Mitigation measures have been designed to reduce environmental impacts on the community to negligible levels.	Minor
b	**The Transformation of a Locality**	
	The Activity will result in a minor change to the locality.	Minor
c	**The Environmental Impact on the Ecosystems of the Locality**	
	No vegetation of significance will be removed to allow for the Activity. The impact of that vegetation removal is discussed in this REF. Extensive mitigation measures have been designed to reduce environmental impacts.	Minor
d	**Reduction of the Aesthetic, Recreational, Scientific or Other Environmental Quality or Value of a Locality**	
	It is expected that the reduction in aesthetic quality of the locality will be minor. No reduction in the quality of the environment will occur due to the mitigation measures detailed in this REF. No significant changes to the locality will occur.	Nil
e	**The Effects 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**	
	The Activity will not impact existing land uses. There will be no significant impacts to heritage, visual amenity or social significance and as such impacts are therefore considered to be negligible.	Nil
f	**The Impact on the Habitat of Protected Fauna (Within the Meaning of the *Biodiversity Conservation Act 2016***	
	With effective implementation of the mitigation measures provided in this REF, the Activity is not considered likely to have a significant negative impact on the habitat of any other protected fauna.	Nil
g	**The Endangering of any Species of Animal, Plant or Other Form of Life Whether Living on Land, in Water or in the Air**	
	With effective implementation of the mitigation measures provided in this REF, the Activity is not considered likely to significantly endanger any species of animal, plant or other form of life.	Nil
h	**Long-Term Effects on the Environment**	

	No negative long-term impacts will occur in the locality given the implementation of the proposed mitigation measures in this REF.	Nil
i	**Degradation of the Quality of the Environment**	
	Degradation of the quality of the environment is not expected. With the mitigation measures in this REF, any impacts are unlikely to be substantial.	Nil
j	**Risk to the Safety of the Environment**	
	No negative long-term impacts will occur in the locality given the implementation of the mitigation measures in this REF.	Nil
k	**Reduction in the Range of Beneficial Uses of the Environment**	
	The Activity will not result in any reduction in the range of beneficial uses of the environment.	Nil
l	**Pollution of the Environment**	
	The Activity has minor potential to affect water quality during the works. The mitigation measures will minimise the duration and impact. Given the proposed mitigation measures detailed in this REF and all waste being disposed within an appropriate/ approved waste disposal facility, pollution to the environment will be minimised.	Minor
m	**Environmental Problems Associated with the Disposal of Waste**	
	Any wastes would be disposed of in a manner which would not damage or disturb any native flora or fauna or the physical environment. The disposal of such waste would be within a waste management facility in accordance with EPA approved methods of waste disposal. Mitigation measures detailed in this REF would protect the environment from problems associated with waste disposal.	Nil
n	**Increased Demands on Resources (Natural or Otherwise) that are likely to Become in Short Supply**	
	The Activity does not create any demand for resources that are in short supply nor is it likely to result in an increased demand on any natural resources that are likely to become in short supply.	Nil
o	**The Cumulative Environmental Effect with Other Existing or Likely Future Activities**	
	The Activity would have minor cumulative impacts (e.g., resource consumption; greenhouse gas emissions; vegetation loss) but is unlikely to significantly contribute to any cumulative impacts.	Nil
p	**The impact on coastal processes and coastal hazards, including those under projected climate change conditions**	
	The Activity could contribute to cumulative impacts to a negligible extent (e.g., greenhouse gas emissions, consumption of resources) contributing to climate change and associated impacts, however there would be no direct impact on coastal process or hazards.	Minor
q	**Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1**	
	Not applicable	Nil
r	**Other relevant environmental factors**	
	Nil	Nil

8.2 EPBC Act 1999 (Commonwealth Legislation)

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

- World Heritage.
- 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.

Under the EPBC Act, a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'. A database search was completed on 19 August 2024 encompassing a 10 km radius search area from the centre of the proposed Activity (refer to **Appendix B**). Search results following the site assessment are considered in **Table 8.2**.

Table 8.2 EPBC Act Considerations

Matter	Impact
Any impact on a World Heritage property?	
No World Heritage properties occur at or proximal to the site.	Nil
Any impact on a National Heritage place?	
No World Heritage properties occur at or proximal to the site.	Nil
Any impact on a wetland of international importance?	
No wetlands of international importance (Ramsar Sites) occur at or near the site.	Nil
Any impact on nationally threatened species and ecological communities?	
There are 25 threatened flora species, 37 threatened fauna species and six threatened ecological communities listed under the EPBC Act which may occur within 10 km of the site. These are not likely to be significantly affected by the Activity (refer to biodiversity assessment at **Section 6.1**) and mitigation measures have been provided to minimise any potential impacts. No marine habitat would be impacted.	Minor
Any impact on a Nationally Important Wetland?	
No nationally important wetlands occur at or near the site. Nationally Important Wetlands are not likely to be affected by the Activity.	Nil
Any impact on Migratory species?	
Based on the minor nature of the works, no listed migratory species are likely to be significantly affected by the Activity (refer to **Section 6.1**).	Nil to negligible
Any impact on a Commonwealth marine area?	
No Commonwealth marine areas occur at or near the site.	Nil
Any impact on the Great Barrier Reef Marine Park?	
The Great Barrier Reef Marine Park is distant from the site.	Nil
Does the Proposal involve a nuclear action (including uranium mining)?	
The Activity does not involve a nuclear action.	Nil
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	
The Activity does not involve any impact on a water resource, in relation to coal seam gas development and large mining development.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	
The Activity is not expected to impact upon such land.	Nil

The assessment of the impact of the Activity on MNES and the environment of Commonwealth land has found that there is unlikely to be significant impact on relevant MNES. Accordingly, the Activity does not require referral to the Australian Government Department of Climate Change, Energy, the Environment and Water.

9 Conclusion and Certification

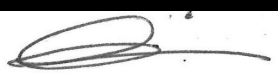
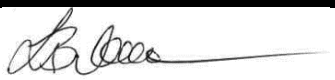
The Activity is the replacement of Deep Creek and Spring Gully bridges, over Shannon Brook and Spring Creek respectively, on the Casino Coraki Road at Tatham. It is proposed to construct the two new bridges offline, in parallel locations to the existing bridges. This will allow for traffic to continue utilising Casino Coraki Road during the construction period. Once the new bridges are complete, the existing bridges will be demolished. The Activity includes approximately 700 m of new roadway, to tie in the new bridges.

The Activity is permitted without development consent and subject to assessment under Part 5, Division 5.1 of the EP&A Act. This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed Activity. The Activity would result in some impacts; however, these are not likely to be significant and can be effectively managed/ ameliorated through the implementation of the safeguards and mitigation measures recommended in this REF. A permit must be obtained from the Department of Primary Industries as the Activity involves dredging and reclamation work on water land (key fish habitat).

The Activity described will not affect areas of outstanding biodiversity value or Wilderness Areas. The Activity is unlikely to significantly affect threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement (or Biodiversity Development Assessment Report (BDAR) if the Proponent elected) is not required. The Activity is also unlikely to affect Commonwealth land or have a significant impact on any matters of national environmental significance in relation to the EPBC Act.

I certify to the best of my knowledge that:

- This REF provides a true and fair review of the Activity in relation to its potential effects on the environment, and
- The assessment satisfies the requirements of Sections 5.5 to 5.7 of the EP&A Act, the EP&A Regulation 2021, including Section 171 and the *Guidelines for Division 5.1 Assessments* approved under Section 170 of the EP&A Regulation, and other relevant legislation and guidelines, and
- The assessment has been adequately completed, and
- Subject to the inclusion of the safeguards/ measures included in this REF, it is reasonable to conclude that the project will not likely have a significant impact on the environment during both the construction and operation phases, and
- Given the impacts of the Activity are not likely to be significant, an Environmental Impact Statement is not required under Section 5.7 of the EP&A Act, and
- A Species Impact Statement or BDAR is not required, and
- The Activity does not warrant/ require referral to the Australian Department of Agriculture, Water and the Environment under the EPBC Act, and
- The Activity is not State Significant Infrastructure and does not require approval under Division 5.2 of the EP&A Act.

REF Prepared by		
Signature:		
Name:	Megan Smith	Sam Smith
Position:	Environmental Planner	Ecologist
REF Reviewed by		
Signature:		
Name:	Lauren Buchanan	
Position:	Senior Environmental Scientist	

10 Determining Authority Sign Off

Determining Officer (Public Authority) who Approves this REF

☒ I certify that I have reviewed and endorsed the contents of this REF document, and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under section 170 of the EP&A Regulation, and the information it contains is neither false nor misleading. Based on the completed REF and my knowledge of the project, the assessment has been adequately completed, the project has predictable impacts which would not be significant, the conclusion as to the likely environmental impact of the project is reasonable, and the project can proceed subject to the relevant measures and conditions in this REF, any approval, license or permit.

☐ The project requires additional environmental assessment.

Reasons:

Enter Reasons.

☐ The project should not proceed in its current form.

Reasons:

NOTE: A site visit may be required depending on the level of confidence and risk to the environment.

Reviewed by:	
Signature	Date: 1-10-2024
Name	ANDY EDWARDS
Position	MANAGER: DEVELOPMENT & CERTIFICATION
Determining Authority Name	RICHMOND VALLEY COUNCIL
Determined By:	

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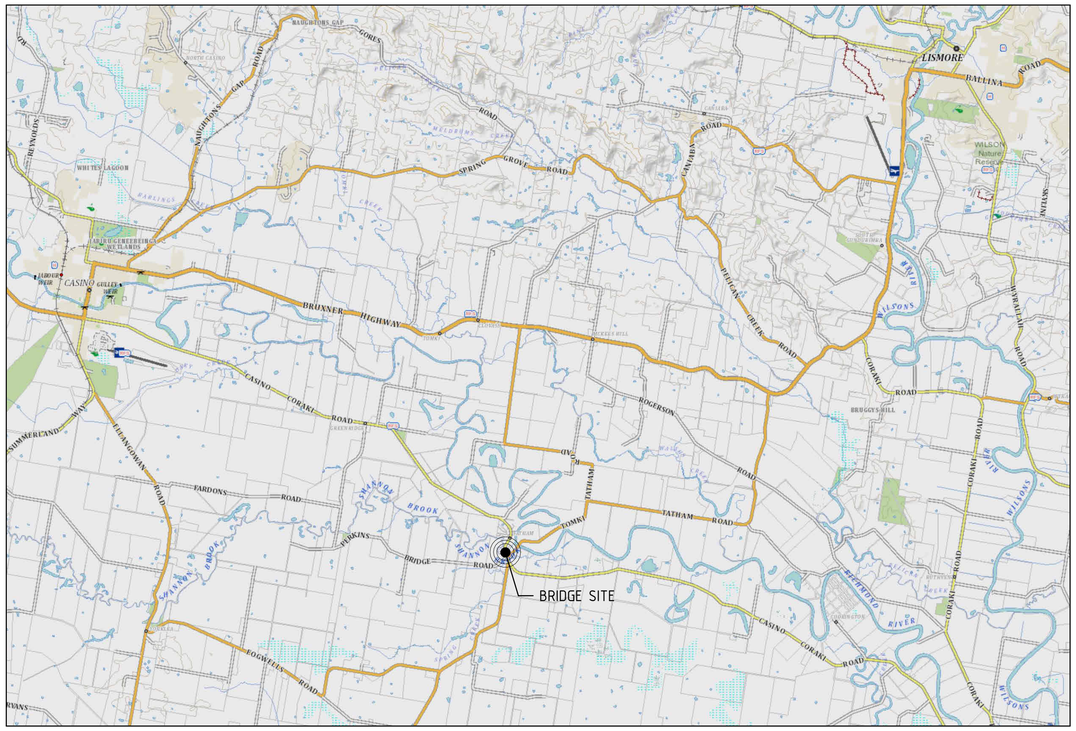
Copyright and Usage

Appendix A

Design Drawings

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

AUTHORITY: RICHMOND VALLEY COUNCIL



1 / 001 **LOCATION**
N.T.S.

DRAWING LIST

SHEET No.	SHEET NAME	REV.	DATE
GENERAL			
24_010-G001	COVER SHEET	P1	09/08/24
STRUCTURAL (SPRING GULLY BRIDGE)			
24_010-S201	STRUCTURAL NOTES - SHEET 1	P1	09/08/24
24_010-S202	STRUCTURAL NOTES - SHEET 2	P1	09/08/24
24_010-S203	STRUCTURAL NOTES - SHEET 3	P1	09/08/24
24_010-S210	GENERAL ARRANGEMENT	P1	09/08/24
24_010-S211	TYPICAL SECTIONS - SHEET 1	P1	09/08/24
24_010-S212	TYPICAL SECTIONS - SHEET 2	P1	09/08/24
24_010-S220	SETOUT AND PILING DETAILS - SHEET 1	P1	09/08/24
24_010-S221	SETOUT AND PILING DETAILS - SHEET 2	P1	09/08/24
24_010-S222	PRECAST PILE DETAILS	P1	09/08/24
24_010-S230	SCOUR PROTECTION MEASURES	P1	09/08/24
24_010-S240	ABUTMENT A - CONCRETE DETAILS	P1	09/08/24
24_010-S241	ABUTMENT A - REINFORCEMENT DETAILS	P1	09/08/24
24_010-S242	ABUTMENT B - CONCRETE DETAILS	P1	09/08/24
24_010-S243	ABUTMENT B - REINFORCEMENT DETAILS	P1	09/08/24
24_010-S250	PIER - CONCRETE DETAILS	P1	09/08/24
24_010-S251	PIER - REINFORCEMENT DETAILS	P1	09/08/24
24_010-S260	PRESTRESSED BEAM DETAILS	P1	09/08/24
24_010-S261	PRESTRESSED BEAM DETAILS - TYPES A & B	P1	09/08/24
24_010-S270	DECK - CONCRETE DETAILS - SHEET 1	P1	09/08/24
24_010-S271	DECK - CONCRETE DETAILS - SHEET 2	P1	09/08/24
24_010-S272	DECK - REINFORCEMENT DETAILS (SHEET 1)	P1	09/08/24
24_010-S273	DECK - REINFORCEMENT DETAILS (SHEET 2)	P1	09/08/24
24_010-S291	MISCELLANEOUS DETAILS	P1	09/08/24
24_010-S299	BAR SHAPES DIAGRAM	P1	09/08/24

BRIDGE DESIGN:
BRIDGE DESIGN TO AS5100-2017
TRAFFIC LOADING SM1600. DESIGN SPEED 100km/h.
EARTHQUAKE DESIGN CLASSIFICATION BEDC-2.
ALLOWANCE FOR SUPERIMPOSED DEAD LOADS 1.7kPa (serviceability)
TRAFFIC BARRIERS 'LOW PERFORMANCE' LEVEL.

WATERWAY DATA (EXCLUDING AFFLUX):

ANNUAL EXCEEDENCE PROBABILITY (%)	FLOW m^3/s	VELOCITY (AVERAGE) m/s	WATER LEVEL (excl AFFLUX) RL (m)	ULTIMATE LOAD FACTOR γ_{WF}
5		max. 3	≈12.0	1.0
1		max. 3	≈12.25	1.3
0.05		max. 3	≈15.25	1.3

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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ACN: 140 182 476 ABN: 78 210 078 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
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Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
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Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

COVER SHEET

Project Number	24_010
Sheet	1 OF 25
Issue	P1
Drawing Number	24_010-G001

W:\Jobs\2024 Jobs\24_010 Tatham Bridges\Spring Gully\Quickway\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:23:04 PM

GENERAL:

G1. DESIGN SPECIFICATIONS: AS5100-2017 EXCEPT WHERE NOTED

G2. PRODUCT TRADE NAMES HAVE BEEN USED TO ESTABLISH A QUALITY REQUIREMENT NO SUBSTITUTIONS SHALL BE MADE WITHOUT WRITTEN APPROVAL.

G3. RESPONSIBILITY FOR DESIGN CERTIFICATION OF ITEMS SHOWN ON THESE DRAWINGS:
- ALL STRUCTURAL ELEMENTS: PETER LOWNDES CONSULTING ENGINEER.

G4. DRAWINGS TO BE READ IN CONJUNCTION WITH:
- GEOTECHNICAL REPORT: REGIONAL GEOTECHNICAL SOLUTIONS REPORT REF. NO. RGS32900.1-AB DATED JANUARY 2022

G5. EXTENTS OF SUPPLIED GEOTECHNICAL INFORMATION:
GENERAL INDICATION ONLY OF THE CONDITIONS LIKELY TO BE ENCOUNTERED.
GROUND CONDITIONS COULD VARY.

G6. ENGINEERING DESIGN IS BASED ON SURVEY SUPPLIED BY: RICHMOND VALLEY COUNCIL
IMPORTANT SURVEY NOTES:
- DESIGN USES DATA TERRAIN MODEL COMPUTER GENERATED FROM THE SITE SURVEY.
- SOME ELEMENTS OF THE SURVEY DATA ARE INTERPOLATED AND MAY VARY FROM THE ACTUAL SITE CONDITIONS.
- CONTRACTOR SHALL LIAISE WITH THE SURVEYOR AND SET OUT THE WORKS ONLY FROM APPROVED BENCHMARKS.

G7. CONSTRUCTION TO BE SET OUT USING FOLLOWING SURVEY INFORMATION:
BENCHMARKS PROVIDED BY RICHMOND VALLEY COUNCIL'S SURVEYOR.

G8. CONTRACTOR TO OBTAIN APPROVAL FOR FULL EXTENT OF VEGETATION CLEARING BEFORE COMMENCING WORKS.

G9. CONTRACTOR TO MAINTAIN 'AS CONSTRUCTED' RECORDS TO FOLLOWING STANDARD:
COUNCIL'S 'AS CONSTRUCTED' REQUIREMENTS

G10. CURRENT EDITION OF STANDARDS (AT TIME OF CONSTRUCTION) TO BE USED, UNO.

DIMENSIONS / LEVELS:

L1. REDUCED LEVELS, CHAINAGES AND COORDINATES ARE ALL IN METRES.

L2. ALL OTHER DIMENSIONS ARE IN MILLIMETRES.

L3. ALL LEVELS ARE TO LOCAL SITE DATUM ONLY

L4. ALL COORDINATES ARE TO LOCAL GRID DATUM ONLY

L5. DIMENSIONS SHALL NOT BE SCALED FROM DRAWINGS.

L6. BRIDGE LEVELS AND SETOUT POINTS ARE TO BE CONFIRMED ON SITE BY A REGISTERED SURVEYOR PRIOR TO CONSTRUCTION. ADVISE ANY DISCREPANCY BEFORE PROCEEDING.

EXISTING SERVICES:

ES1. LOCATE SERVICES BEFORE STARTING: SERVICE LOCATIONS SHOWN ON DRAWINGS ARE APPROXIMATE ONLY.

ES2. POTHOLE AND PROTECT SERVICES: ACCURATELY LOCATE SERVICES ADJACENT TO BRIDGE STRUCTURE BEFORE COMMENCING CONSTRUCTION. PROTECT SERVICES FROM DAMAGE.

TEMPORARY WORKS:

T1. OBTAIN DESIGN AND INSTALLATION CERTIFICATION FOR TEMPORARY WORKS:
STRUTS, PROPPING, TIE BACKS, EXCAVATION SHORING, PROTECTION WORKS, DE-WATERING SYSTEMS, FORMWORK, EARLY LOADING OF STRUCTURES AND THE LIKE.

T2. INSTALL SUITABLE AND STRONG BARRIERS FOR THE PROTECTION AND SAFEGUARDING OF TRAFFIC AND PEDESTRIANS.

T3. ANY TEMPORARY ROAD SURFACES TO BE TRAFFIC-ABLE AT ALL TIMES AT LOW SPEED (30 km/hr). POTHOLES, ETC. TO BE MONITORED AND REPAIRED.

DEMOLITION OF EXISTING BRIDGE:

DB1. DISMANTLE EXISTING BRIDGE SUPERSTRUCTURE. STACK GOOD TIMBER ON SITE FOR COUNCIL. CONTRACTOR TO DISPOSE OF REMAINDER.

DB2. CUT EXISTING HARDWOOD PILES OFF AT EXISTING GROUND LEVEL.

PROGRAM AND CONSTRUCTION CONSTRAINTS:

PR1. CONSTRUCTION CONSTRAINTS:
- ALLOW FOR LIKELIHOOD OF FLOODING WITHIN THE CREEK:
PROTECT CONSTRUCTION EQUIPMENT AND WORKS
- PROGRAM CONSTRUCTION WORKS TO OCCUR DURING DRY WINTER MONTHS (JUNE TO SEPTEMBER), TO REDUCE LIKELIHOOD OF FLOODING

PR2. PROVIDE WORK SCHEDULE AND CONSTRUCTION SITE PLAN INDICATING ACCESS, PROTECTIVE FENCING, BARRIERS, BOARDING'S, SIGNAGE AND SEDIMENT & EROSION CONTROL.

PR3. PROVIDE A TRAFFIC MANAGEMENT PLAN INCORPORATING:
- RICHMOND VALLEY COUNCIL REQUIREMENTS
- DETAILS OF PUBLIC NOTIFICATION PROPOSALS (IN ACCORDANCE WITH PROJECT SPECIFICATION)
- PROVISION TO ADVISE THE SUPERINTENDENT OF ALL IMPENDING CHANGES TO TRAFFIC CONDITIONS
- INFORMATION SIGNAGE FOR ALTERED TRAFFIC CONDITIONS INCLUDING TRAFFIC DETOURS AND ACCESS FOR PRIVATE PROPERTIES.
- CONTACT DETAILS OF PERSON RESPONSIBLE FOR MAINTENANCE OUTSIDE WORKING HOURS.
- DETAILS OF PROPOSED SIGNAGE LAYOUTS, INCLUDING REQUIREMENTS FOR NIGHT WORK AND TEMPORARY DIRECTION.

PR4. PROVIDE COMMENCEMENT NOTICE, OPERATIONAL WORKS SIGNAGE AND COMPLETION NOTICE AS REQUIRED BY THE ENVIRONMENTAL APPROVALS.

DESIGN LOADINGS / PARAMETERS:

D1. CONCRETE UNIT WEIGHT (INCL. REINFORCING): 25.5 kN/m^3

D2. ASPHALT UNIT WEIGHT: 24.5 kN/m^3

D3. TRAFFIC LOADING:
STANDARD HIGHWAY LOADING: SM1600, W80, A160 AS PER AS5100-2017

D4. ALLOWANCE FOR SUPERIMPOSED DEAD LOADS: 1.7 kPa (SERVICEABILITY)

D5. MINIMUM DESIGN LATERAL LOADING: 500 kN

D7. DESIGN LIFE: 100 YEARS FOR ALL CONCRETE ELEMENTS

D8. AVERAGE BRIDGE TEMPERATURE RANGES: +45°C, -5°C

D9. AVERAGE BRIDGE TEMPERATURE: 20-25 °C FOR SETTING BEARINGS AND JOINTS.

D10. WATERWAY/FLOOD DATA (EXCLUDING AFLUX):
HYDROLOGY/HYDRAULIC DATA TAKEN PRELIMINARY CALCULATIONS ONLY.
- AEP 5 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.0 m, γw=1.0
- AEP 1 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.25 m, γw=1.3
- AEP 0.05 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈15.25 m, γw=1.3

D11. THE FOLLOWING MAXIMUM SCOUR HAS BEEN CONSIDERED FOR BRIDGE ABUTMENT/PIER DESIGN:
ABUTMENT SCOUR TO APPROX. 2m
ABUTMENTS A & B - SCOUR PROTECTION SIZED TO ARI100 FLOOD VELOCITIES
PIER SCOUR TO APPROX. 3m

D12. DESIGN GUST WIND SPEED (ULTIMATE): V_{SITE} = 63 m/s; (TERRAIN CATEGORY 2; REGION B)

D13. EARTHQUAKE: BEDC-2

D14. PROBABILITY FACTOR: k_p = 1.0
SEISMIC HAZARD FACTOR: z = 0.08

D15. DESIGN LANE WIDTH: 3.2m

D16. ROAD DESIGN SPEED AS FOLLOWS: - ALL: 100 km/h

D17. DESIGN TRAFFIC VOLUMES: - CURRENT AADT:

D18. BRIDGE TRAFFIC BARRIERS: 'LOW PERFORMANCE' PERFORMANCE LEVEL (DETERMINED IN ACCORDANCE WITH AS5100)

STANDARD SPECIFICATIONS:

TRANSPORT FOR NEW SOUTH WALES (TfNSW) SPECIFICATIONS
R44 *EARTHWORKS*
B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*
B50 *DRIVEN REINFORCED CONCRETE PILES*
B53 DRIVEN H-SECTION STEEL PILES
B58 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITH PERMANENT STEEL CASINGS*
B59 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITHOUT PERMANENT STEEL CASINGS*
B80 *CONCRETE WORK FOR BRIDGES*
B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B150 *ERECTION OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B170 *SUPPLY AND INSTALLATION OF VOID FORMERS*
B201 *STEELWORK FOR BRIDGES*
B220 *PROTECTIVE TREATMENT OF BRIDGE STEELWORK*
B240 *SUPPLY OF BOLTS, NUTS, SCREWS AND WASHERS*
B264 *ERECTION OF BARRIER RAILINGS AND MINOR COMPONENTS*
B280 *UNREINFORCED ELASTOMERIC BEARING PADS AND STRIPS*
B281 *LAMINATED ELASTOMERIC BEARINGS*
B284 *INSTALLATION OF BRIDGE BEARINGS*
3552 SUBSURFACE DRAINAGE PIPE (CORRUGATED PERFORATED AND NON-PERFORATED PLASTIC)

CONSTRUCTION SEQUENCE NOTES:

BRIDGE DESIGN IS BASED ON THE CONSTRUCTION SEQUENCE AS FOLLOWS:

CS1. DEMOLISH EXISTING BRIDGE SUPERSTRUCTURE AND PIERS AND REMOVE COMPLETLEY.
CUT DOWN EXISTING BRIDGE ABUTMENTS TO LEVEL OF UNDERSIDE OF NEW ABUTMENTS.

CS2. WHERE REQUIRED, CONSTRUCT ROCKWORK RETAINING STRUCTURES AROUND ABUTMENTS

CS3. CONSTRUCT WORKING SLABS UNDER NEW ABUTMENTS AND TIE IN TO RETAINED PORTIONS OF EXISTING ABUTMENT STRUCTURES.

CS4. INSTALL PILE/ROCK ANCHOR FOUNDATIONS.

CS5. LOCALLY INSTALL ANY ADDITIONAL ROCK PROTECTION AROUND ABUTMENTS.

CS6. CONSTRUCT ABUTMENT HEADSTOCKS AND WING WALLS.

CS7. PREPARE BEARING/GROUT PADS FOR DECK UNIT ERRECTION.

CS8. ERECT DECK UNITS ON BEARINGS/GROUT PADS AND GROUT INTO PLACE. ERECT NO EARLIER THAN 30 DAYS AFTER DECK UNIT MANUFACTURE.

CS9. CONSTRUCT DECK SLAB.

CS10. BACKFILL BEHIND ABUTMENTS. BACKFILL TO OCCUR NO EARLIER THAN 7 DAYS AFTER DECK CONSTRUCTION OF DECK SLAB. BACKFILL SHALL BE UNDERTAKEN IN A MANNER SUCH THAT THE FILL DEPTHS AT THE TWO OPPOSING ABUTMENTS DO NOT VARY BY MORE THAN 600mm.

CS11. INSTALL BRIDGE TRAFFIC BARRIERS.

CS12. COMPLETE APPROACH ROAD WORKS AND REMOVE EXISTING BRIDGE STRUCTURE,

CS13. COMPLETE ROCK PROTECTION WORKS AS REQUIRED.

NOT FOR CONSTRUCTION

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Designer: PAL | Design Checked: Signed:
Drafter: PAL | Drawing Checked: Signed:
Approved By: PAL | Survey Folder Number:
Project Identifier\-\ICAD File Name:
Records File Number:

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

CLIENT:
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Casino NSW 2470

BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 1

Project Number: 24_010
Sheet: 2 OF 25
Issue: P1
Drawing Number: 24_010-S201

EARTHWORKS:

EW1. EARTHWORKS SHALL BE IN ACCORDANCE WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*.

EW2. CLEAR ALL VEGETATION FROM AREAS TO BE EXCAVATED OR FILLED. ALL RUBBISH INCLUDING DEBRIS FROM CLEARING TO BE DISPOSED IN ACCORDANCE WITH LOCAL AUTHORITY STANDARDS. BURNING NOT ALLOWED.

EW3. ALL ORGANIC MATERIAL, TOPSOIL AND UNSUITABLE SUBGRADES ARE TO BE STRIPPED FROM THE AREA TO BE FILLED AND REMOVED FROM THE SITE. SUFFICIENT TOPSOIL IS TO BE RETAINED FOR RE-SPREADING TO A MINIMUM DEPTH OF 75 mm ALL OVER THE SITE AFTER EARTHWORKS. AFTER STRIPPING AS ABOVE THE WHOLE SITE IS TO BE COMPACTED AND PROOF ROLLED TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT PRIOR TO PLACING OF EMBANKMENT.

EW4. FILLING IS TO BE CARRIED OUT IN CONTROLLED LAYERS NOT TO EXCEED 200mm DEPTH. EACH LAYER IS TO BE COMPLETELY COMPACTED TO A MINIMUM OF 95% RELATIVE DRY DENSITY FOR COHESIVE SOILS OR A MINIMUM DENSITY INDEX OF 70% FOR NON-COHESIVE SOILS AND TESTED AND APPROVED BY THE GEOTECHNICAL CONSULTANT PRIOR TO THE PLACEMENT OF THE NEXT LAYER. THE TOP 300mm OF THE ROAD SUBGRADE IS TO BE COMPACTED TO A MINIMUM OF 98% RELATIVE DRY DENSITY.

EW5. MATERIAL IN ANY PARTICULAR LAYER SHOULD BE HOMOGENOUS. IF NECESSARY, SMALL QUANTITIES OF FILL DIFFERING FROM THE REST SHOULD BE SPREAD AS A THIN LAYER OVER THE WHOLE SITE AND INCORPORATED INTO A FULL LAYER. IN A CUT/FILL SITUATION THE GEOTECHNICAL CONSULTANT MAY DIRECT THAT ANY EXISTING SOIL WITHIN 600mm OF THE FINISHED SURFACE LEVEL BE REMOVED AND REPLACED WITH FILL EQUIVALENT TO THE GENERAL FILL MATERIAL. THE MATERIAL SO REMOVED MAY, IF IT OTHERWISE MEETS THE SPECIFICATION, BE USED AS GENERAL FILL AS ABOVE.

EW6. FILL (IMPORTED OR IN-SITU) IN ROADWAYS IS TO CONSIST OF HOMOGENOUS SITE MATERIAL CONTINUOUSLY GRADED WITH A MAXIMUM PARTICLE SIZE OF 75mm, A MINIMUM CBR OF 8 AND A MOISTURE CONTENT BETWEEN -2% TO +2% OF OPTIMUM MOISTURE CONTENT AT TIME OF COMPACTION. REFER NOTES BA1, BA2 FOR BACKFILL BEHIND STRUCTURES.

EW7. ALL TESTING IS TO BE CARRIED OUT BY A NATA CERTIFIED LABORATORY.

EW8. ALL "UNCONTROLLED FILL" IDENTIFIED ON SITE SHALL BE REMOVED TO NATURAL SURFACE LEVEL AND, IF SUITABLE, REUSED AND PLACED AS SPECIFIED ABOVE.

EW9. VISIBLE SUBGRADE MOVEMENT SHALL BE ASSESSED USING A WATER TRUCK WITH A SINGLE REAR AXLE AND A GROSS MASS OF NOT LESS THAN 15 TONNES OR APPROVED SIMILAR.

LEVELLING GROUT, INJECTION EPOXY AND NON-SHRINK GROUT:

LG1. GENERAL PURPOSE SHRINKAGE COMPENSATED CEMENTITIOUS GROUT TO BE PARCHEM "CONSTRUCTION GROUT" OR APPROVED EQUIVALENT.

LG2. LEVELLING GROUT FOR BEARING PADS TO BE PARCHEM "RENDEROC BB", OR APPROVED EQUIVALENT, SUITABLE FOR 20mm – 150mm THICKNESS.

LG3. INJECTION EPOXY FOR EPOXYING OF FIXING BOLTS AND REINFORCEMENT BARS TO BE RAMSET "CHEMSET REO502", OR APPROVED EQUIVALENT. HOLES TO BE BLOWN/VACUUMED AND DRY PRIOR TO INSTALLATION OF EPOXY.

CONCRETE:

C1. CONCRETE WORKS TO BE IN ACCORDANCE WITH: TfNSW B80 *CONCRETE WORKS FOR BRIDGES*.

C2. CONCRETE STRENGTH, EXPOSURE CLASSIFICATION AND REINFORCEMENT COVER SHALL BE AS FOLLOWS:

ITEM	EXPOSURE	f'c (MPa) & AGGREGATE SIZE	REINFORCEMENT COVER (ALL FACES) (mm)	TARGET SLUMP (mm)	SURFACE FINISH
ABUTMENTS & WINGWALLS	B1	S40/20	45	100	FORMED
DECK	B1	S40/20	45	100	LIGHT BROOM
PIER PILECAP, COLUMNS & HEADSTOCK	B1	S40/20	45	100	FORMED
PRECAST PILES	B1	S50/20	40	100	FORMED
PSC BEAMS	B1	S50/20	40	100	FORMED

NOTE: N = NORMAL PLACEMENT OF CONCRETE, T = TREMIE PLACEMENT OF CONCRETE

C3. CONCRETE SHALL BE VIBRATED AS FOLLOWS:
- PRECAST ELEMENTS TO BE CAST IN RIGID FORMS AND SUBJECTED TO INTENSE VIBRATION.
- ALL OTHER CONCRETE TO BE VIBRATED UNO.

C4. CONCRETE ELEMENT EDGE FINISHING:
- CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
- NCF DENOTES NO CHAMFER OR FILLET.

C5. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER.

C6. REINFORCEMENT SHALL BE SUPPORTED TO GIVE THE CORRECT CONCRETE COVER ON CHAIRS AS FOLLOWS:
- ALL BRIDGE ABUTMENTS, PIERS AND PRECAST DECK UNITS: EXTRUDED FIBRE CONCRETE BLOCKS (60MPa MINIMUM COMPRESSIVE STRENGTH) OR STAINLESS STEEL NIBS WELDED TO THE REINFORCEMENT
- PILES IN GROUND: PLASTIC CHAIRS AND SPACERS
- ALL OTHER CONCRETE: PLASTIC CHAIRS AND SPACERS.

C7. CONSTRUCTION JOINTS SHALL BE USED ONLY AS SHOWN ON THE DRAWINGS. NO CONSTRUCTION JOINT SHOWN ON THE DRAWINGS SHALL BE OMITTED WITHOUT THE WRITTEN APPROVAL OF THE DESIGN ENGINEER.

C8. TIME FOR SAWCUTTING (WHERE SHOWN ON DRAWINGS): WITHIN 8-10 HOURS OF FINISHING WORKS.

C9. ANY CONCRETE FACE AGAINST WHICH NEW CONCRETE IS TO BE PLACED SHALL BE THOROUGHLY SCABBLED. CLEAN OFF DUST AND CONTAMINANTS BEFORE NEW POUR.

C10. FORMWORK TO REMAIN IN POSITION FOR FOLLOWING TIMEFRAMES UNO:
- SOFFITS OF SUSPENDED SLABS, BEAMS, HEADSTOCKS CONCRETE: COMPRESSIVE STRENGTH TO EXCEED 70% OF F'C AND MINIMUM CONCRETE AGE OF 7 DAYS
- SIDEFORMS: COMPLY WITH REQUIREMENTS OF AS5100.5 cl17.8 AND TIMEFRAMES DETAILED IN ITP FOR ELEMENT.

C11. LOADING OF STRUCTURES WITH COMPRESSIVE STRENGTH LESS THAN *f'c*: OBTAIN APPROVAL BEFORE APPLYING LOADS OR DESIGN & INSTALL SUITABLE PROPPING IN ACCORDANCE WITH NOTE T1.

C12. CONCRETE TO BE CURED TO THE STANDARD (SHOWN IN NOTE C1) AND BELOW REQUIREMENTS:
- ALL EXPOSED SURFACES: SPRAY WITH ALIPHATIC ALCOHOL AFTER FIRST SCREED, AND AGAIN AFTER EACH FINISHING OPERATION.

CURING PERIODS:
- ABUTMENT HEADSTOCKS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.
- BRIDGE DECK AND APPROACH SLABS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.

PREFERRED CURING METHODS:
- UNDER PLASTIC, LAPPED AND TAPED. HOSE WITH WATER ONCE DAILY UNDER PLASTIC AND RETAPE; OR
- COAT WITH FOSROC CONCURE A99 CURING COMPOUND TO TfNSW B80 cl8.4 REQUIREMENTS.
- PRECAST ELEMENTS TO BE STEAM CURED TO TfNSW B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*.

REINFORCEMENT:

R1. REINFORCEMENT SHALL CONFORM WITH TfNSW B80 *CONCRETE WORK FOR BRIDGES*. ALL REINFORCEMENT TO BE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL) CERTIFIED.

R2. REINFORCEMENT SHALL BE GRADE D500N HOT ROLLED HIGH YIELD BARS TO AS4671 UNO. WHERE R BARS ARE SPECIFIED, THESE SHALL BE ROUND BARS GRADE R250N.

R3. BAR SHAPES ARE AS SHOWN ON DRAWING

R4. HOOKS AND COGS SHALL BE IN ACCORDANCE WITH AS5100 cl 13.1.2.7.

R5. LAPS AND OTHER SPLICES IN REINFORCEMENT SHALL ONLY BE MADE AT THE POSITIONS SHOWN ON THE DRAWINGS UNLESS ALTERNATIVE OR EXTRA LOCATIONS ARE APPROVED IN WRITING BY THE SUPERINTENDENT.

R6. DO NOT CUT REINFORCEMENT TO CLEAR PENETRATION, SLEEVES OR H.D. BOLTS. DISPLACE REINFORCEMENT SLIGHTLY AS NECESSARY AND PROVIDE CORRECT COVER TO THE PENETRATION, SLEEVES OR H.D. BOLTS.

R7. SIDE AND END LAPS IN WELDED MESH REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS5100.5 cl 13.2.3.

R8. REINFORCEMENT LAP SPLICE LENGTHS (UNO ON DRAWINGS) AS FOLLOWS ♦:

EXPOSURE CLASSIFICATION	f'c (MPa)	DEFORMED BAR DIAMETER								
		N10	N12	N16	N20	N24	N28	N32	N36	N40
B1	32	350	400	550	800	1050	1350	1650	2000	2350
	40	300	350	500	750	1000	1250	1500	1800	2150
B2	40	300	350	500	650	900	1150	1400	1700	2000
	50	300	350	500	650	850	1050	1300	1600	1850
C1	50	300	350	500	600	700	950	1200	1450	1750
	≥55	300	350	500	600	700	900	1150	1400	1650
C2	≥55	300	350	500	600	700	850	1050	1300	1600

♦ FOR HORIZONTAL BARS WITH MORE THAN 300 OF CONCRETE BELOW THE ABOVE BARS, THE LAP LENGTHS IN THIS TABLE SHALL BE MULTIPLIED BY 1.3. WHERE LAPS ARE REQUIRED BUT NOT SHOWN ON THE DRAWINGS, THEY SHOULD BE STAGGERED AND POSITIONED AWAY FROM POINTS OF MAXIMUM STRESS. WHERE MORE THAN 50% OF REINFORCEMENT IS SPLICED AT POINTS OF MAXIMUM STRESS, LAP LENGTHS SHOWN IN THE TABLE ABOVE ARE TO BE MULTIPLIED BY 1.3.

R9. REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE
NF	NEAR FACE
EF	EACH FACE
EE	EACH END
NSOP	NOT SHOWN ON PLAN
NSOE	NOT SHOWN ON ELEVATION
+	LENGTH VARIES

NOT FOR CONSTRUCTION

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Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

CLIENT:
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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 2

Project Number: 24_010
Sheet: 3 OF 25
Issue: P1
Drawing Number: 24_010-S202

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ELASTOMERIC BEARING PADS/STRIPS:

EB1. ELASTOMERIC BEARING STRIPS SHALL BE UNREINFORCED NATURAL RUBBER BEARING STRIP, TYPE 60H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB2. LAMINATED ELASTOMERIC BEARING PADS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE REQUIREMENTS OF AS5100.4 cl 12 FROM TYPE 50H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB3. LAMINATED ELASTOMERIC BEARING PADS SHALL BE SUPPLIED WITH HOLES TO SUIT THE BEARING RESTRAINT PINS. HOLE SETOUT SHALL BE AS SHOWN ON THE BEARING DETAIL DRAWINGS.

EB4. STORE BEARINGS UNDER COVER UNTIL INSTALLATION. ONCE INSTALLED, KEEP PROTECTED FROM THE ELEMENTS WITH COVER SHEET UNTIL DECK UNITS INSTALLED.

INSTALLATION OF ELASTOMERIC BEARINGS

PROCEDURE AS FOLLOWS:

BI1. PREPARE BEARING GROUT PAD TO LEVEL SPECIFIED (BEARING RL MINUS BEARING THICKNESS).

BI2. IF BEARING PIN NOT CAST INTO HEADSTOCK THEN DRILL AND CHEMSET BEARING RESTRAINT PIN IN POSITION (TOP OF PIN TO BE INSTALLED 12mm ABOVE LEVEL OF GROUT PAD).

BI3. INSTALL BEARING ON TOP OF PREPARED GROUT PAD, ENSURE BEARING IS IN FULL CONTACT WITH GROUT PAD.

BI4. IMMEDIATELY PRIOR TO PLACEMENT OF GIRDER PLACE NOMINAL 5mm LAYER OF MEGAPOXY PM OVER TOP SURFACE OF BEARING.

BI5. LOWER PSC GIRDER INTO POSITION OVER BEARING UNTIL GIRDER LIGHTLY CONTACTS THE TOP SURFACE OF THE BEARING. (CONTACT DOES NOT HAVE TO OCCUR ON ALL EDGES OF BEARING, LIGHT CONTACT IS DESCRIBED AS THE FIRST POINT OF CONTACT BETWEEN THE BEARING AND GIRDER).

BI6. SUSPEND GIRDER IN THIS POSITION WITH TIMBER WEDGES. WEDGES TO REMAIN IN POSITION UNTIL MEGAPOXY PM HAS CURED (NOMINAL 24hrs AT 25°C).

BI7. REMOVE WEDGES AND INSTALL ANY PERMANENT GIRDER FIXINGS.

PRESTRESSED BEAM NOTES

PB1. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE REQUIRED TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.

PB2. REFER DWG NO. TENDER-S260 FOR MASS OF BEAMS

PB3. DURING STORAGE, TRANSPORT AND HANDLING, KEEP BEAM UPRIGHT AND SUPPORTED AT NOT MORE THAN 600 mm FROM EACH END.

PB4. PROVIDE SUITABLE LIFTING DEVICES NOT FURTHER THAN 600mm FROM BEAM ENDS.

PB5. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT TRANSFER 40MPa.

PB6. STRANDS AS 4672.1 – 7 WIRE ORDINARY – 15.2 – 1 750 – RELAX 2.

PB7. THE FORCE REMAINING IN EACH STRAND AT BEAM MIDSPAN IMMEDIATELY AFTER TENSIONING SHALL BE: AS SHOWN ON DWG NO. TENDER-S260

PB8. CUT STRANDS FLUSH WITH THE END OF THE BEAM AND SEAL EXPOSED STRANDS AGAINST CORROSION WITH 3 mm THICK EPOXY RESIN – MEGAPOXY H THIXOTROPIC OR EQUIVALENT.

PB9. REFER DWG NO. TENDER-S260 FOR BEAM HOGS

BRIDGE TRAFFIC BARRIER NOTES:

SB1. DIMENSIONS ARE GIVEN TO THE NEAREST MILLIMETER AFTER FABRICATION.

SB2. STEELWORK SHALL BE FABRICATED TO THE REQUIREMENTS OF TfNSW B201.

SB3. RHS AND SHS TO BE GRADE C450LO TO AS/NZS 1163.

SB4. STEEL PLATE TO AS/NZS 3678.

SB5. FLAT BAR TO BE GRADE 300 TO AS/NZS 3679.1.

SB6. BOLTS CLASS 8.8, NUTS CLASS 8 AND WASHERS FOR CLASS 8.8 BOLTS SHALL BE FABRICATED IN ACCORDANCE WITH TfNSW B240 AND AS/NZS 1252, THIN NUTS CLASS 5 TO AS 1112.4.

SB7. THE EXPOSED END OF THREADED BAR SHALL HAVE THE ORIGINAL GALVANIZING FINISH.

SB8. ALL THREADED BARS, BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANIZED TO AS/NZS 4680 USO.

SB9. PRIOR TO GALVANIZAING ALL WELD SPLATTER AND WELDING SLAG IS TO BE REMOVED.

SB10. MEMBERS TO BE BRANDED WITH SUITABLE TYPE NUMBER AFTER FABRICATION.

SB11. EDGES TO BE PROTECTIVE TREATED SHALL BE ROUNDED TO A RADIUS OF 1.5mm USO.

SB12. ALL WELDING TO CONFORM TO AS/NZS 1554.1.

SB13. ALL WELDS EXCEPT LOCATION TACK WELDS TO BE SP CATEGORY.

SB14. WELDING CONSUMABLES TO BE CONTROLLED HYDROGEN TYPE: G493 TO AS/NZS ISO 14341-B OR T493 TO AS/NZS ISO 17632-B USO.

SB15. DELINEATION ON THE BRIDGE TRAFFIC BARRIER SYSTEM SHALL BE INSTALLED IN THE LOCATION AND TO THE MAXIMUM SPACING SHOWN ON THE DRAWINGS. DELINEATORS SHALL BE CONSISTENT WITH THE REQUIREMENTS SPECIFIED IN TfNSW R131.

STEELWORK GENERAL:

S1. ALL STEELWORK IS TO BE IN ACCORDANCE WITH TfNSW B201 *STEELWORKS FOR BRIDGES*.

S2. FILLET WELDS SHALL BE 6mm, CATEGORY SP, UNO.

S3. ALL WELDING ELECTODES TO BE E4916, E4918 OR W50X TO AS 4855, UNO.

S4. ALL STEELWORK, UNLESS OTHERWISE NOTED, SPECIFIED OR APPROVED, SHALL BE HOT DIP GALVANISED AFTER FABRICATION TO AS 4680. HIGH STRENGTH STRUCTURAL BOLTS (GRADE 8.8) TO BE UTILISED UNO. ALL BOLTS, NUTS AND WASHERS TO BE HOT DIP GALVANISED TO AS 1214 UNO.

BACKFILLING BEHIND ABUTMENTS:

BA1. BACKFILL MATERIAL SHALL BE AS FOLLOWS:
- BEHIND HEADSTOCKS, WINGWALLS AND RETAINING WALLS: FREE-DRAINING GRANULAR MATERIAL COMPLYING WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS* cl 6.2.2.
- COMPACTION SHALL BE IN ACCORDANCE WITH TfNSW B30 cl 6.4.

BA2. WITHIN 1m OF WALLS AND HEADSTOCKS: PLACE IN LAYERS NOT EXCEEDING 100mm AND COMPACT TO 95% RELATIVE COMPACTION (70% MINIMUM DENSITY INDEX IN SAND) USING A HANDHELD VIBRATING PLATE COMPACTOR OR EQUAL. LARGE COMPACTION EQUIPMENT IS NOT PERMITTED IN THESE ZONES.

ROCK FACING:

ROCK GRADING		
	MIN	MAX
D15	280	395
D50	430	520
D85	595	700
D100		915

RF1. ROCK SHALL BE WELL GRADED WITH NOT LESS THAN 50% LARGER THAN A SIZE TWICE THE MINIMUM SIZE SPECIFIED.

RF2. ROCK SHALL BE CLEAN, HARD, DENSE AND DURABLE IGNEOUS OR METAMORPHIC ROCKS.

RF3. ROCK SHALL BE RESISTANT TO WEATHERING, FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER.

RF4. ROCK THAT IS LAMINATED, FRACTURED, POROUS, WITH DISCONTINUITIES OR OTHERWISE PHYSICALLY WEAK SHALL NOT BE USED.

RF5. THE BREADTH OF THICKNESS OF A SINGLE STONE SHALL NOT BE LESS THAT ONE-THIRD ITS LENGTH.

RF6. ROCK PROTECTION SHALL BE CONSTRUCTED IN THE LOCATIONS AND IN ACCORDANCE WITH THE DRAWINGS.

RF7. ROCK PROTECTION SHALL HAVE A UNIFORM APPEARANCE OVERALL AND SHALL NOT HAVE NOTICEABLE IRREGULARITIES IN HORIZONTAL AND VERTICAL ALIGNMENTS.

RF8. ROCK PROTECTION SHALL BE PLACED IN A MANNER WHICH ENSURES THAT THE LARGER ROCKS ARE UNIFORMLY DISTRIBUTED THROUGHOUT THE PROTECTION WORK AND THAT THE SMALLER ROCKS EFFECTIVELY FILL THE SPACES BETWEEN THE LARGE ROCKS WITHOUT LEAVING ANY LARGE VOIDS.

RF9. THE LAYERS OF PLACED ROCK SHALL BE OF EVEN THICKNESS AND OF EVEN GRADING.

NOT FOR CONSTRUCTION

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Drafter: PAL | Drawing Checked: Signed:
Approved By: PAL | Survey Folder Number:
Project Identifier\-\CAD File Name:
Records File Number:
Design Certifier Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 3

Project Number: 24_010
Sheet: 4 OF 25
Issue: P1
Drawing Number: 24_010-S203

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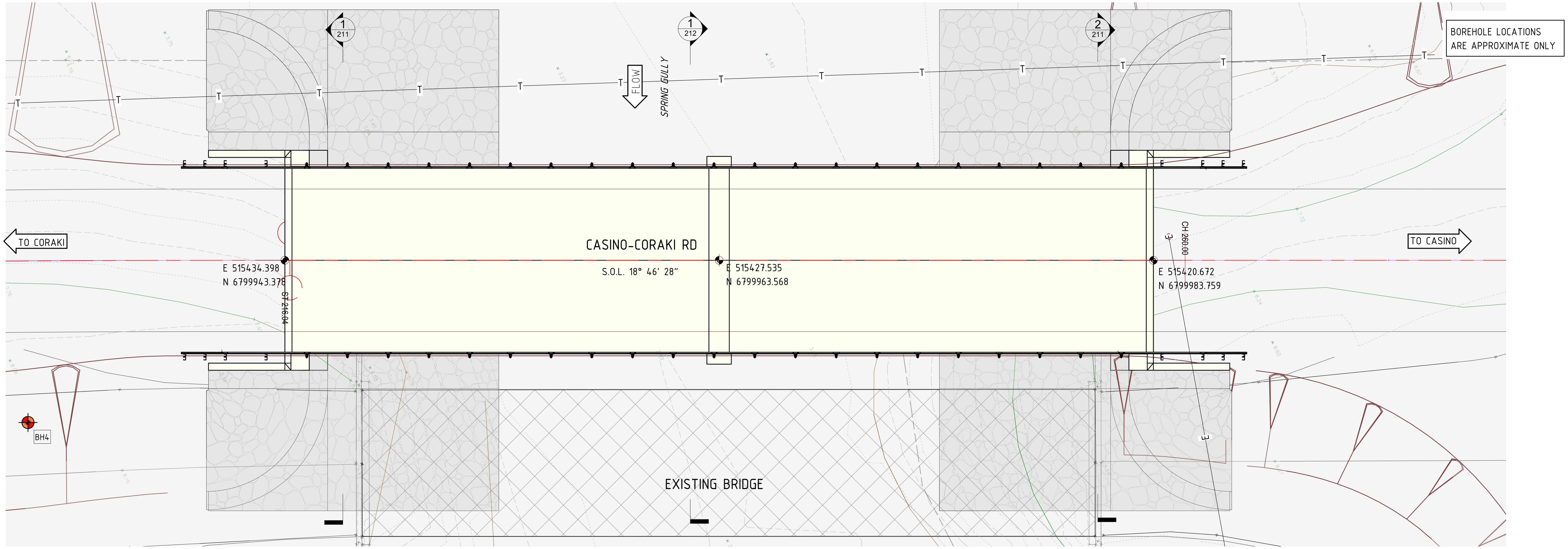
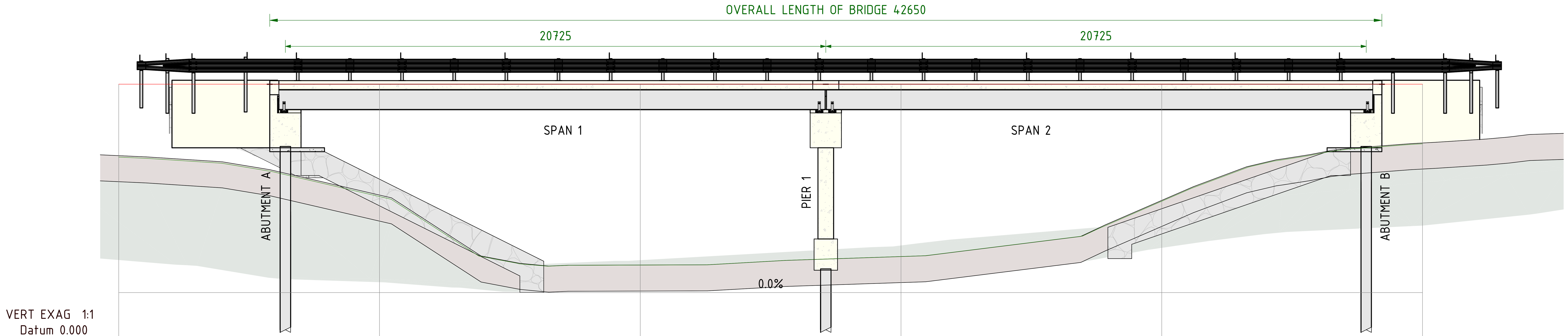


1 / 210 **PLAN**
SPRING GULLY BRIDGE | 1 : 100



DEPTH	2.799	3.392	4.313	6.944	6.615	4.493	2.289
DESIGN LEVELS	10.000	10.000	10.000	10.000	10.000	10.000	10.000
EXISTING LEVELS	7.201	6.608	5.687	3.056	3.385	5.507	7.711
CHAINAGE	210.000	216.040	220.000	230.000	240.000	250.000	260.000

2 / 210 **SECTION**
1 : 100

GENERAL NOTES

SCALES AS SHOWN.
DIMENSIONS ARE IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE RELATED TO AHD DATUM.

LEGEND

Ⓕ DENOTES FIXED BEARING.

NOT FOR CONSTRUCTION

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Designer	Design Checked
PAL	Signed:
Drafter	Drawing Checked
PAL	Signed:
Approved By	Survey Folder Number
PAL	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

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Bar Scales: 1:100 0 500 1000 1500 2000 2500 500 250
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BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

GENERAL ARRANGEMENT

Project Number	Sheet	Issue	Drawing Number
24_010	5 OF 25	P1	24_010-S210

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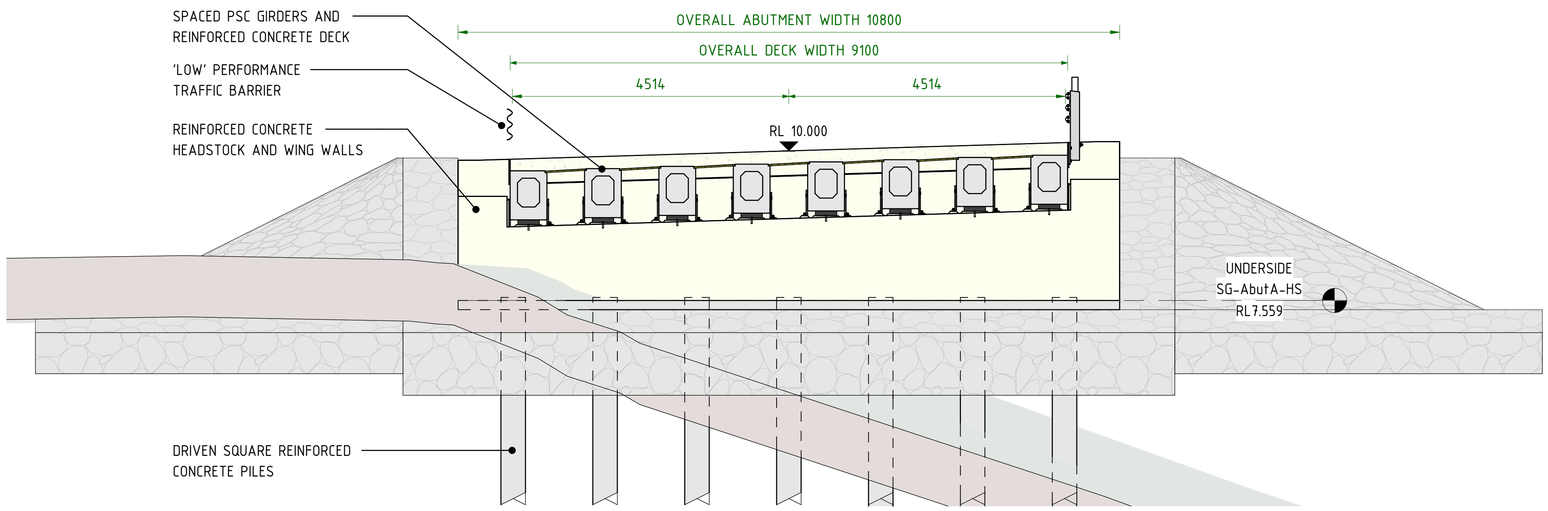
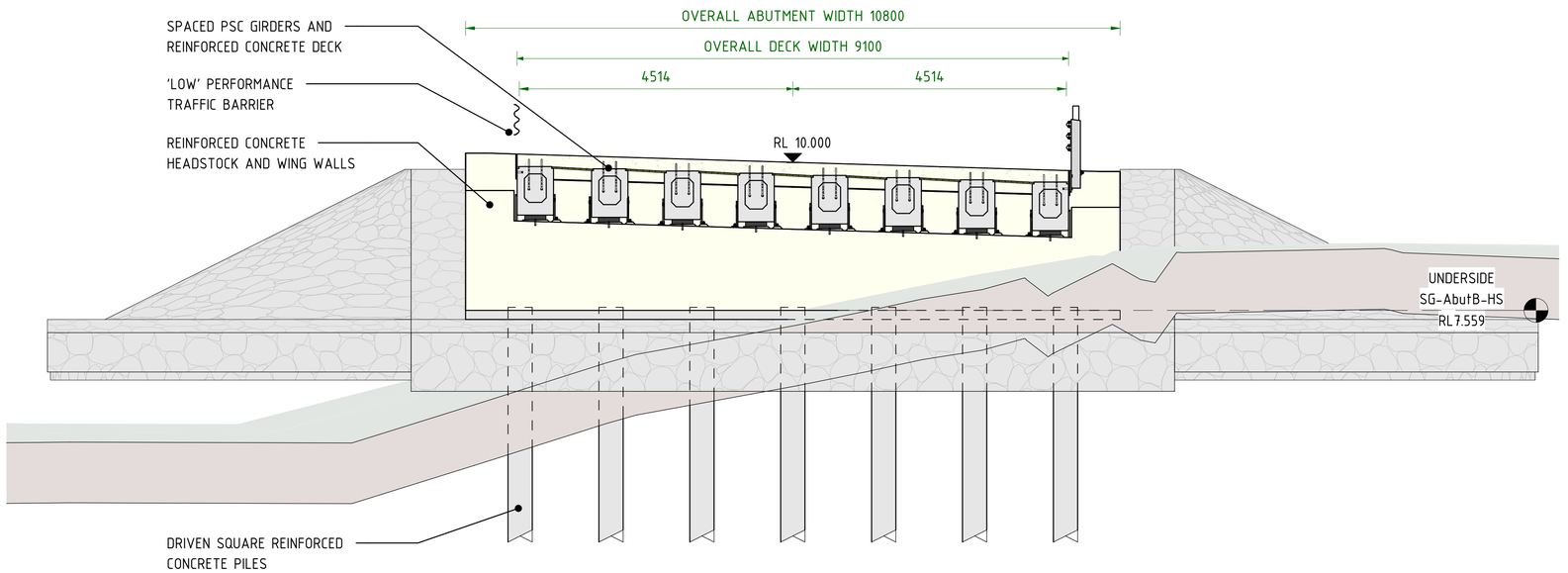


1 / 211 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT A | 1 : 50



2 / 211 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT B | 1 : 50

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Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

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Bar Scales: 1:50 0 250 500 750 1000 1250 / 250 125
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BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 1

Project Number: 24_010
Sheet: 6 OF 25
Issue: P1
Drawing Number: 24_010-S211

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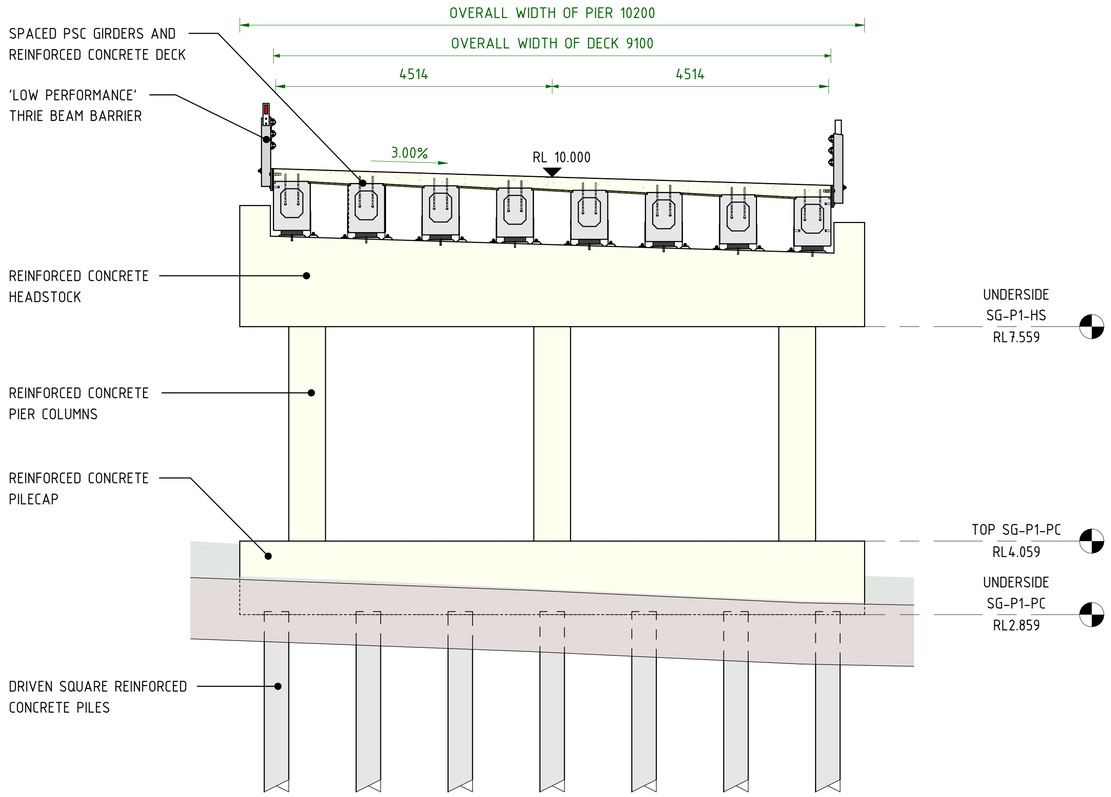

1 / 212 TYPICAL SECTION
SPRING GULLY BRIDGE - PIER | 1 : 50

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P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

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1:50 0 250 500 750 1000 1250
250 125

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BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 2

Project Number: 24_010
Sheet: 7 OF 25
Issue: P1
Drawing Number: 24_010-S212

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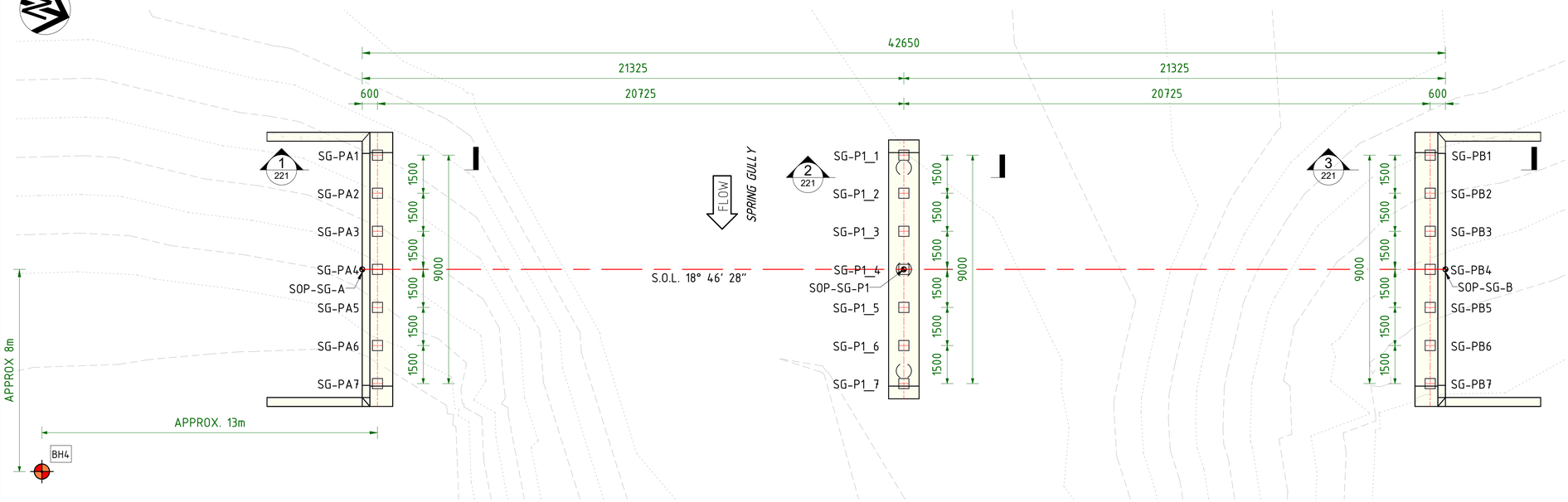
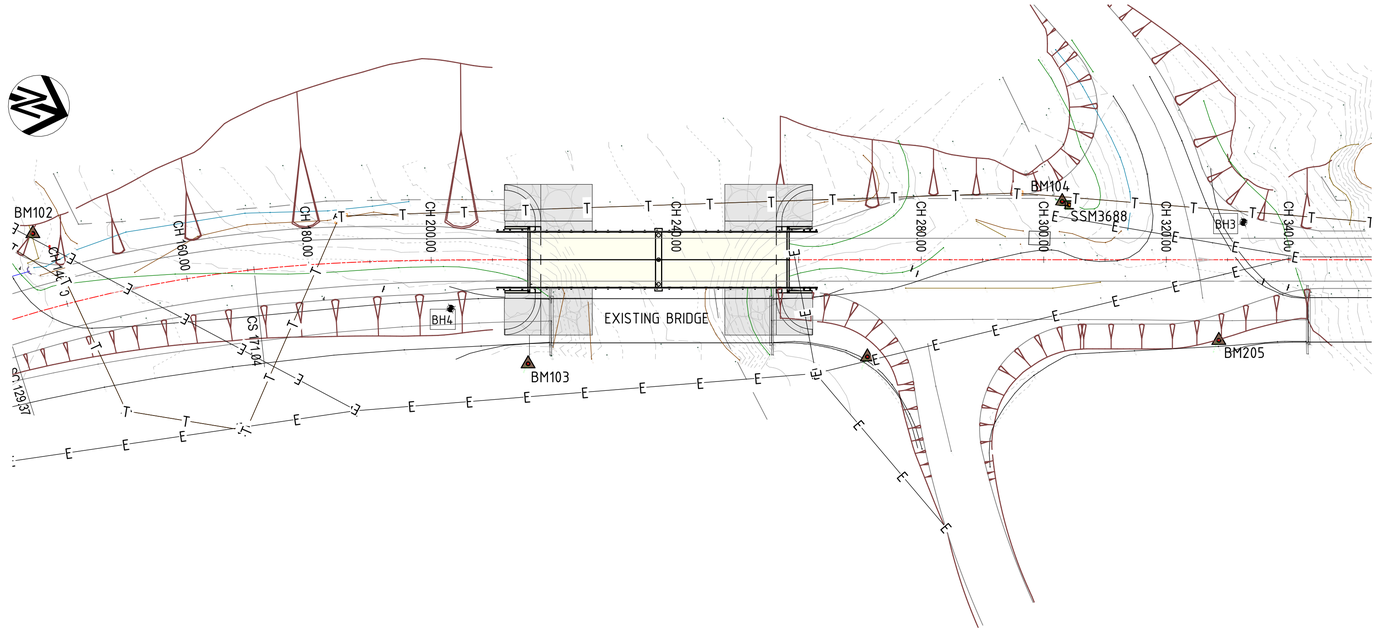


1/220 SETOUT PLAN
1 : 100



2/220 SITE PLAN
1 : 500

SURVEY MARKS & SETOUT POINTS

MARK	EASTINGS	NORTHINGS	RL (m)	COMMENTS
BM101	515549.355	6799753.501	10.319	STPOST
BM102	515456.366	6799865.493	8.802	STPOST
BM103	515450.467	6799948.870	7.953	STPOST
BM104	515397.333	6800022.904	9.311	STPOST
BM105	515373.478	6800175.686	7.736	STPOST
BM204	515431.572	6800000.953	8.607	SPK IN BIT
BM205	515410.559	6800054.401	8.733	SPK IN BIT
BM206	515363.196	6800171.876	8.089	SPK IN BIT
SOP-SG-A	515434.398	6799943.378	10.000	
SOP-SG-B	515420.672	6799983.759	10.000	
SOP-SG-P1	515427.535	6799963.568	10.000	

BOREHOLE 4

(RL8.150)

0.0 m	FILL - sandy CLAY (CL) low plasticity, brown and orange-brown, with fine to coarse grained gravel and cobbles	SPT (1.0) 13, 10, 8 N*=18
1.0 m	FILL - sandy CLAY (CL) low plasticity, dark brown, fine to coarse grained gravel with cobbles and boulders	SPT (2.5) 1, 2, 4 N*=6
4.0 m		SPT (5.5) 0, 2, 2 N*=4
	Silty CLAY (CH) - high plasticity, grey, orange-brown	SPT (8.5) 3, 4, 6 N*=10
		SPT (11.5) 0, 2, 2 N*=4
14.5 m	Silty CLAY (CH) - high plasticity, grey, orange-brown with shell fragments	SPT (14.5) 2, 3, 5 N*=8
16.5 m	Silty CLAY (CH) - medium plasticity, grey and brown, trace fine grained sand	SPT (17.5) 3, 5, 7 N*=12
19.0 m	Silty CLAY (CH) - medium plasticity, grey and brown, trace fine grained sand	SPT (20.5) 3, 4, 5 N*=9
23.0 m		SPT (23.5) 3, 4, 6 N*=10
	SAND (SP) - fine to medium grained, brown, trace clay fines	SPT (26.5) 3, 6, 10 N*=16
29.0 m		SPT (29.5) 3, 3, 6 N*=9
	Sandy CLAY (CL) - medium plasticity, dark grey-brown, fine to medium grained sand	
32.2 m	Sandy CLAY (CL) - medium plasticity, dark grey-brown, fine to medium grained sand	SPT (32.5) 11, 15, 22 N*=37
	BASALT - dark grey, with some calcite inclusions	
35.0 m	EXTREMELY WEATHERED BASALT - sandy CLAY, low plasticity, grey-brown, fine to medium grained	SPT (35.5) 24, 16, 0/50mm N*=R
35.8 m	BASALT - dark grey, vesicular (vesicules up to 30mm, some clay infill)	
36.7 m	BASALT - dark grey, vesicular (vesicules up to 30mm, some clay infill)	
39.2 m		

3/220 BOREHOLE LOGS
1 : 100

GENERAL NOTES

DIMENSIONS IN MILLIMETERS.
CO-ORDINATES ARE TO MGA.
REDUCED LEVELS TO AHD (m).

NOT FOR CONSTRUCTION

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1:500 0 2500 5000 7500 10000 12500 / 2500 1250
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BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

SETOUT AND PILING DETAILS - SHEET 1

Project Number: 24_010
Sheet: 8 OF 25
Issue: P1
Drawing Number: 24_010-S220

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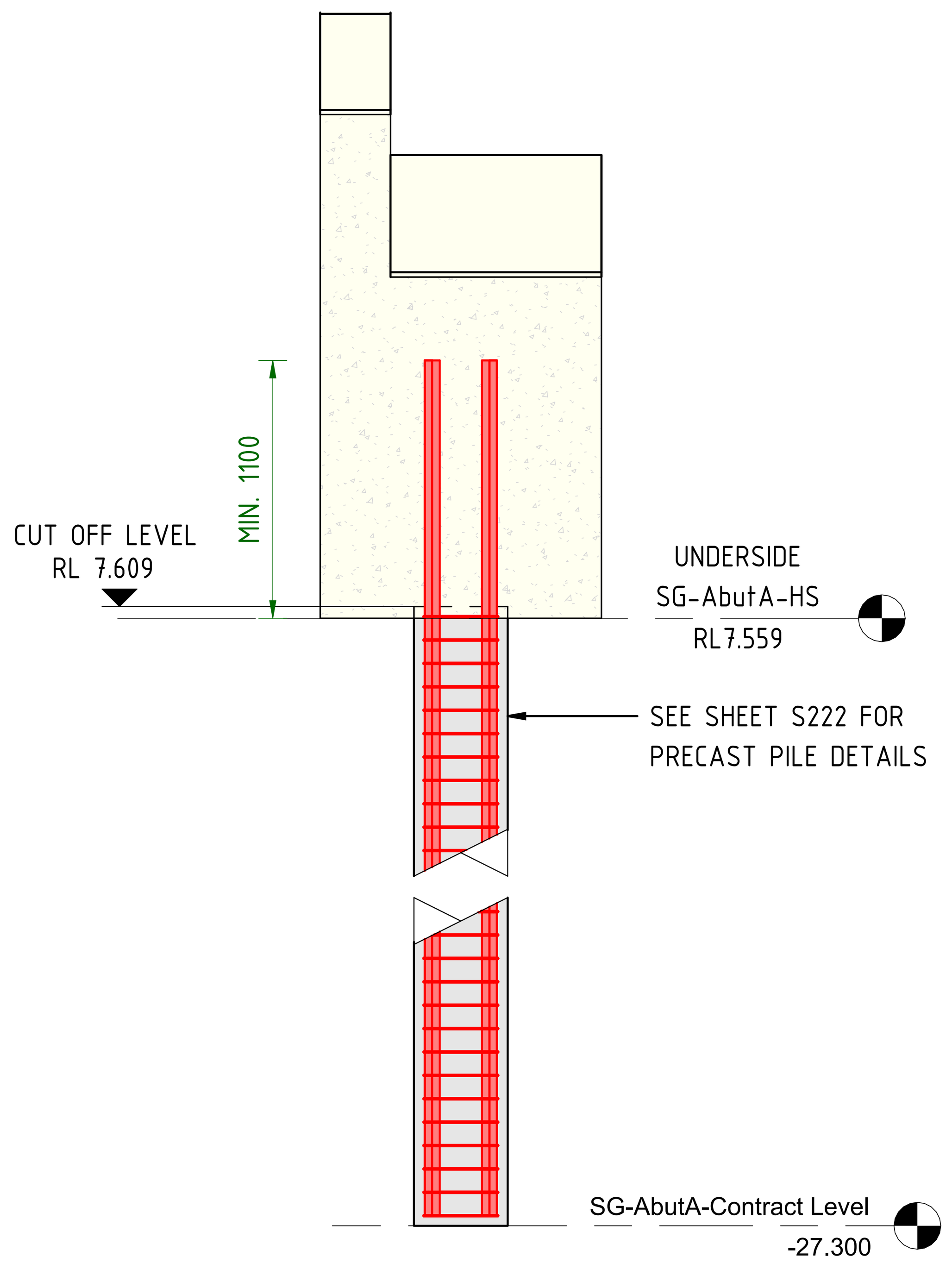
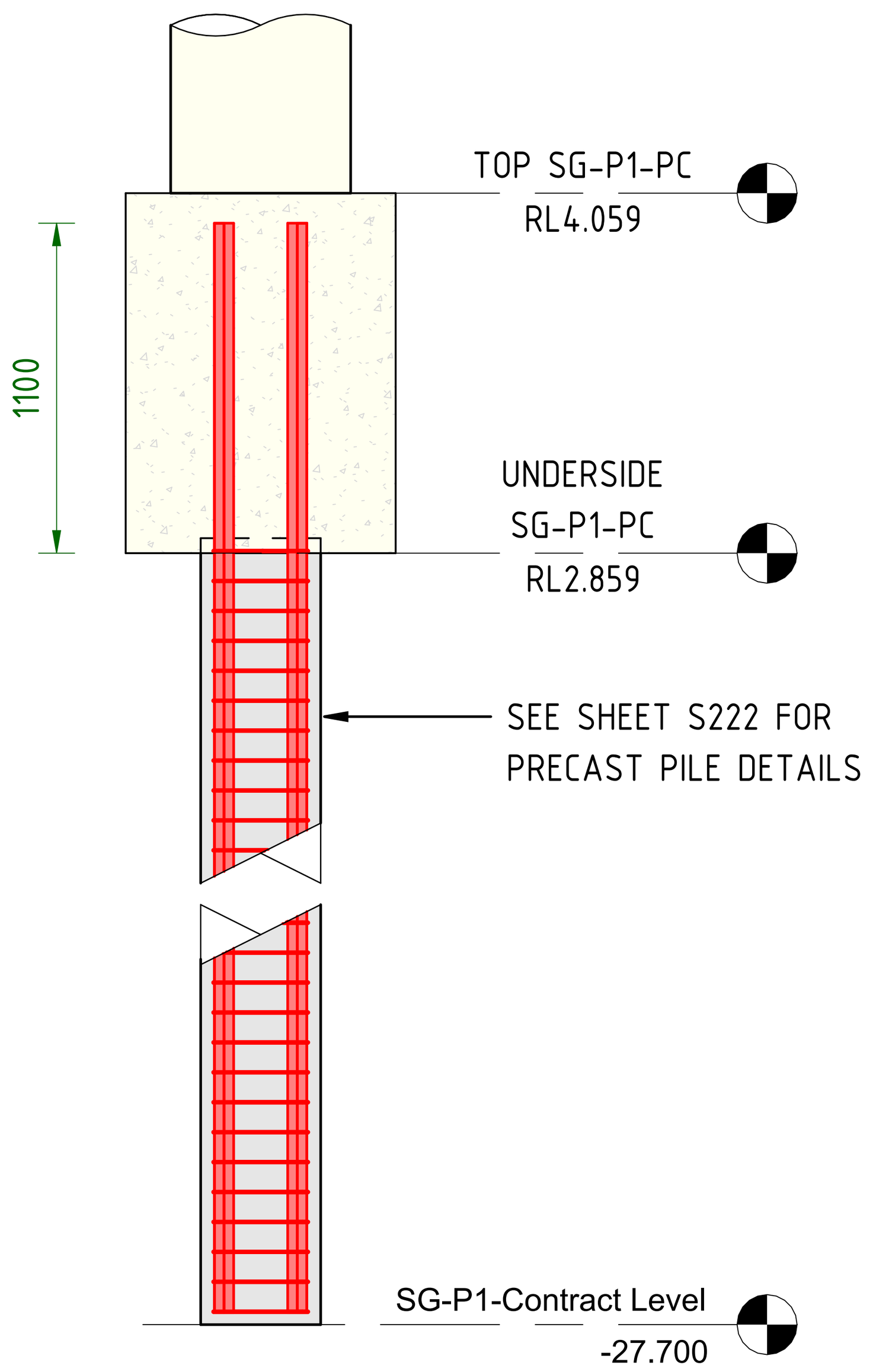
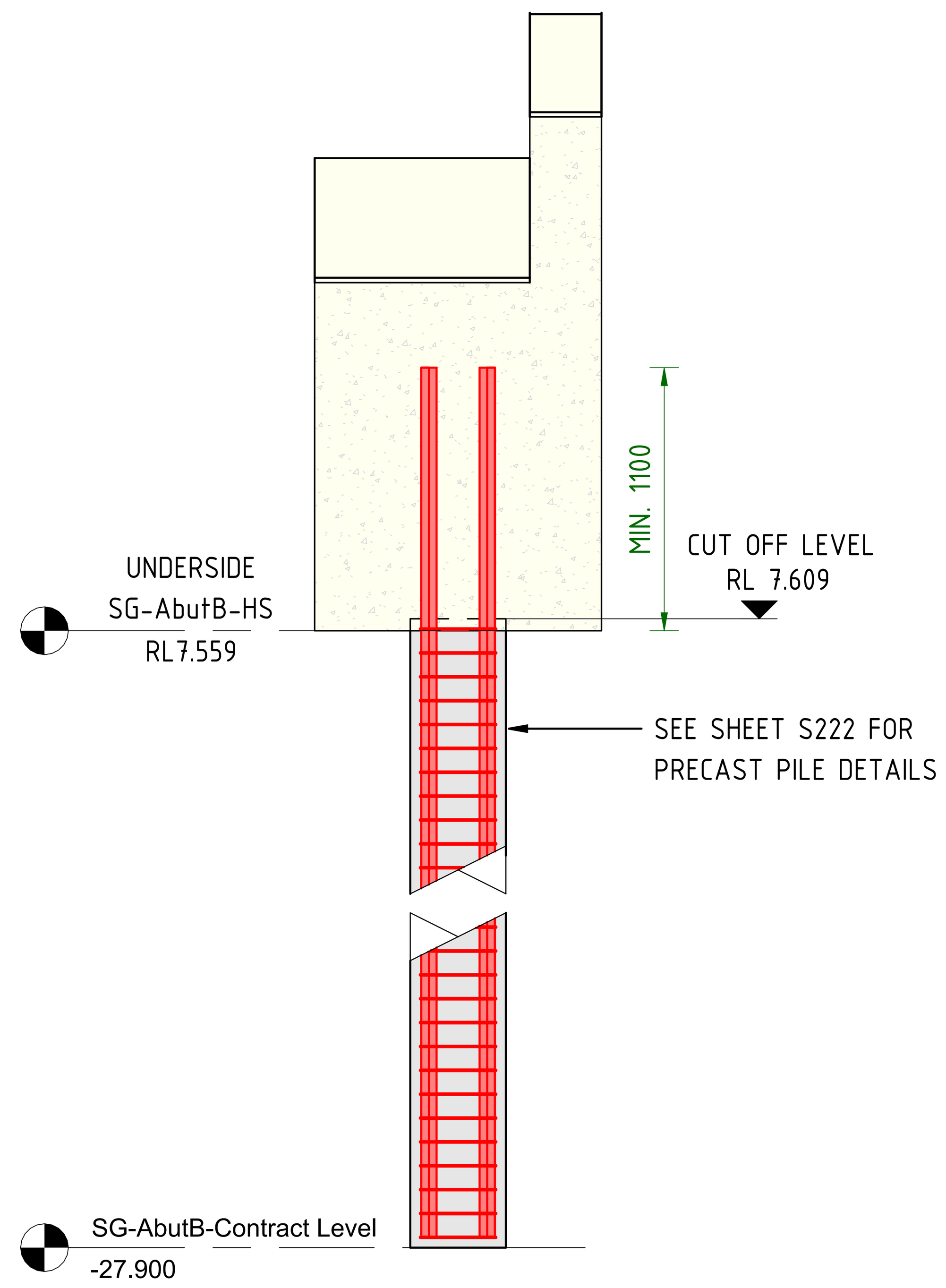


1/221 SECTION
ABUTMENT A | 1 : 25



2/221 SECTION
PIER 1 | 1 : 25



3/221 SECTION
ABUTMENT B | 1 : 25

TABLE 1 - DRIVEN PILE DETAILS

MARK	EASTINGS	NORTHINGS	PILE TYPE	DESIGN LOADS: VERTICAL LOADS Max[1] (kN)	DESIGN LOADS: VERTICAL LOADS Min[1] (kN)	DESIGN LOADS: Lateral (kN)	DESIGN LOADS: Bending Longitudinal (kN.m)	DESIGN LOADS: Bending Lateral (kN.m)	CUTOFF LEVEL[2]	DESIGN FOUNDING LEVEL[3]	DRIVEN LENGTH (m)	ACTUAL HAMMER WEIGHT (T)	FINAL DROP HEIGHT (m)	PILE SET/TC AT END OF DRIVE (PER 10 BLOWS)	ACTUAL TOE LEVEL (m)
SG-P1_1	515423.274	6799962.120	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_2	515424.695	6799962.603	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_3	515426.115	6799963.085	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_4	515427.535	6799963.568	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_5	515428.955	6799964.051	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_6	515430.375	6799964.534	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-P1_7	515431.796	6799965.016	400 SQ RC DRIVEN PILE						2.909	-27.700	30.609				
SG-PA1	515429.945	6799942.498	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA2	515431.365	6799942.980	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA3	515432.785	6799943.463	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA4	515434.205	6799943.946	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA5	515435.625	6799944.429	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA6	515437.046	6799944.911	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PA7	515438.466	6799945.394	400 SQ RC DRIVEN PILE						7.609	-27.300	34.909				
SG-PB1	515416.604	6799981.742	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB2	515418.024	6799982.225	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB3	515419.445	6799982.708	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB4	515420.865	6799983.190	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB5	515422.285	6799983.673	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB6	515423.705	6799984.156	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				
SG-PB7	515425.125	6799984.639	400 SQ RC DRIVEN PILE						7.609	-27.900	35.509				

IMPORTANT DRIVEN PILE NOTES:
FOUNDING LEVELS ARE INDICATIVE ONLY.

[1] VERTICAL LOADS DO NOT INCLUDE DYNAMIC IMPACT
[2] CUTOFF LEVEL IS GIVEN AS 50mm ABOVE UNDERSIDE OF HEADSTOCKS
[3] FOUNDING LEVEL ASSUMED FOR PILES DRIVEN TO REFUSAL. REFUSAL SHALL BE TAKEN AS 20mm SET IN 10 BLOWS (2mm/BLOW) OR LESS, AT 30kJ DRIVING ENERGY.

GENERAL NOTES

DIMENSIONS IN MILLIMETERS.
CO-ORDINATES ARE TO MGA.
REDUCED LEVELS TO AHD (m).

DRIVEN PILE NOTES

DRIVEN PILES ARE TO BE FOUNDED ON EW/SW BASALT STRATA MATERIAL AS DESCRIBED IN THE GEOTECHNICAL REPORT.
DRIVEN PILES ARE TO BE DRIVEN TO THE NOMINATED LEVELS.
IF APPROVED, DRIVING PILES MAY CEASE AT SETS CORRESPONDING TO R_{UT}, WHICH SHALL BE DETERMINED BY DIVIDING THE DESIGN LOAD BY AN APPROVED GEOTECHNICAL STRENGTH REDUCTION FACTOR ΦG IN ACCORDANCE WITH AS2159.
THE MINIMUM NET DRIVING ENERGY SHALL BE 15KJ
THE MAXIMUM NET DRIVING ENERGY SHALL BE 30KJ.
IF MECHANICAL SPLICES ARE USED THEY SHALL NOT BE USED ABOVE THE MAXIMUM TOE LEVEL UNLESS THEY ARE CAPABLE OF PROVIDING THE DESIGN BENDING MOMENT OF THE PILE. OTHERWISE THEY ARE NOT TO BE USED WITHIN 3M OF THE PILE CUTOFF LEVEL.

CONCRETE NOTES

DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION: ALL ABUTMENT ELEMENTS - B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 40 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

REINFORCEMENT NOTES

SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 40 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

- FF FAR FACE NF NEAR FACE
- EF EACH FACE + LENGTH VARIES
- USO UNLESS SPECIFIED OTHERWISE.
- NSOP NOT SHOWN ON PLAN.

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	620	880	1150	1450	1770	2120	2500
ALL OTHER BARS	350	480	680	890	1120	1370	1630	1930

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
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Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Designer	Design Checked
PAL	Signed:
Drafter: PAL	Drawing Checked — Signed:
Approved By: PAL	Survey Folder Number
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:25 0 125 250 375 500 625 125 63

Do not scale, use figured dimensions only

CLIENT:
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Phone: 02 6660 0300
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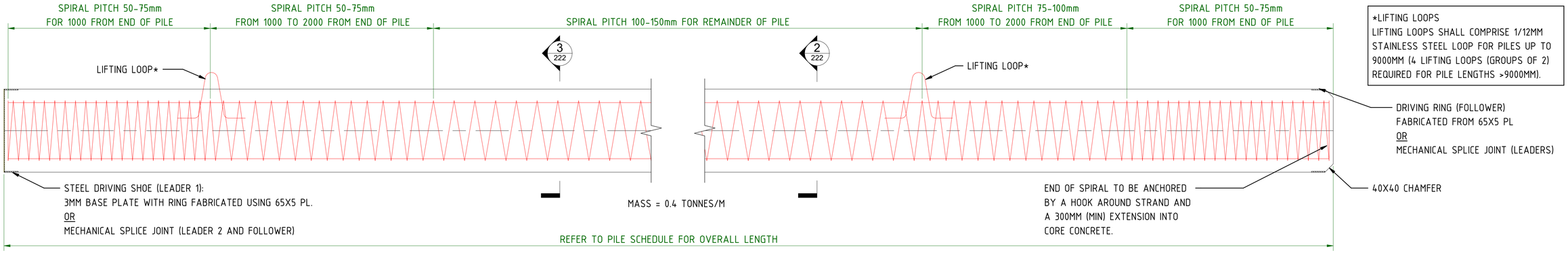
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

SETOUT AND PILING DETAILS - SHEET 2

Project Number: 24_010
Sheet: 9 OF 25
Issue: P1
Drawing Number: 24_010-S221

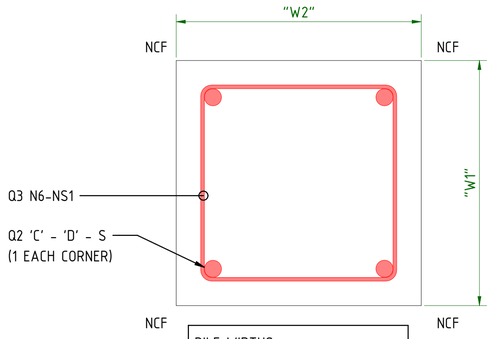


1/222 ELEVATION
PRECAST PILES | 1 : 10

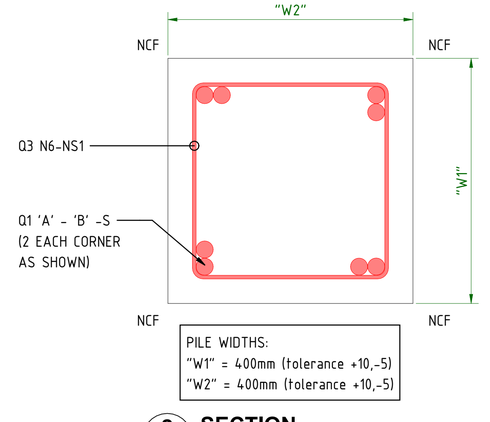
TABLE 2 - PILE CASTING DETAILS

MARK	TYPE	NO. REQUIRED OF EACH SEGMENT	DRIVEN LENGTH CUTOFF RL- CL	MIN. TOTAL CAST LENGTH REQ. (m)	LEADER 1 LENGTH (m)	LEADER 2 LENGTH (m)	FOLLOWER LENGTH (m)	BAR MARK Q1 'A'	BAR MARK Q1 'B'	BAR MARK Q2 'C'	BAR MARK Q2 'D'
SG-P1_1	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_2	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_3	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_4	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_5	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_6	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-P1_7	400mm SQ RC Driven Pile	1	30.609	32.8	12.0	12.0	9.0	4	N28	8	N32
SG-PA1	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA2	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA3	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA4	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA5	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA6	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PA7	400mm SQ RC Driven Pile	1	34.909	37.1	12.0	12.0	13.5	4	N28	8	N32
SG-PB1	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB2	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB3	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB4	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB5	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB6	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32
SG-PB7	400mm SQ RC Driven Pile	1	35.509	37.7	12.0	12.0	14.0	4	N28	8	N32

NOTE: PILE JOINTS TO BE A MECHANICAL SPLICE THAT CAN TRANSFER A MOMENT CAPACITY EQUAL TO THE LOWEST MOMENT CAPCITY OF LEADER/FOLLOWER SEGMENTS BEING JOINED.



3/222 SECTION
PILE LEADER SEGMENT | 1 : 5



2/222 SECTION
PILE FOLLOWER SEGNMENT | 1 : 5

CONCRETE NOTES
DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION:
ALL PRECAST PILES ELEMENTS - B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 50 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 40 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	610	760	910	1160	1470	1810	2180
ALL OTHER BARS	350	470	580	700	900	1130	1390	1670

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

NOT FOR CONSTRUCTION

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Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway
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Designer	PAL	Design Checked	Signed:
Drafter	PAL	Drawing Checked	Signed:
Approved By	PAL	Survey Folder Number	
Project Identifier\-\CAD File Name			
Records File Number			

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

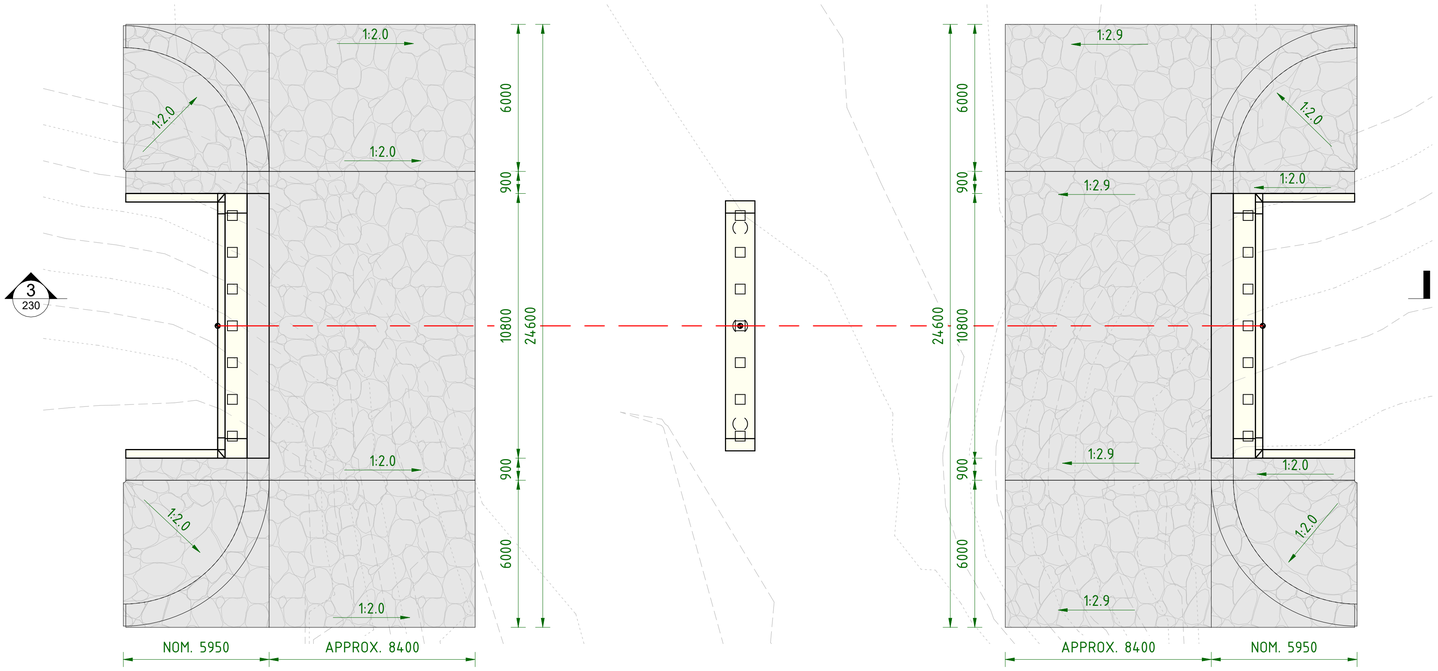
Bar Scales:
1:5 0 25 50 75 100 125 / 25 13
1:10 0 50 100 150 200 250 / 50 25
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

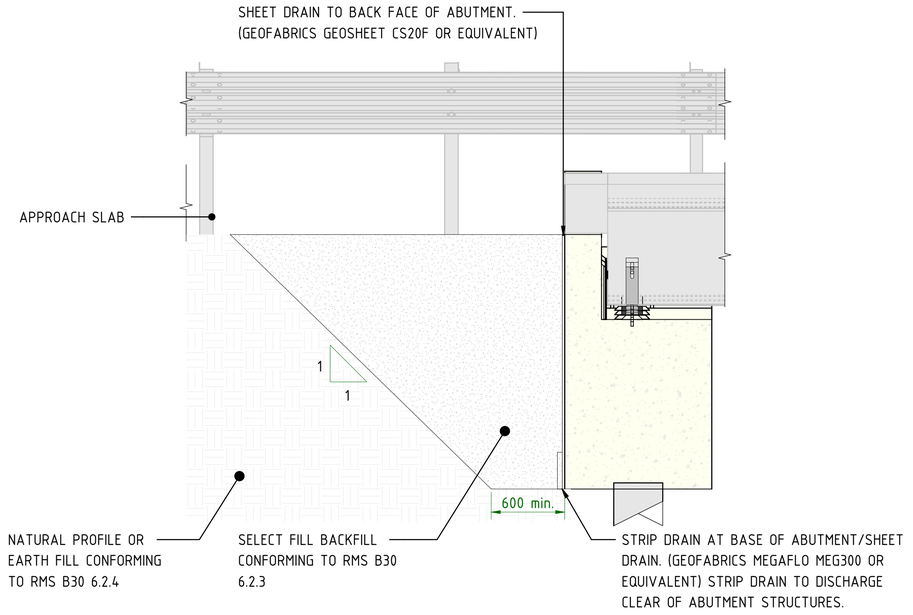
ON CASINO CORAKI ROAD

PRECAST PILE DETAILS

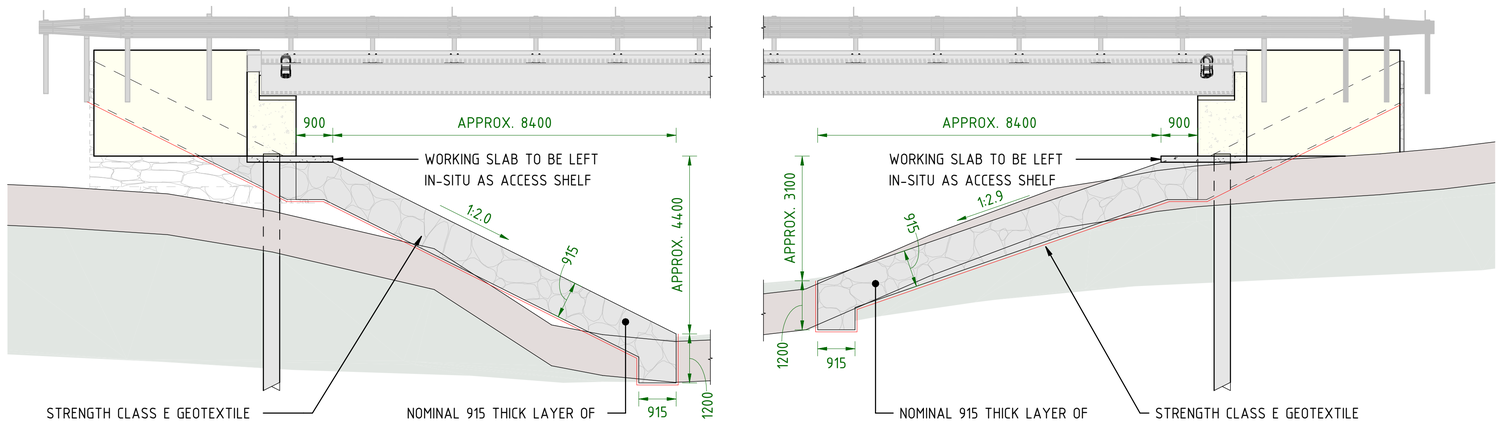
Project Number: 24_010
Sheet: 10 OF 25
Issue: P1
Drawing Number: 24_010-S222



1/230 PLAN
SCOUR PROTECTION MEASURES | 1 : 125



2/230 SECTION
ABUTMENT BACKFILL | 1 : 25



3/230 SECTION
SCOUR PROTECTION MEASURES | 1 : 75

BACKFILLING BEHIND ABUTMENTS

BACKFILL MATERIAL BEHIND HEADSTOCKS, WINGWALLS AND RETAINING WALLS SHALL BE: FREE-DRAINING GRANULAR MATERIAL COMPLYING WITH TfNSW B30 cl 6.2. PLACE AND COMPACT AS PER TfNSW B30 cl 6.4.2.

BACKFILLING BEHIND HEADSTOCKS AND WINGWALLS SHALL NOT COMMENCE UNTIL GIRDER INSTALLATION IS COMPLETED AND BEARING STRIPS/GROUT AT GIRDER ENDS HAS BEEN INSTALLED. (ALTERNATE OF TEMPORARY WEDGING GIRDER ENDS AGAINST ABUTMENT IS PERMITTED BUT WEDGES SHALL NOT BE REMOVED UNTIL PERMANENT BEARING STRIPS/GROUT HAS BEEN INSTALLED)

BACKFILL MATERIAL SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING:

- WITHIN 1M OF WALLS AND HEADSTOCKS: PLACE IN LAYERS NOT EXCEEDING 100 AND COMPACT TO 95% RELATIVE COMPACTION (70% MINIMUM DENSITY INDEX IN SAND) USING A HEANDHELD VIBRATING PLATE COMPACTOR OR EQUAL. LARGE COMPACTION EQUIPMENT IS NOT PERMITTED IN THESE ZONES.

ROCK FACING:

ROCK GRADING		
	MIN	MAX
D15	280	395
D50	430	520
D85	595	700
D100		915

ROCK SHALL BE WELL GRADED WITH NOT LESS THAN 50% LARGER THAN A SIZE TWICE THE MINIMUM SIZE SPECIFIED.
ROCK SHALL BE CLEAN, HARD, DENSE AND DURABLE IGNEOUS OR METAMORPHIC ROCKS.
ROCK SHALL BE RESISTANT TO WEATHERING, FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER.
ROCK THAT IS LAMINATED, FRACTURED, POROUS, WITH DISCONTINUITIES OR OTHERWISE PHYSICALLY WEAK SHALL NOT BE USED.
THE BREADTH OF THICKNESS OF A SINGLE STONE SHALL NOT BE LESS THAT ONE-THIRD ITS LENGTH.
ROCK PROTECTION SHALL BE CONSTRUCTED IN THE LOCATIONS AND IN ACCORDANCE WITH THE DRAWINGS.
ROCK PROTECTION SHALL HAVE A UNIFORM APPEARANCE OVERALL AND SHALL NOT HAVE NOTICEABLE OVERALL IRREGULARITIES IN HORIZONTAL AND VERTICAL ALIGNMENTS.
ROCK PROTECTION SHALL BE PLACED IN A MANNER WHICH ENSURES THAT THE LARGER ROCKS ARE UNIFORMLY DISTRIBUTED THROUGHOUT THE PROTECTION WORK AND THAT THE SMALLER ROCKS EFFECTIVELY FILL THE SPACES BETWEEN THE LARGE ROCKS WITHOUT LEAVING ANY LARGE VOIDS.
THE LAYERS OF PLACED ROCK SHALL BE OF EVEN THICKNESS AND OF EVEN GRADING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

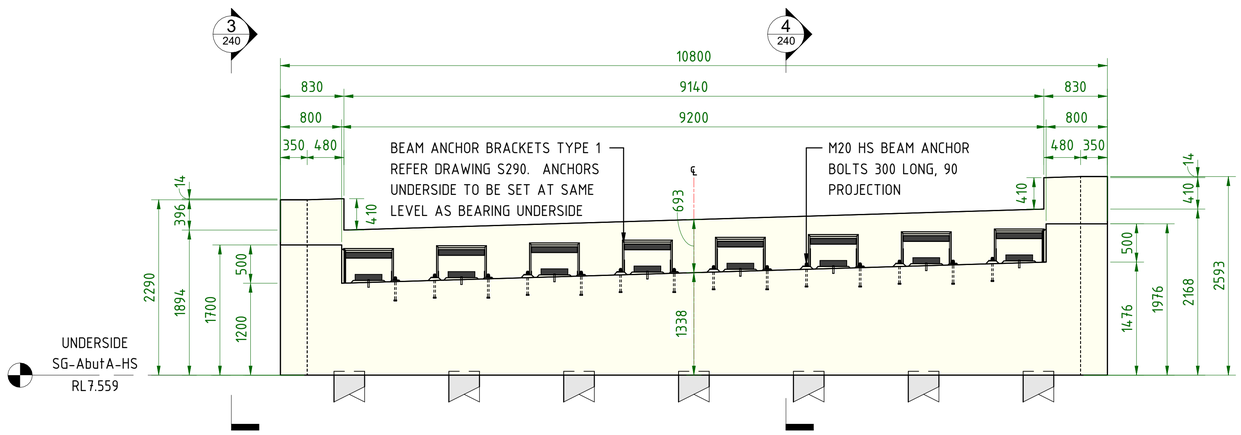
Bar Scales:
1:25 0 125 250 375 500 625 / 125 63
1:75 0 375 750 1125 1500 1875 / 375 188
1:125 0 625 1250 1875 2500 3125 / 625 313
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

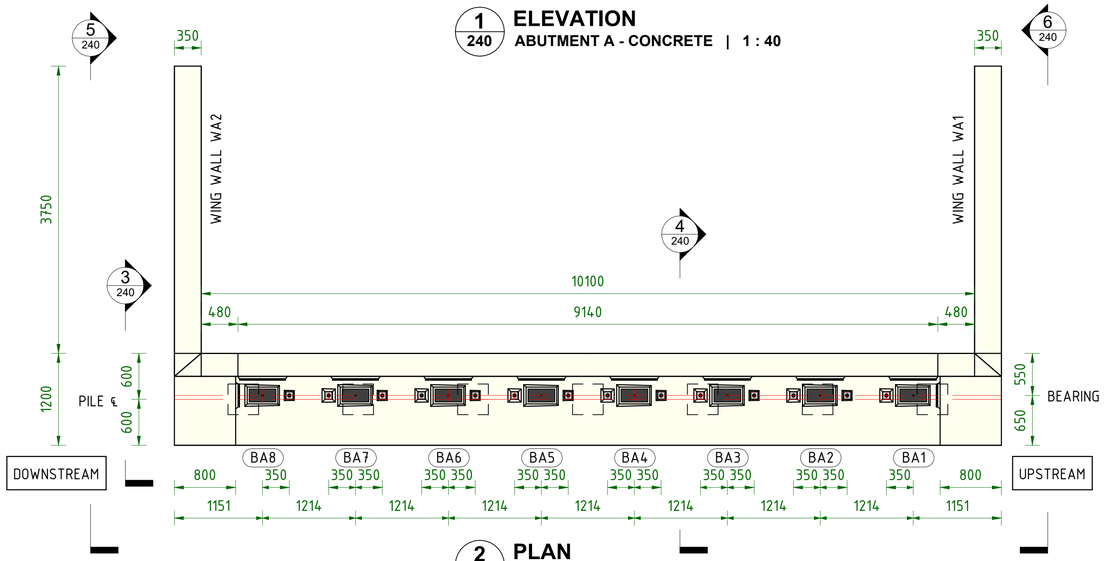
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

SCOUR PROTECTION MEASURES

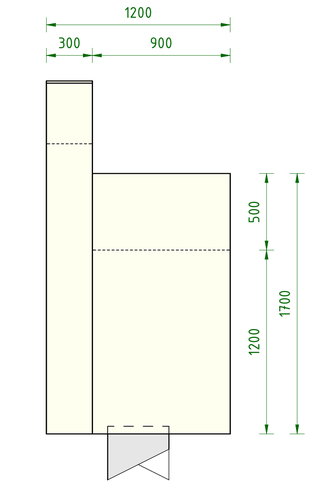
Project Number: 24_010
Sheet: 11 OF 25
Issue: P1
Drawing Number: 24_010-S230



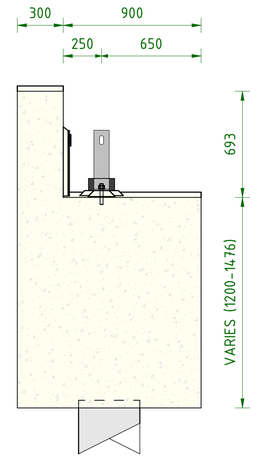
1/240 ELEVATION
ABUTMENT A - CONCRETE | 1 : 40



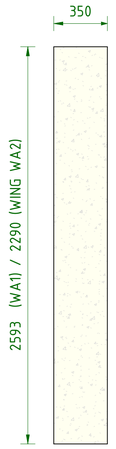
2/240 PLAN
ABUTMENT A - CONCRETE | 1 : 40



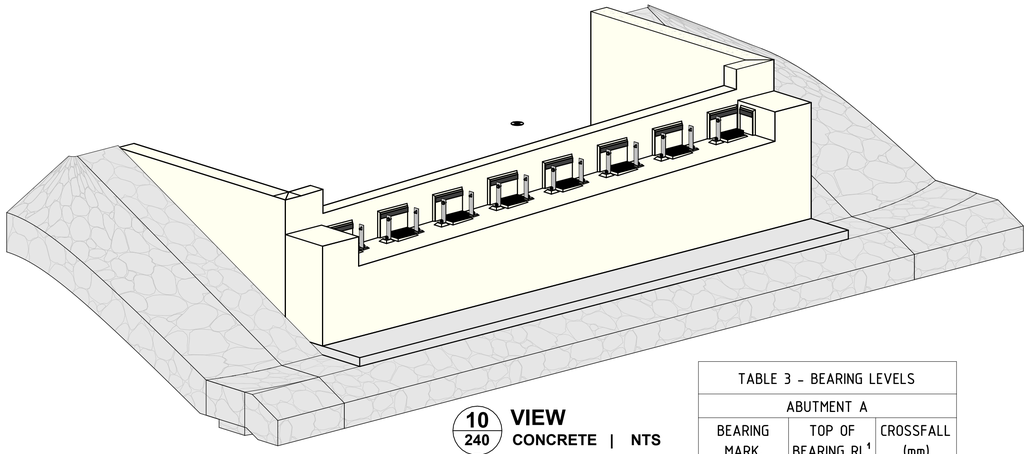
3/240 VIEW
ABUTMENT A - CONCRETE | 1 : 20



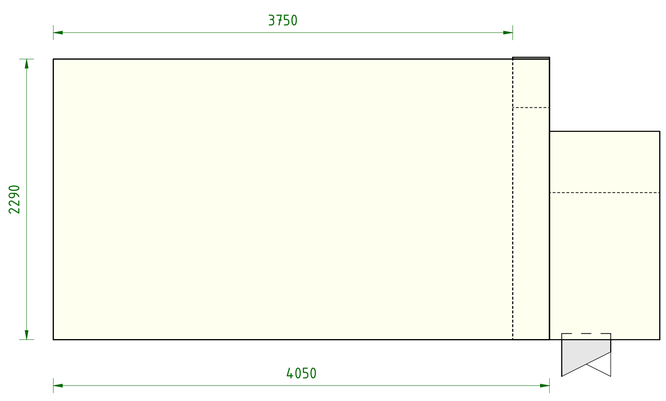
4/240 SECTION
ABUTMENT A - CONCRETE | 1 : 20



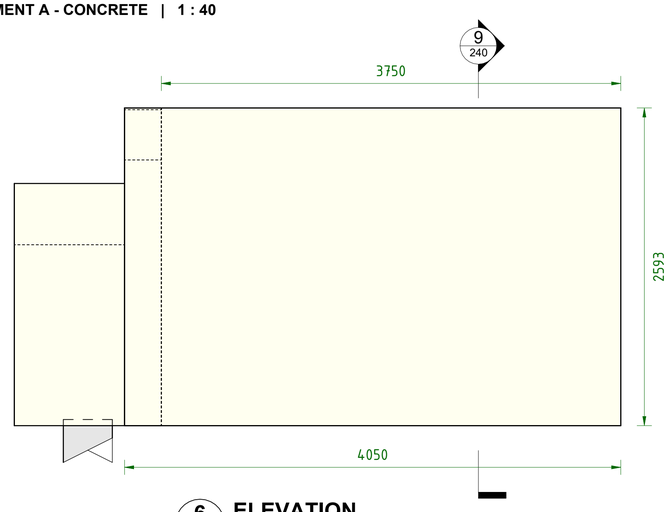
9/240 SECTION
1 : 20



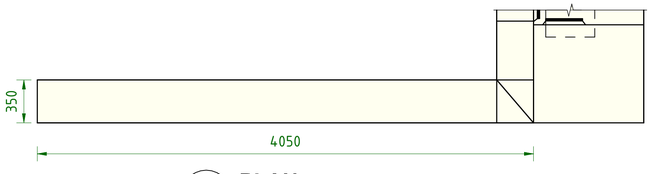
10/240 VIEW
CONCRETE | NTS



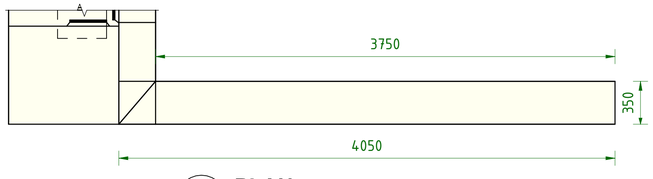
5/240 ELEVATION
WING WALL A2 - CONCRETE | 1 : 25



6/240 ELEVATION
WING WALL A1 - CONCRETE | 1 : 25



8/240 PLAN
WING WALL A1 - CONCRETE | 1 : 25



7/240 PLAN
WING WALL A2 - CONCRETE | 1 : 25

TABLE 3 - BEARING LEVELS		
ABUTMENT A		
BEARING MARK.	TOP OF BEARING RL[1]	CROSSFALL (mm)
BA1	9.129	0
BA2	9.093	0
BA3	9.057	0
BA4	9.020	0
BA5	8.984	0
BA6	8.947	0
BA7	8.911	0
BA8	8.874	0

[1] BEARING LEVELS ARE SET FOR A DECK THICKNESS OF 202mm AT THE BEARING POSITIONS.

CONCRETE NOTES
DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION:
ALL ABUTMENT & WINGWALL ELEMENTS - B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 40 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Silverwater NSW 2128
Tel: 02 9644 6333 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\CAD File Name	
Records File Name	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:20 0 100 200 300 400 500 / 100 50
1:25 0 125 250 375 500 625 / 125 63
1:40 0 200 400 600 800 1000 / 200 100
1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

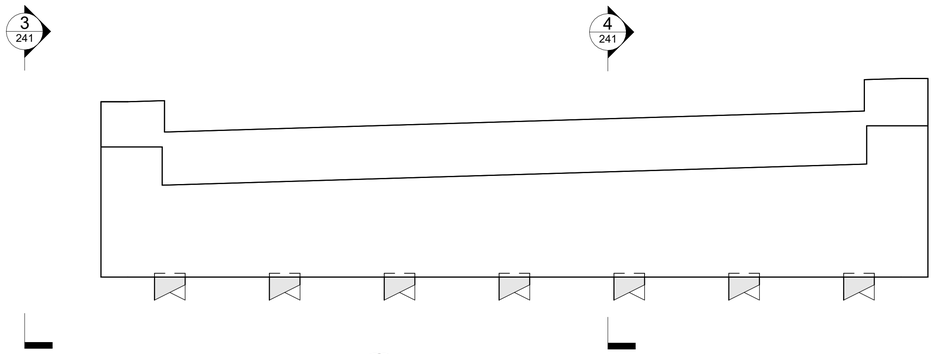
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

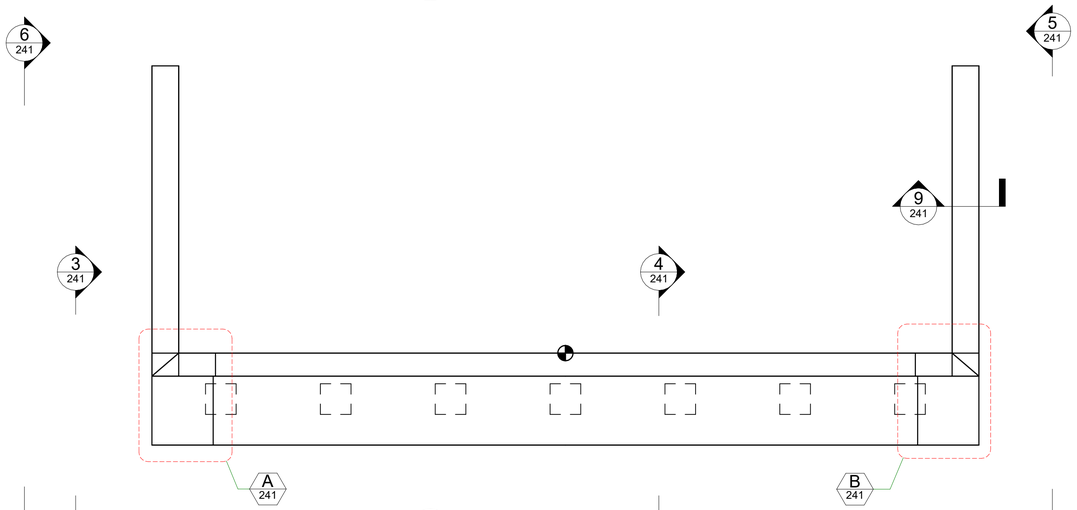
ABUTMENT A - CONCRETE DETAILS

Project Number	24_010
Sheet	12 OF 25
Issue	P1
Drawing Number	24_010-S240

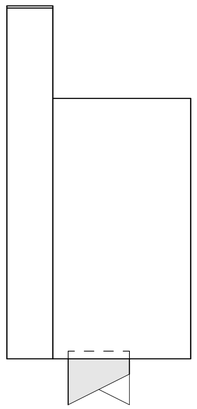
W:\Jobs\2024 Jobs\24_010 Tatham Bridges-Spring Gully-Quickway\Design Drwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:23:34 PM



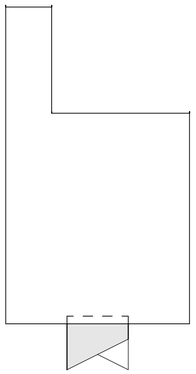
1/241 ELEVATION
ABUTMENT A - REINFORCEMENT | 1 : 40



2/241 PLAN
ABUTMENT A - REINFORCEMENT | 1 : 40

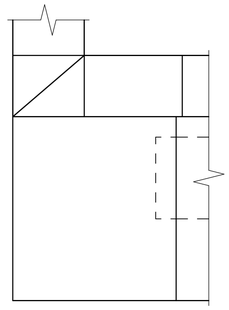


3/241 VIEW
1 : 20

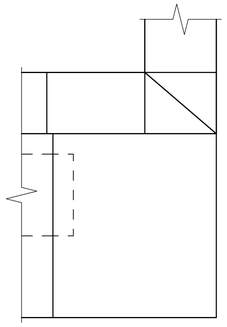


4/241 SECTION
1 : 20

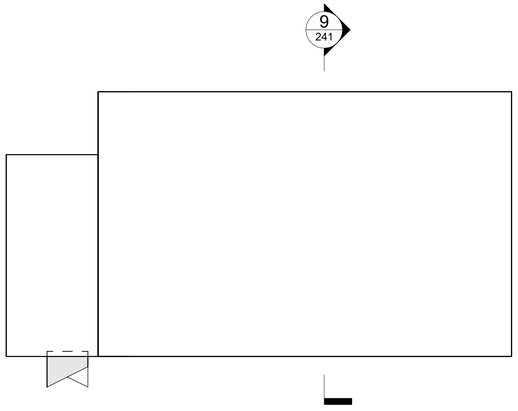
9/241 SECTION
1 : 20



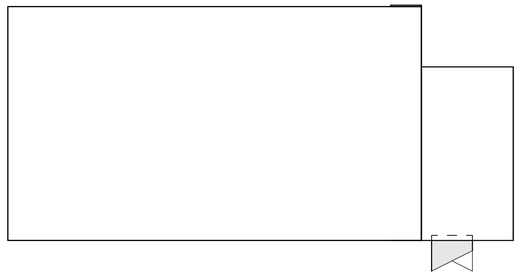
A/241 DETAIL
1 : 15



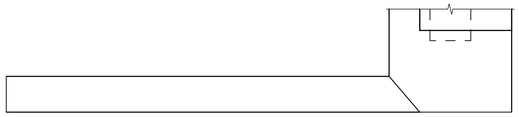
B/241 DETAIL
1 : 15



5/241 ELEVATION
WING WALL A1 - REINFORCEMENT | 1 : 30

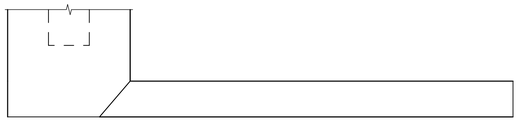


6/241 ELEVATION
WING WALL A1 - REINFORCEMENT | 1 : 30



REINFORCEMENT SHOWN IN WING WALL TAPER SECTION

7/241 PLAN
WING WALL A2 - REINFORCEMENT | 1 : 30



REINFORCEMENT SHOWN BELOW LEVEL OF WING WALL TAPER

8/241 PLAN
WING WALL A1 - REINFORCEMENT | 1 : 30

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 45 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	650	940		1580		2320	
ALL OTHER BARS	350	500	720		1210		1790	

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\CAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

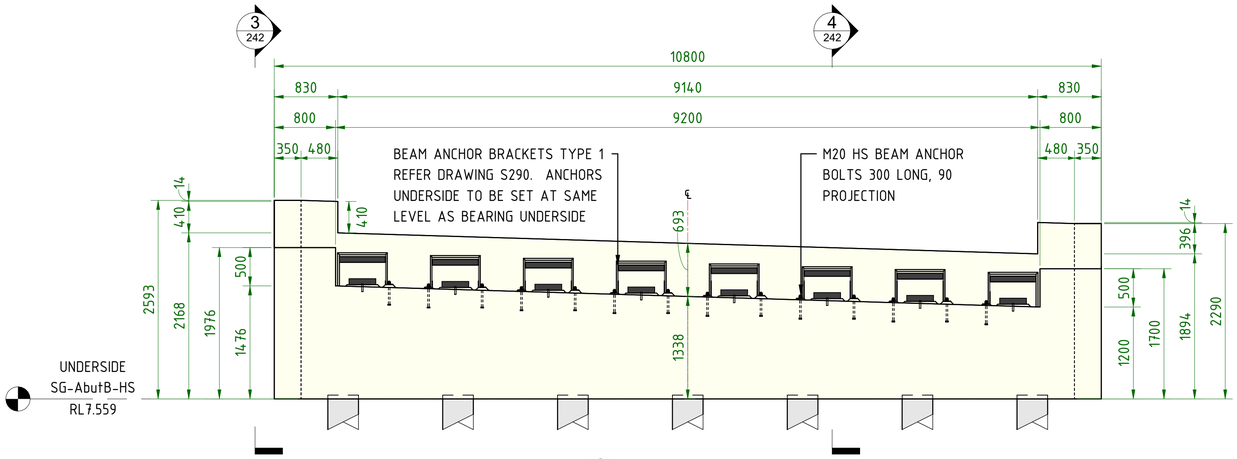
Bar Scales:
1:15 0 75 150 225 300 375 / 75 38
1:20 0 100 200 300 400 500 / 100 50
1:30 0 150 300 450 600 750 / 150 75
1:40 0 200 400 600 800 1000 / 200 100
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

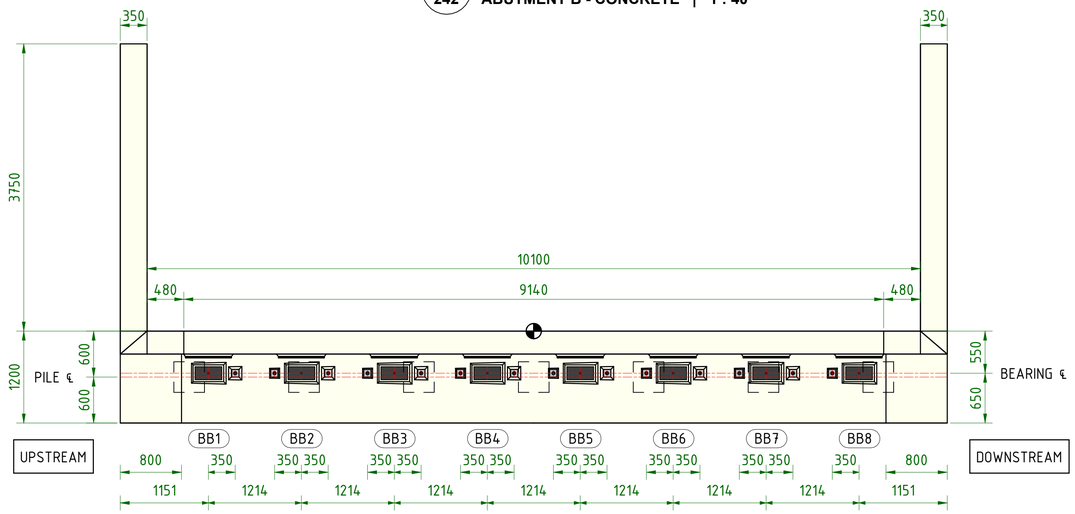
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

ABUTMENT A - REINFORCEMENT DETAILS

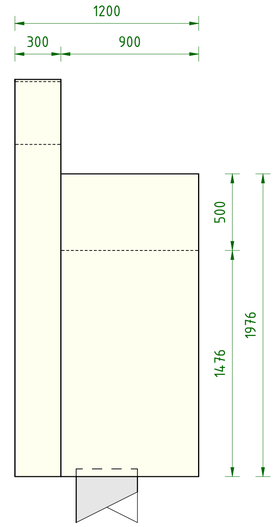
Project Number: 24_010
Sheet: 13 OF 25
Issue: P1
Drawing Number: 24_010-S241



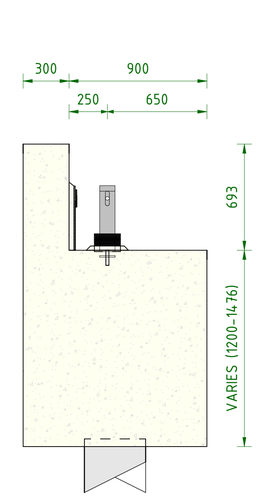
1/242 ELEVATION
ABUTMENT B - CONCRETE | 1 : 40



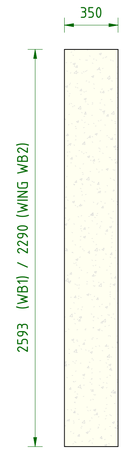
2/242 PLAN
ABUTMENT B - CONCRETE | 1 : 40



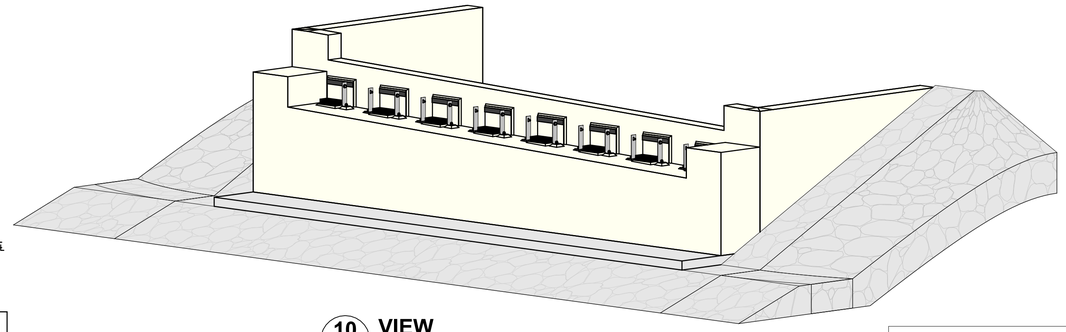
3/242 VIEW
ABUTMENT B - CONCRETE | 1 : 20



4/242 SECTION
ABUTMENT B - CONCRETE | 1 : 20



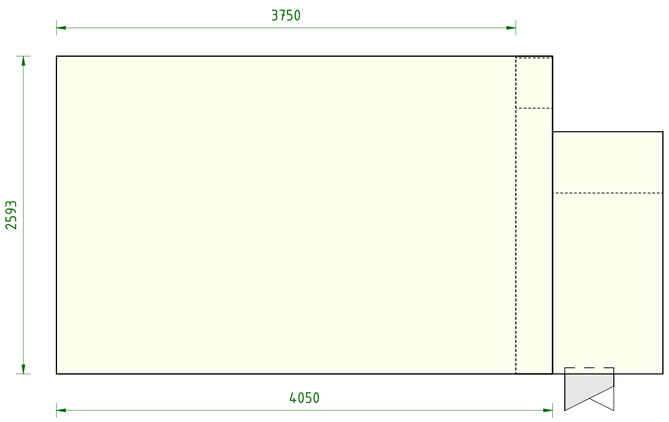
9/242 SECTION
1 : 20



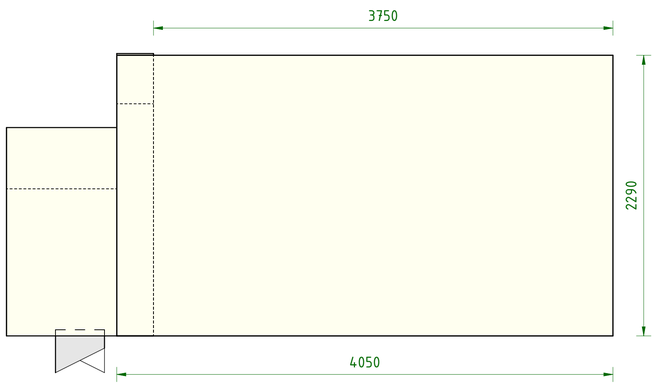
10/242 VIEW
CONCRETE | NTS

TABLE 4 - BEARING LEVELS		
ABUTMENT B		
BEARING MARK	TOP OF BEARING RL[1]	CROSSFALL (mm)
BB1	9.129	0
BB2	9.093	0
BB3	9.057	0
BB4	9.020	0
BB5	8.984	0
BB6	8.947	0
BB7	8.911	0
BB8	8.874	0

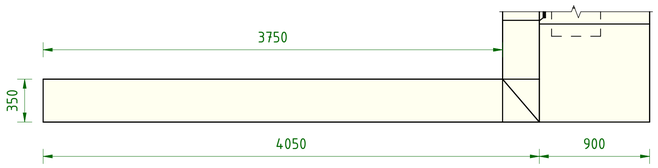
[1] BEARING LEVELS ARE SET FOR A DECK THICKNESS OF 202mm AT THE BEARING POSITIONS.



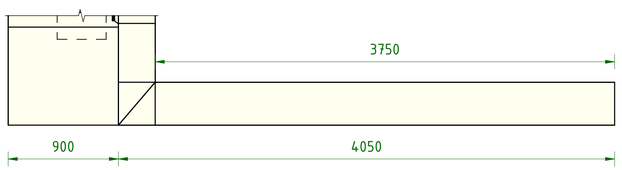
5/242 ELEVATION
WING WALL B1 - CONCRETE | 1 : 25



6/242 ELEVATION
WING WALL B2 - CONCRETE | 1 : 25



99/242 PLAN
WING WALL B1 - CONCRETE | 1 : 25



8/242 PLAN
WING WALL B2 - CONCRETE | 1 : 25

CONCRETE NOTES
DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION:
ALL ABUTMENT & WINGWALL ELEMENTS - B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 40 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES
Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway
Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\CAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:20 0 100 200 300 400 500 / 100 50
1:25 0 125 250 375 500 625 / 125 63
1:40 0 200 400 600 800 1000 / 200 100
1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

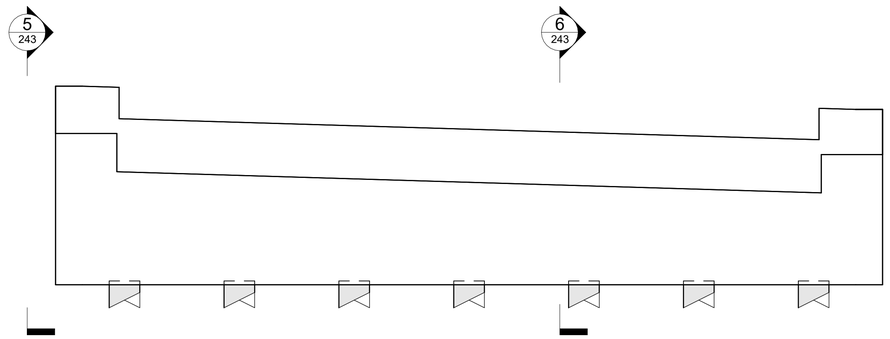
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

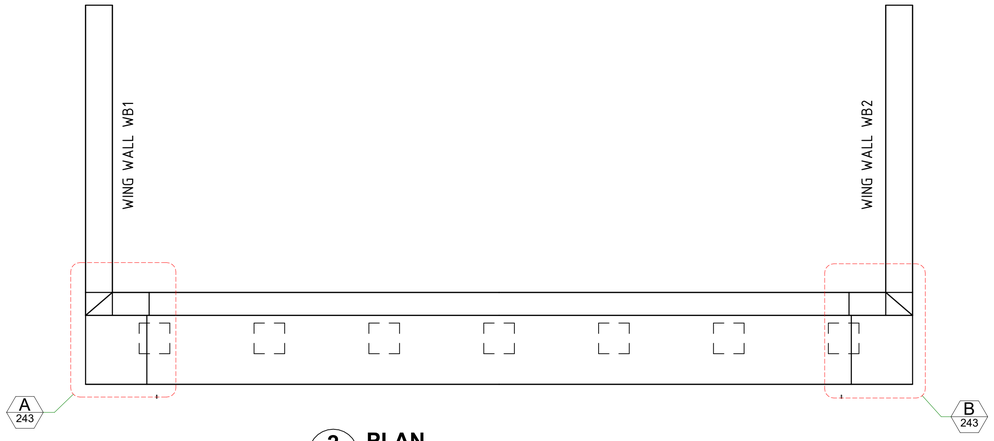
ABUTMENT B - CONCRETE DETAILS

Project Number: 24_010
Sheet: 14 OF 25
Issue: P1
Drawing Number: 24_010-S242

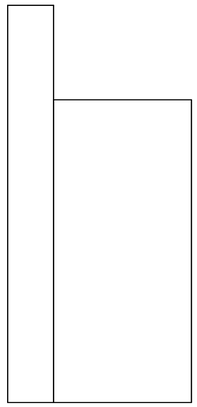
W:\Jobs\2024 Jobs\24_010 Tatham Bridges-Spring Gully\Quickway\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:22:37 PM



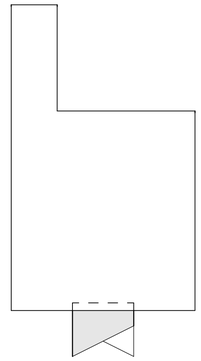
1 / 243 ELEVATION
ABUTMENT B - REINFORCEMENT | 1 : 40



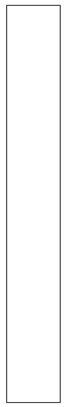
2 / 243 PLAN
ABUTMENT B - REINFORCEMENT | 1 : 40



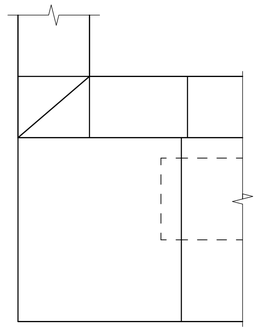
5 / 243 VIEW
ABUTMENT B - REINFORCEMENT | 1 : 20



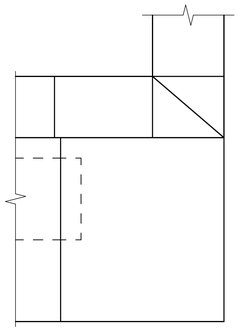
6 / 243 SECTION
ABUTMENT B - REINFORCEMENT | 1 : 20



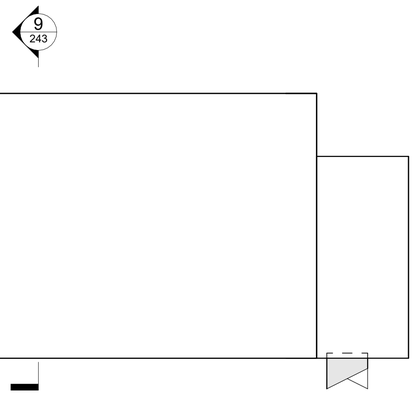
9 / 243 SECTION
1 : 20



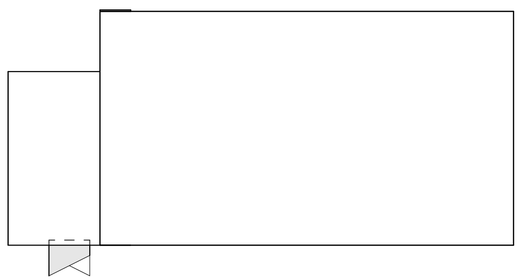
A / 243 DETAIL
1 : 15



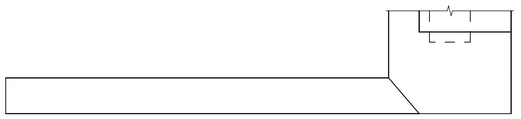
B / 243 DETAIL
1 : 15



3 / 243 ELEVATION
WING WALL B1 - REINFORCEMENT | 1 : 30

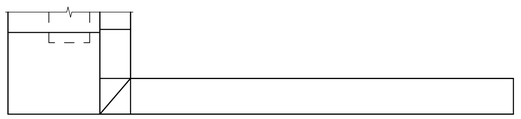


4 / 243 ELEVATION
WING WALL B2 - REINFORCEMENT | 1 : 30



REINFORCEMENT SHOWN IN WING WALL TAPER SECTION

7 / 243 PLAN
WING WALL B1 - REINFORCEMENT | 1 : 30



REINFORCEMENT SHOWN BELOW LEVEL OF WING WALL TAPER

8 / 243 PLAN
WING WALL B2 - REINFORCEMENT | 1 : 30

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 45 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	650	940		1580		2320	
ALL OTHER BARS	350	500	720		1210		1790	

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

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Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\CAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:15 0 75 150 225 300 375 / 75 38
1:20 0 100 200 300 400 500 / 100 50
1:30 0 150 300 450 600 750 / 150 75
1:40 0 200 400 600 800 1000 / 200 100
Do not scale, use figured dimensions only

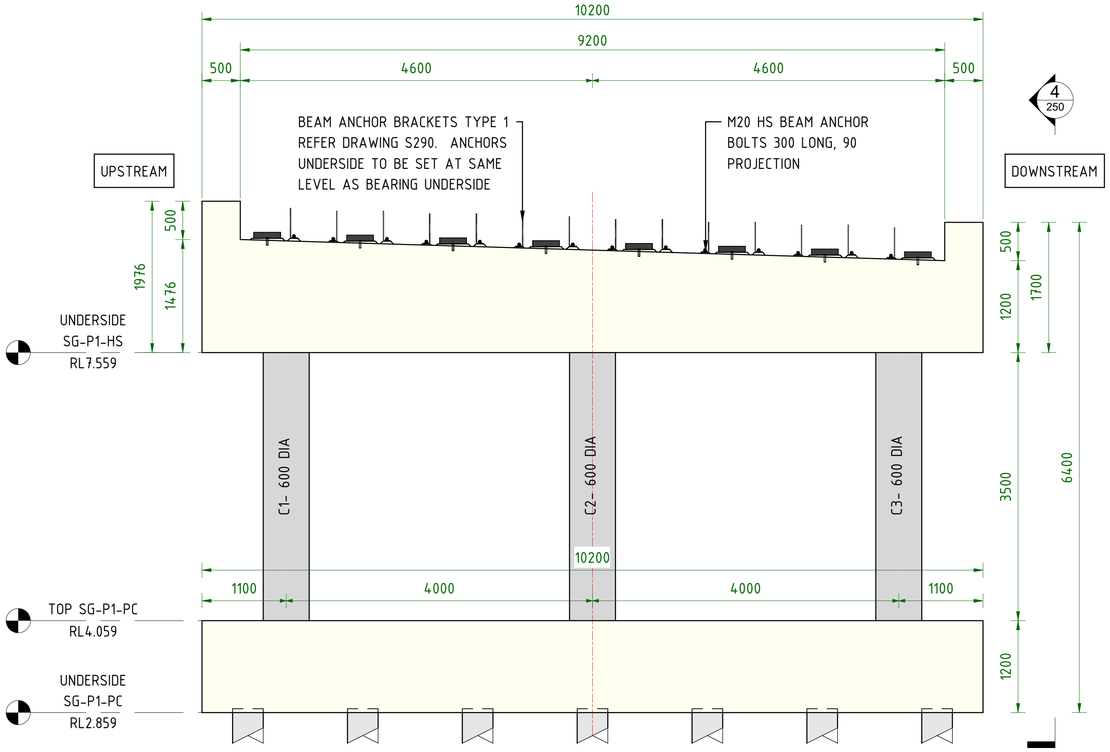
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

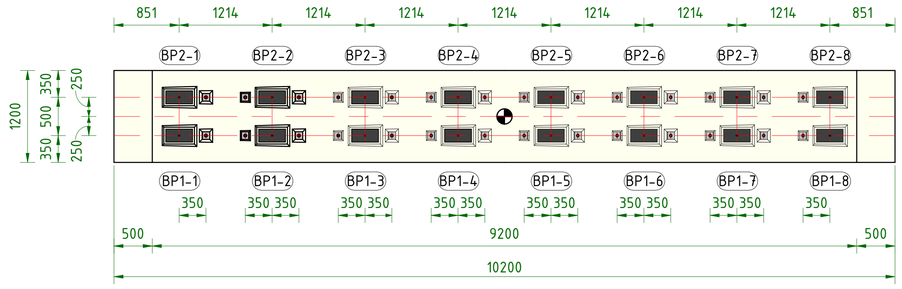
ABUTMENT B - REINFORCEMENT DETAILS

Project Number: 24_010
Sheet: 15 OF 25
Issue: P1
Drawing Number: 24_010-S243

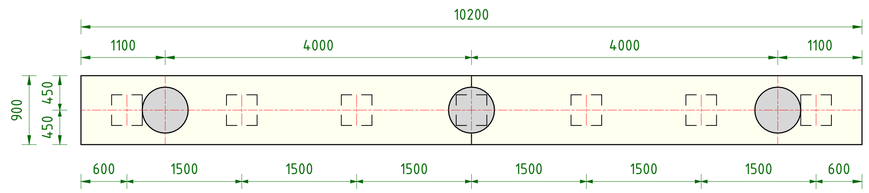
W:\Jobs\2024 Jobs\24_010 Tatham Bridges-Spring Gully-Quickway\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:22:38 PM



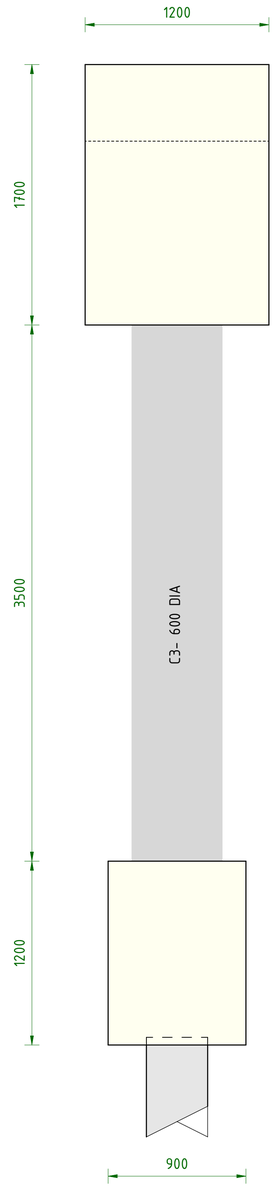
1 / 250 ELEVATION
PIER - CONCRETE | 1 : 40



2 / 250 PLAN
PIER HEADSTOCK - CONCRETE | 1 : 40



3 / 250 PLAN
PIER PILE CAP - CONCRETE | 1 : 40



4 / 250 VIEW
PIER - CONCRETE | 1 : 20

TABLE 5 - BEARING LEVELS		
PIER		
BEARING MARK	TOP OF BEARING RL[1]	CROSSFALL (mm)
BP1-1	9.129	0
BP1-2	9.093	0
BP1-3	9.057	0
BP1-4	9.020	0
BP1-5	8.984	0
BP1-6	8.947	0
BP1-7	8.911	0
BP1-8	8.874	0
BP2-1	9.129	0
BP2-2	9.093	0
BP2-3	9.057	0
BP2-4	9.020	0
BP2-5	8.984	0
BP2-6	8.947	0
BP2-7	8.911	0
BP2-8	8.874	0

[1] BEARING LEVELS ARE SET FOR A DECK THICKNESS OF 202mm AT THE BEARING POSITIONS.

CONCRETE NOTES
DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION:
ALL PIER ELEMENTS - B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 40 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number
Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

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1:20 0 100 200 300 400 500 / 100 50
1:40 0 200 400 600 800 1000 / 200 100
Do not scale, use figured dimensions only

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Email: council@richmondvalley.nsw.gov.au
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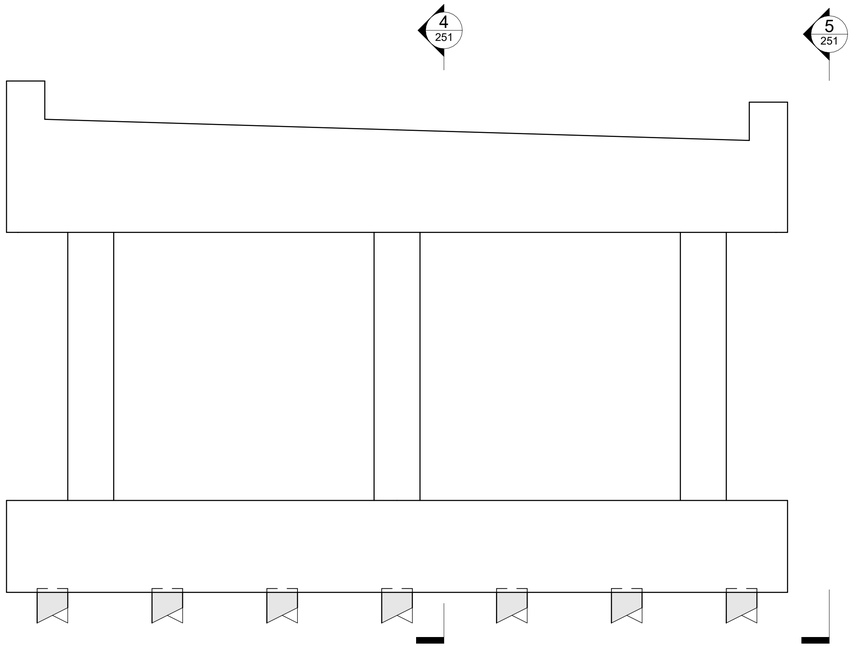
Casino NSW 2470

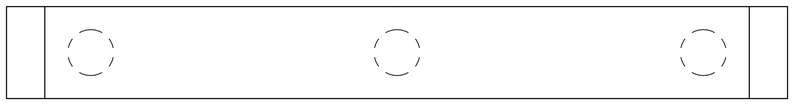
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

PIER - CONCRETE DETAILS

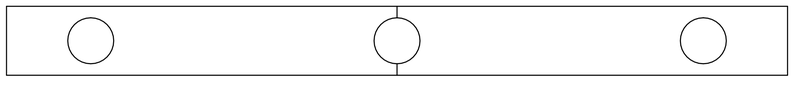
Project Number: 24_010
Sheet: 16 OF 25
Issue: P1
Drawing Number: 24_010-S250



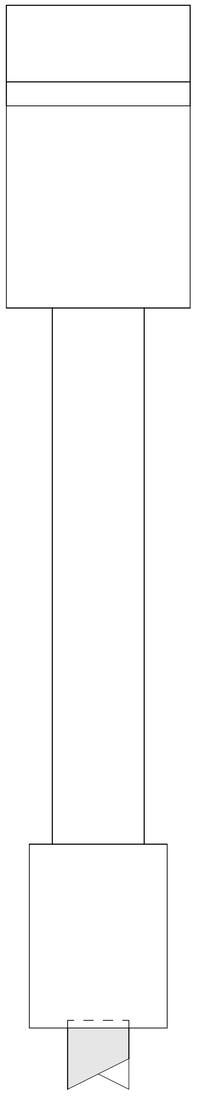
1 / 251 ELEVATION
PIER - REINFORCEMENT | 1 : 40



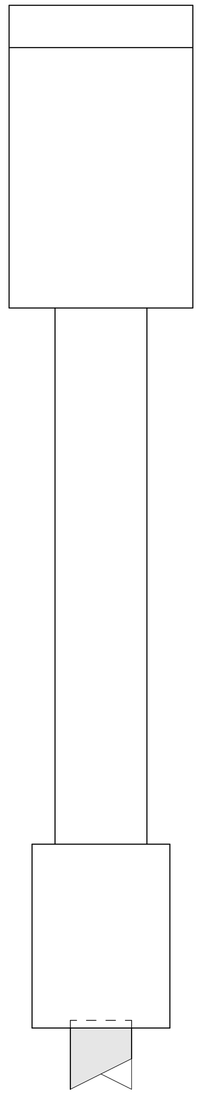
2 / 251 PLAN
PIER HEADSTOCK - REINFORCEMENT | 1 : 40



3 / 251 PLAN
PIER PILE CAP - REINFORCEMENT | 1 : 40



4 / 251 SECTION
PIER - REINFORCEMENT | 1 : 20



5 / 251 VIEW
PIER - REINFORCEMENT | 1 : 20

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 45 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	650	940		1580		2320	
ALL OTHER BARS	350	500	720		1210		1790	

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:20 0 100 200 300 400 500 (100 50)
1:40 0 200 400 600 800 1000 (200 100)
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
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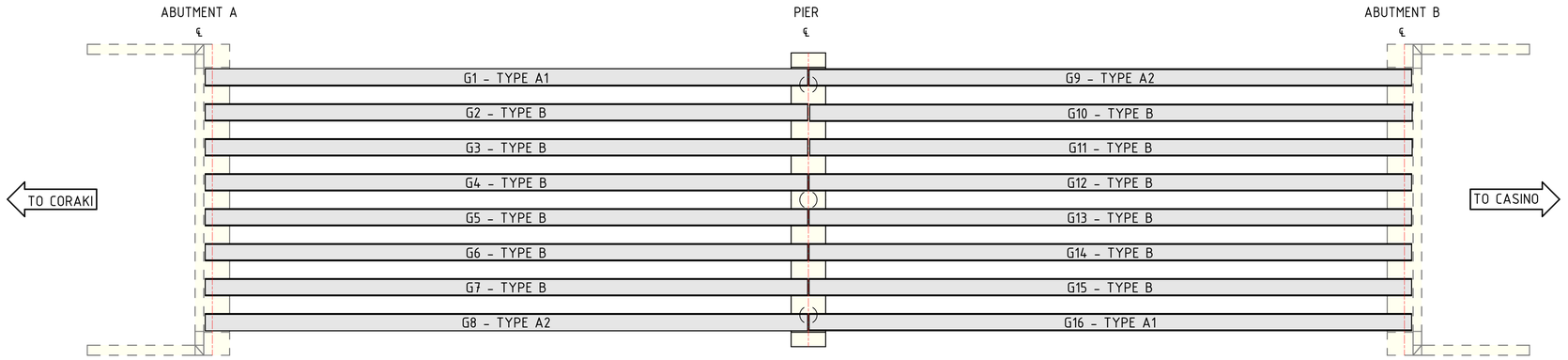
Address: 10 Graham Place
Casino NSW 2470

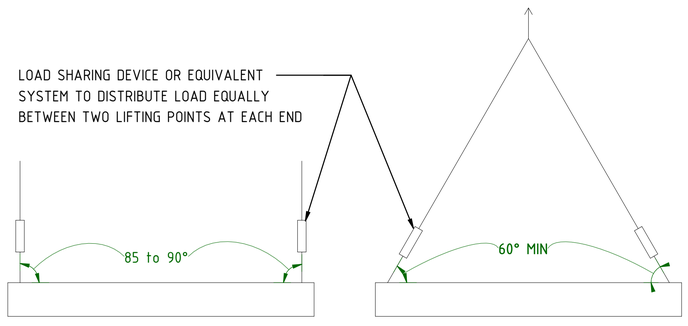
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

PIER - REINFORCEMENT DETAILS

Project Number: 24_010
Sheet: 17 OF 25
Issue: P1
Drawing Number: 24_010-S251



1/260 BEAM LAYOUT
1 : 100



LIFTING DIAGRAM
(IN PRECAST YARD OR SITE)
NTS

LIFTING DIAGRAM
(ON SITE)
NTS

2/260 LIFTING DIAGRAM
1 : 100

PRECAST UNITS SCHEDULE						
TYPE	MARK	CAST LENGTH	VOLUME	WEIGHT (T)	STRESSING FORCE (kN)	COUNT
TYPE A1	P1 & P16	20971	<varies>	<varies>	188	2
TYPE A2	P8 & P9	20971	<varies>	<varies>	188	2
TYPE B	P2-P7 & P10-P15	20971	6.99 m^3	17.83	188	12

PRECAST UNIT HOG TABLE			
TYPE	AT TRANSFER (mm)	AT 30 DAYS (mm)	CALCULATED DEFLECTION DUE TO DECK CAST (mm)
TYPE A1	-32	-41	17
TYPE A2	-32	-41	17
TYPE B	-32	-41	17

NOTE: NEGATIVE (-) HOG VALUES REPRESENT AN UPWARD DEFLECTION
POSITIVE (+) HOG VALUES REPRESENT A DOWNWARD DEFLECTION

GENERAL NOTES
GENERAL NOTES REFER DWG NO. S201 - DWG NO. S203
DIMENSIONS IN MILLIMETRES.

PRECAST CONCRETE
CONCRETE EXPOSURE CLASSIFICATION: B1
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 50 MPa.
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 40 mm UNO.
REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE REQUIRED TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
ALL CHAMFERS TO BE 10X10.
CONCRETE SHALL BE CAST IN RIGID FORMS AND SUBJECTED TO INTENSE VIBRATION.

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 40 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	620	880	1150	1450	1770	2120	2500
ALL OTHER BARS	350	480	680	890	1120	1370	1630	1930

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

PRESTRESSING NOTES
MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT TRANSFER 40MPa.
STRANDS AS 4672.1 - 7 WIRE ORDINARY - 15.2 - 1 750 - RELAX 2.
REFER PRECAST UNITS SCHEDULE FOR THE FORCE REMAINING IN EACH STRAND AT BEAM MIDSPAN IMMEDIATELY AFTER TENSIONING.
CUT STRANDS FLUSH WITH THE END OF THE BEAM AND SEAL EXPOSED STRANDS AGAINST CORROSION WITH 3 THICK EPOXY RESIN - MEGAPOXY H THIXOTROPIC OR EQUIVALENT.
THE HOG OF THE BEAMS AT RELEASE IS CALCULATED ASSUMING;
- DENSITY = 2550 kg/m
- ELASTIC MODULUS AT TRANSFER = 26,000MPA
- STEAM CURING
- STORAGE IN OPEN AIR AT 20°C AVERAGE TEMPERATURE AND RELATIVE HUMIDITY IN RANGE 50% - 75%
- NO LOADS ON BEAM EXCEPT SELF WEIGHT.

REFER PRECAST UNIT HOG TABLE FOR PREDICTED HOGS.

LIFTING AND HANDLING
PRECAST UNITS TO BE LIFTED BY PROVIDED LIFTING ANCHORS ONLY
CALCULATED MASS OF PRECAST UNITS REFER TABLE. THE MASS CALCULATION ASSUMES A CONCRETE DENSITY OF 2550 kg/m^3. OWING TO THE FABRICATION METHODS AND TOLERANCES, THE MASS OF THE DECK UNIT MAY VARY FROM THAT CALCULATED. THE MANUFACTURER SHOULD VERIFY THE ACTUAL MASS AND MARK ON THE SIDE OF THE DECK UNIT.
DURING STORAGE, TRANSPORT AND HANDLING BEAMS SHALL BE KEPT IN AN UPRIGHT POSITION AND SUPPORTED NOT MORE THAN 600mm FROM EACH END.
LIFTING ANCHORS TO BE NOT FURTHER THAN 600mm FROM EACH END OF BEAM. IF ALTERNATE LIFTING METHOD IS ADOPTED, CERTIFICATION IS TO BE PROVIDED BY THE PRECAST SUPPLIER.
PRECAST UNITS TO BE BRACED AGAINST OVERTURNING UNTIL DECK POUR COMPLETED.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES
Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway
Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	Design Checked
PAL	Signed:
Drafter	Drawing Checked
PAL	Signed:
Approved By	Survey Folder Number
PAL	
Project Identifier\-\ICAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:100 0 500 1000 1500 2000 2500
500 250
Do not scale, use figured dimensions only

CLIENT:
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Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

PRESTRESSED BEAM DETAILS

Project Number: 24_010
Sheet: 18 OF 25
Issue: P1
Drawing Number: 24_010-S260

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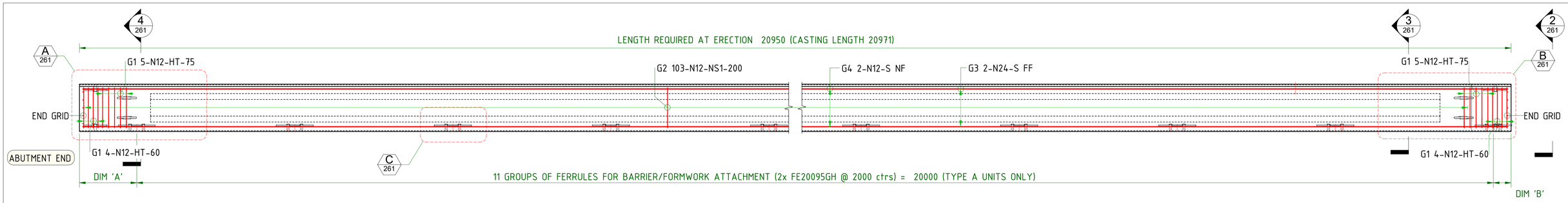
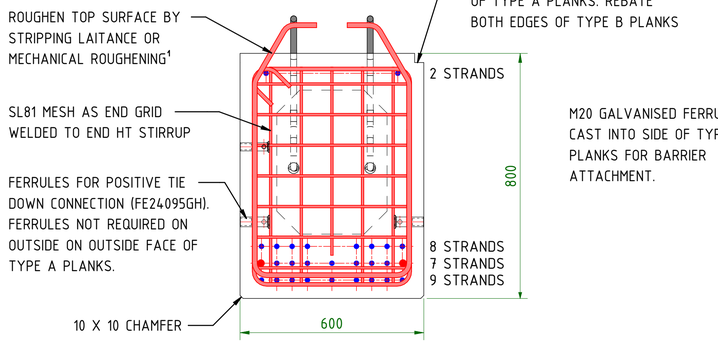
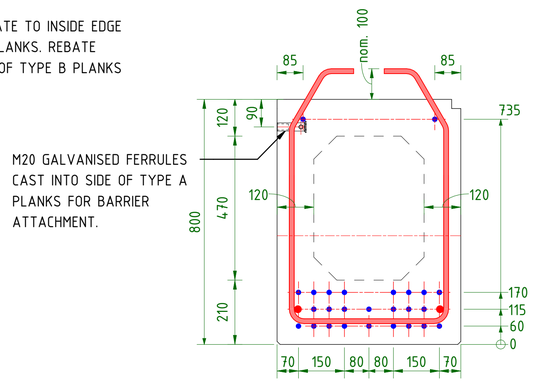


1/261 PLAN 1 : 25

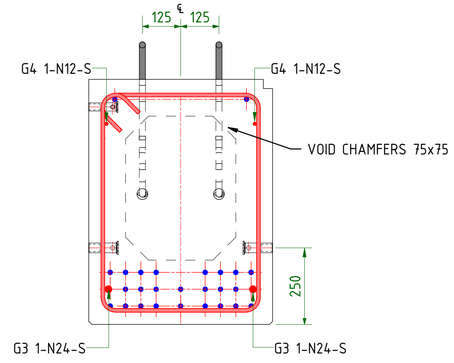
[1] NOTE:
SURFACE FINISH IN ACCORDANCE WITH TMR TECHNICAL NOTE 50 cl.7 IS ACCEPTABLE.



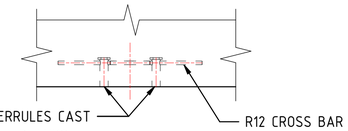
2/261 VIEW 1 : 10



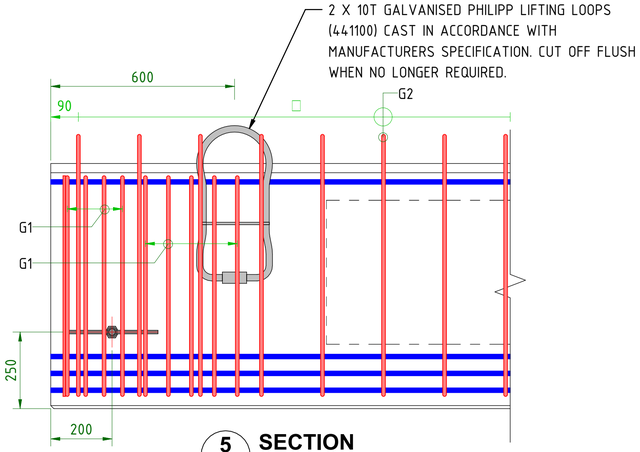
3/261 SECTION 1 : 10



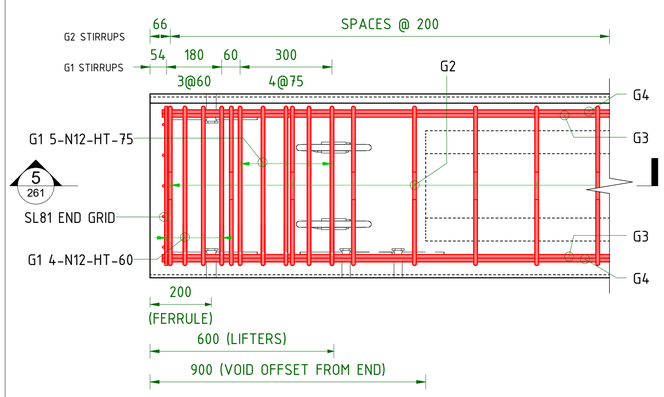
4/261 SECTION 1 : 10



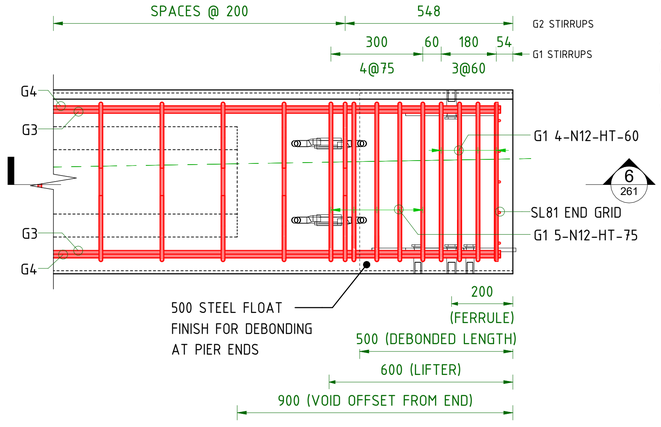
C/261 DETAIL 1 : 10



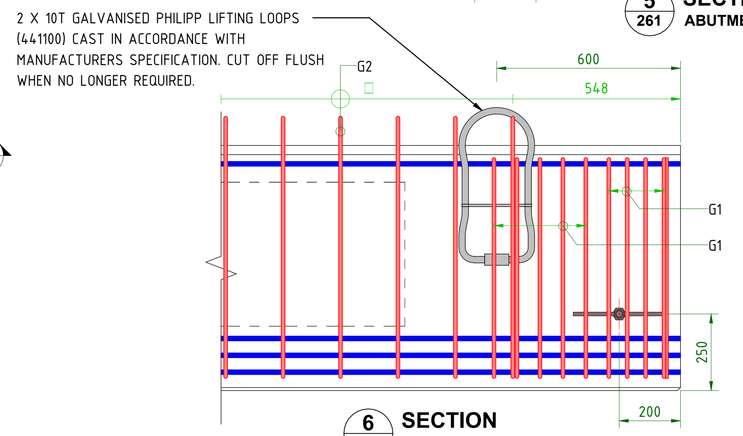
5/261 SECTION ABUTMENT END | 1 : 10



A/261 DETAIL ABUTMENT END | 1 : 10



B/261 DETAIL PIER END | 1 : 10



6/261 SECTION PIER END | 1 : 10

NOTES

GENERAL NOTES REFER DWG NO 201 - DWG NO. S203
PRECAST CONCRETE NOTES REFER DWG NO. S260
LIFTING AND HANDLING NOTES REFER DWG NO. S260

PRESTRESSING NOTES

REFER PRECAST UNITS SCHEDULE DWG NO. S260 FOR THE FORCE REMAINING IN EACH STRAND.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Silverwater NSW 2128
Tel: 02 9644 6333
www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
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Design Checked	Signed:
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Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

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Bar Scales:
1:10 0 50 100 150 200 250 / 0 25
1:25 0 125 250 375 500 625 / 0 125 63

Do not scale, use figured dimensions only

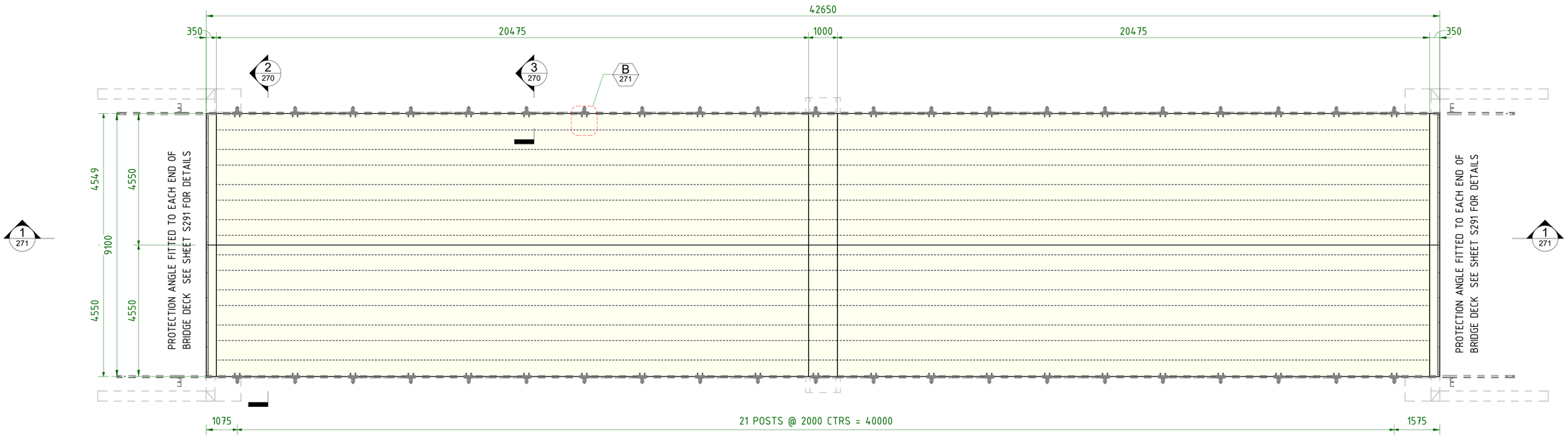
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

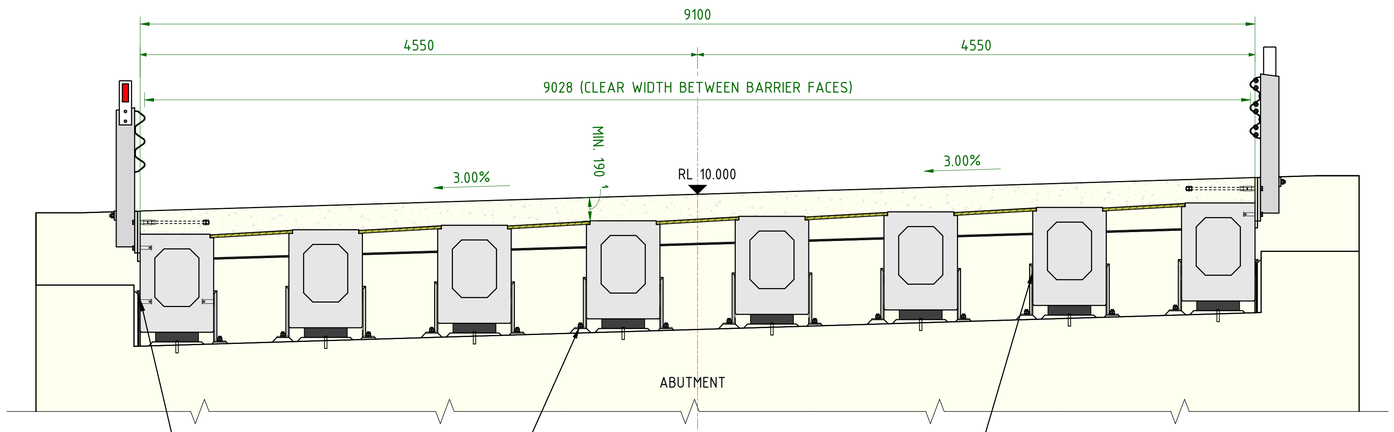
PRESTRESSED BEAM DETAILS - TYPES A & B

Project Number	24_010
Sheet	19 OF 25
Issue	P1
Drawing Number	24_010-S261

W:\Jobs\2024 Jobs\24_010 Tatham Bridges-Spring Gully-Quickway\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:23:47 PM



1/270 PLAN
DECK - CONCRETE | 1 : 75



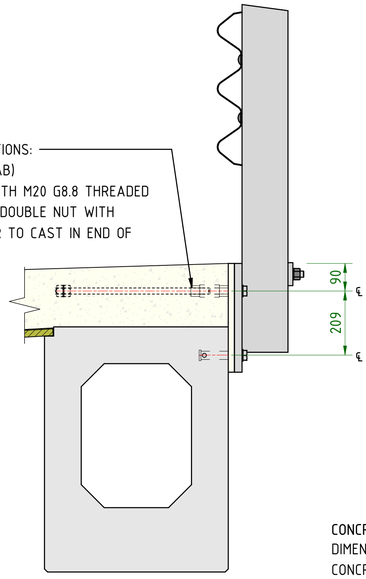
75x100x300 ELASTOMERIC STRIP FIXED BETWEEN DECK AND HEADSTOCK UPSTAND. FIX BEARING TO ABUTMENT WITH 4x4mm STAINLESS STEEL CONCRETE NAILS.

BEAM ANCHORS GROUT BELOW TO SAME HEIGHT AS BOTTOM OF BEARING.

[1] MINIMUM DECK THICKNESS REQUIRED AT MIDSPAN (POST POUR). DEFLECTION DUE TO WET CONCRETE DECK 16 mm

CONNECT BEAMS TO ANCHORS USING M24x50 HS BOLTS WITH WASHER. APPLY THREADLOCK COMPOUND TO BOLT SO THAT VERTICAL MOVEMENT IN BRACKET IS NOT POSSIBLE.

2/270 SECTION
1 : 25



UPPER ANCHOR POSITIONS:
(CAST INTO DECK SLAB)
M20 G8.8 COUPLER WITH M20 G8.8 THREADED ROD MIN. 500 LONG. DOUBLE NUT WITH SANDWICHED WASHER TO CAST IN END OF THREADED ROD.

3/270 SECTION
1 : 10

CONCRETE NOTES
DIMENSIONS IN MILLIMETERS.
CONCRETE EXPOSURE CLASSIFICATION:
ALL DECK ELEMENTS - A.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE 40 MPa.
CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
NCF DENOTES NO CHAMFER OR FILLET.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Design Checked	Signed:
Drafter	PAL
Drawing Checked	Signed:
Approved By	PAL
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

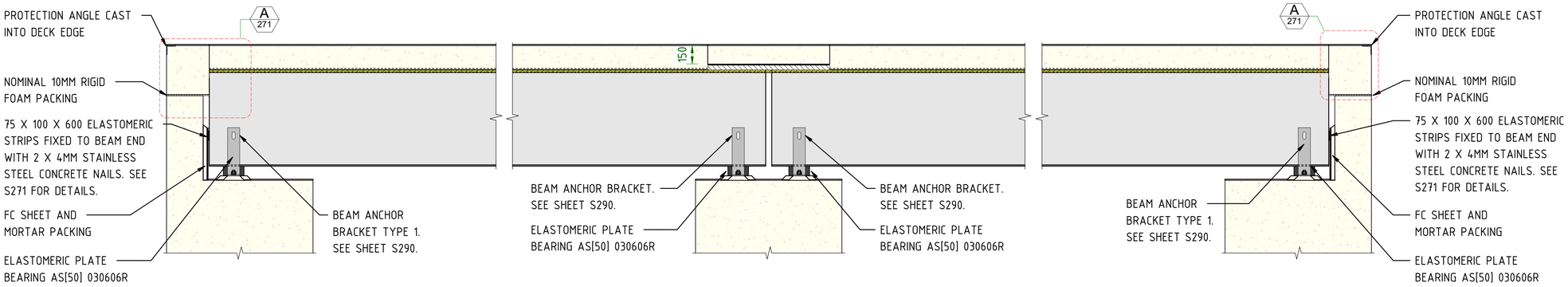
Bar Scales:
1:10 0 50 100 150 200 250 / 50 25
1:25 0 125 250 375 500 625 / 125 63
1:75 0 375 750 1125 1500 1875 / 375 188
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

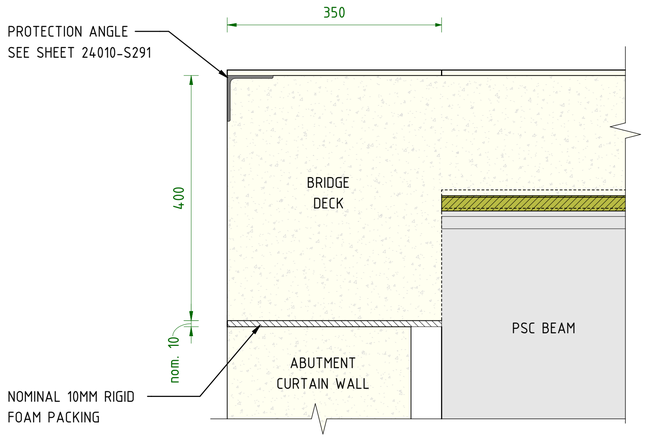
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

DECK - CONCRETE DETAILS - SHEET 1

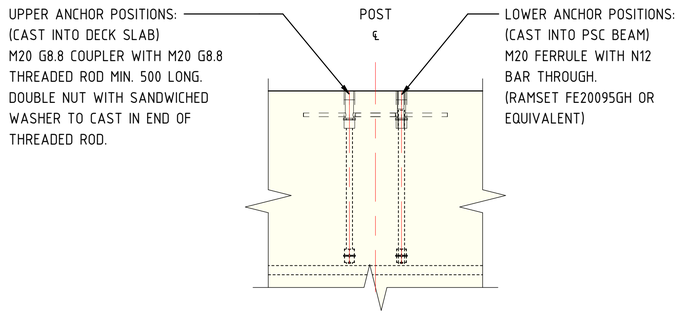
Project Number	24_010
Sheet	20 OF 25
Issue	P1
Drawing Number	24_010-S270



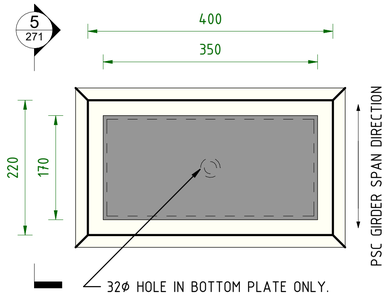
1 / 271 SECTION
DECK - CONCRETE | 1 : 20



A / 271 DETAIL
CONCRETE | 1 : 5

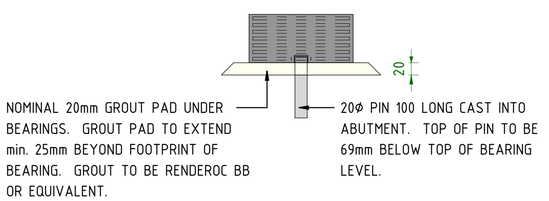


B / 271 DETAIL
CONCRETE | 1 : 10



4 / 271 PLAN - BEARING ASSEMBLY
1 : 5

BEARING TYPE AS [50] 030606R.
32 REQUIRED



5 / 271 ELEVATION - BEARING ASSEMBLY
1 : 5

BEARING INSTALLATION NOTES

1. PREPARE BEARING GROUT PAD TO LEVEL SPECIFIED (BEARING RL MINUS THICKNESS).
2. IF BEARING PIN IS NOT CAST INTO HEADSTOCK THEN DRILL AND CHEMSET BEARING RESTRAINT PIN INTO POSITION. (TOP OF PIN TO BE INSTALLED 12MM ABOVE LEVEL OF GROUT PAD).
3. INSTALL BEARING ON TOP OF PREPARED GROUT PAD, ENSURE BEARING CONTACT WITH GROUT PAD.
4. IMMEDIATELY PRIOR TO PLACEMENT OF GIRDER PLACE NOMINAL 5mm LAYER OF MEGAPOXY PM OVER TOP SURFACE OF BEARING.
5. LOWER PSC GIRDER INTO POSITION OVER BEARING UNTIL GIRDER CONTACTS THE TOP SURFACE OF THE BEARING. (CONTACT DOES NOT HAVE TO OCCUR ON ALL EDGES OF THE BEARING BUT JUST THE FIRST POINT OF CONTACT).
6. SUSPEND GIRDER IN THIS POSITION WITH TIMBER WEDGES. WEDGE TO REMAIN IN POSITION UNTIL MEGAPOXY PM HAS CURED (NOMINAL 24HRS AT 25°C).
7. REMOVE WEDGES AND INSTALL ANY PERMANENT GIRDER FIXINGS.

STEELWORK - MISCELLANEOUS

DIMENSIONS IN MILLIMETERS.
STEEL SECTIONS GRADE 300 TO AS3679.1.
STEEL PLATE MINIMUM GRADE 250 TO AS3678.
COLD ROLLED HOLLOW SECTIONS GRADE 350LO TO AS1163 USO.
BOLTING CATEGORY 8.8/TB TO AS5100.6 USO.
WELDING ELECTRODES E48XX OR W50X.
WELDING SYMBOLS TO AS1101.3.
SURFACE PROTECTION - HOT DIP GALVANIZING.
HOT DIP BOLTS ETC. TO AS1214.
IF NOT SPECIFIED ON THE DRAWING:
- BOLTS ARE TO BE M20.
- EDGE DISTANCE FOR BOLT HOLES TO BE 30 MIN.
- WELDING TO BE 5 FILLET, CONTINUOUS.

USO - UNLESS SPECIFIED OTHERWISE.

NOT FOR CONSTRUCTION

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Drafter: PAL | Drawing Checked: Signed:
Approved By: PAL | Survey Folder Number:
Project Identifier\-\CAD File Name:
Records File Number:

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:5 — 0 25 50 75 100 125 / 25 13
1:10 — 0 50 100 150 200 250 / 50 25
1:20 — 0 100 200 300 400 500 / 100 50
Do not scale, use figured dimensions only

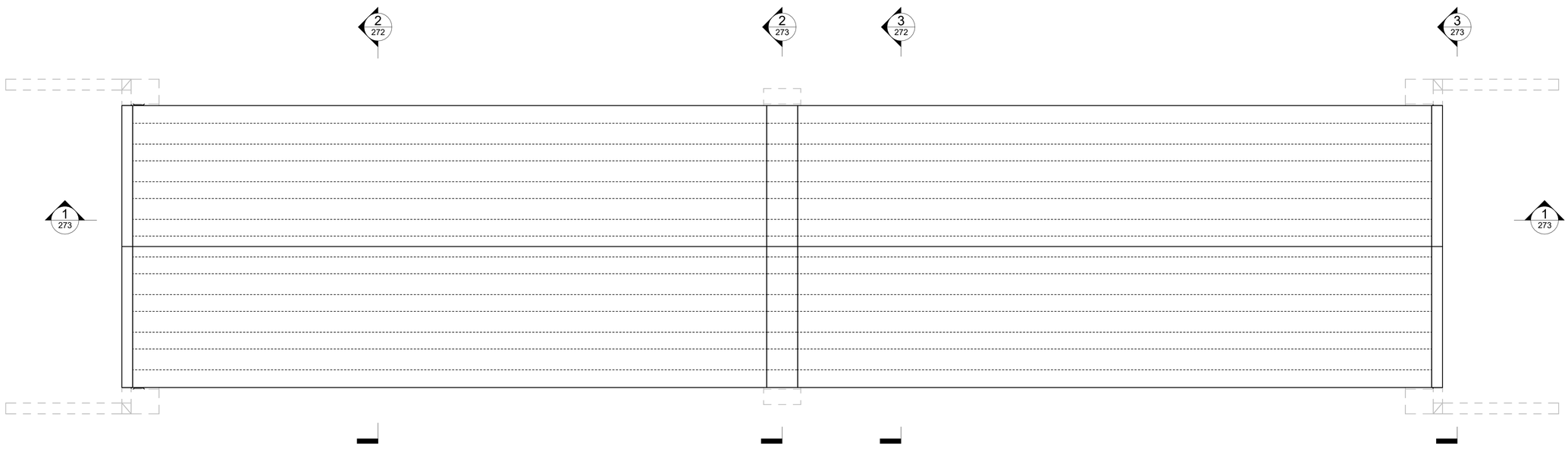
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

DECK - CONCRETE DETAILS - SHEET 2

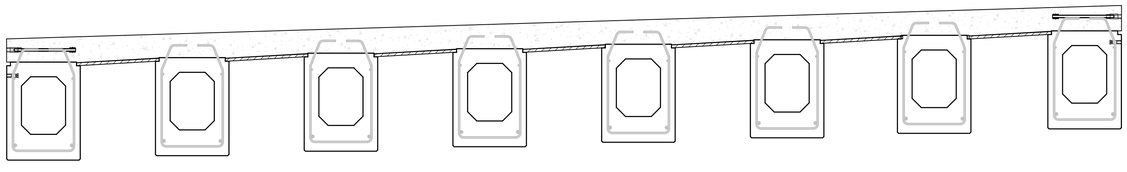
Project Number: 24_010
Sheet: 21 OF 25
Issue: P1
Drawing Number: 24_010-S271

W:\Jobs\2024 Jobs\24_010 Tatham Bridge-Spring Gully-Quickway\Design\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:22:53 PM



1/272 PLAN
DECK - REINFORCEMENT | 1 : 75

2/272 SECTION
SPAN 1 | 1 : 25



3/272 SECTION
SPAN 2 | 1 : 25

REINFORCEMENT NOTES
SCALES AS SHOWN
CLEAR COVER TO REINFORCEMENT NEAREST TO THE CONCRETE SURFACE 45 mm USO.
REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE	NF	NEAR FACE
EF	EACH FACE	+	LENGTH VARIES
USO	UNLESS SPECIFIED OTHERWISE.		
NSOP	NOT SHOWN ON PLAN.		

THE MINIMUM LENGTHS OF LAPS SHALL BE AS FOLLOWS USO:

BAR SIZE	N12	N16	N20	N24	N28	N32	N36	N40
HORIZONTAL BARS WITH ≥ 300 mm OF CONCRETE CAST BELOW THE BAR	460	650	940					
ALL OTHER BARS	350	500	720					

REINFORCEMENT MAY BE DISPLACED SLIGHTLY TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.
TACK WELDING OF REINFORCEMENT FOR LOCATION PURPOSES IS TO BE IN ACCORDANCE WITH AS1554.3 CLAUSE 3.3.

NOT FOR CONSTRUCTION

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PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:
1:25 0 125 250 375 500 625 (125 63)
1:75 0 375 750 1125 1500 1875 (375 188)
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CLIENT:
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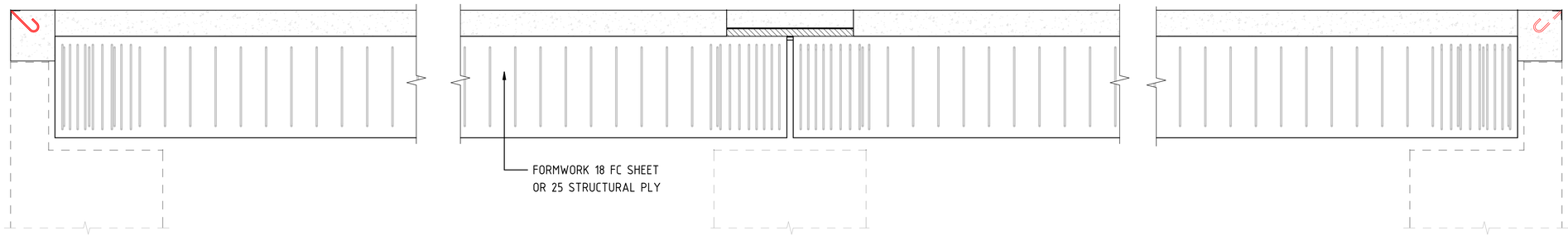
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

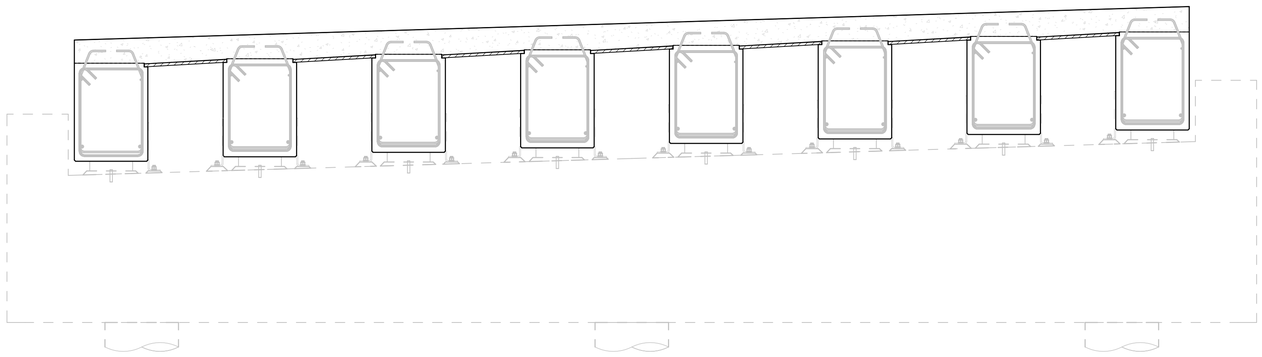
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

DECK - REINFORCEMENT DETAILS (SHEET 1)

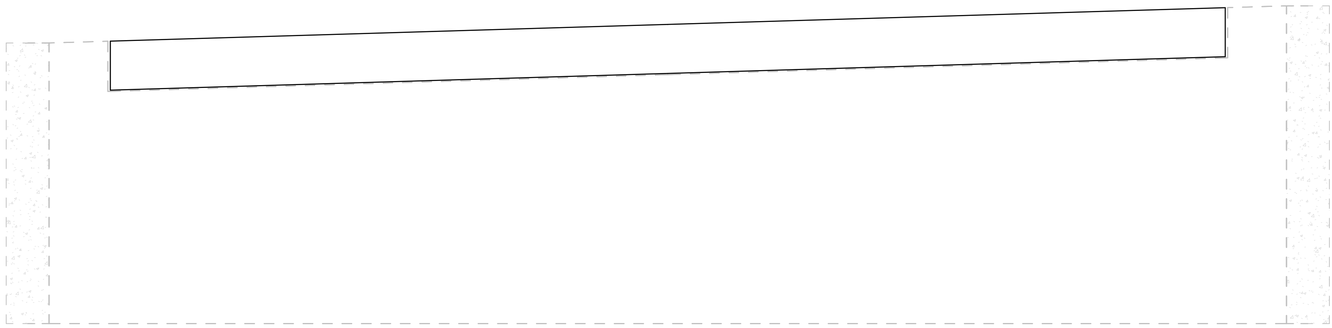
Project Number: 24_010
Sheet: 22 OF 25
Issue: P1
Drawing Number: 24_010-S272



1/273 SECTION
REINFORCEMENT | 1 : 20



2/273 SECTION
LINK SLAB | 1 : 25



3/273 VIEW
DECK END BEAM | 1 : 25

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES
Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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Email: peter.lowndes@bigpond.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway
Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number

Design Certifier:
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
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1:25 0 125 250 375 500 625 (125 63)
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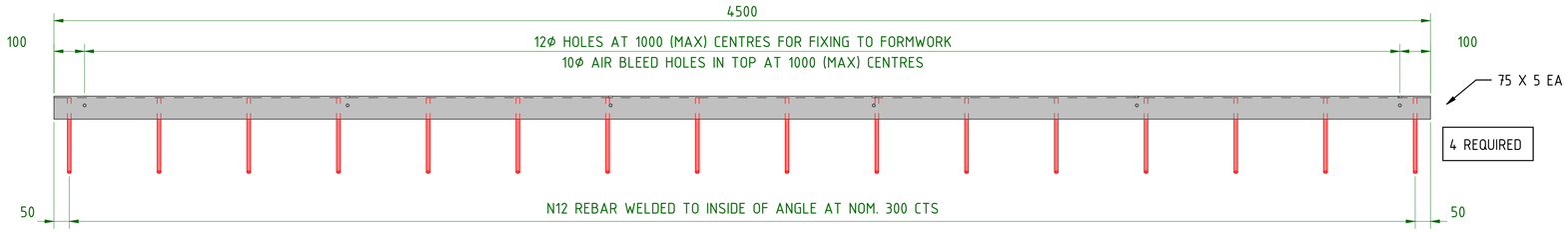
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

DECK - REINFORCEMENT DETAILS (SHEET 2)

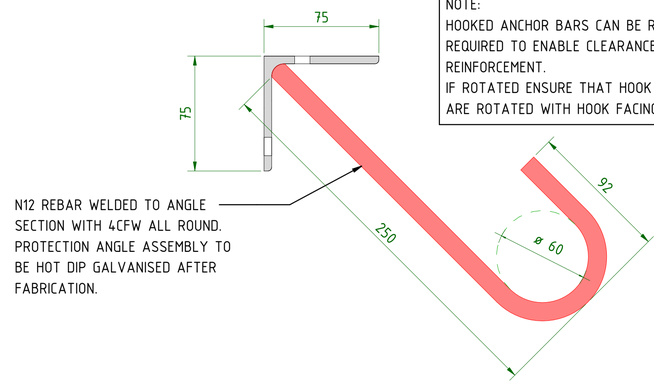
Project Number: 24_010
Sheet: 23 OF 25
Issue: P1
Drawing Number: 24_010-S273

W:\Jobs\2024 Jobs\24_010 Tatham Bridges-Spring Gully-Quickway\Design Dwgs\24010 Spring Gully BR_Design Model.rvt 9/08/2024 2:22:55 PM

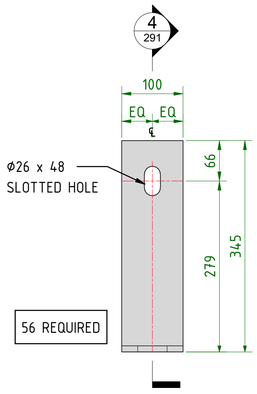


1/291 PROTECTION ANGLE PLAN 1 : 10

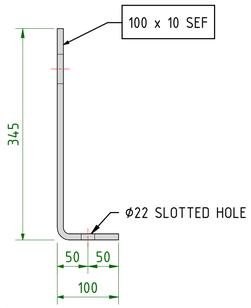
NOTE:
HOOKED ANCHOR BARS CAN BE ROTATED 90° IF REQUIRED TO ENABLE CLEARANCE WITH OTHER REINFORCEMENT.
IF ROTATED ENSURE THAT HOOK BARS AT ENDS ARE ROTATED WITH HOOK FACING INWARDS.



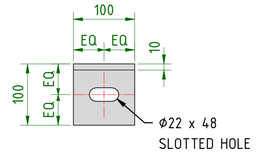
2/291 SECTION 1 : 2



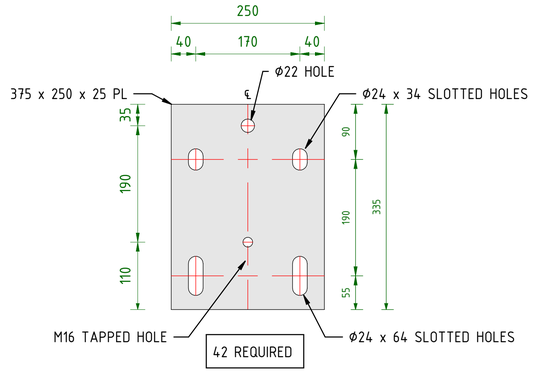
3/291 ELEVATION BEAM ANCHOR | 1 : 5



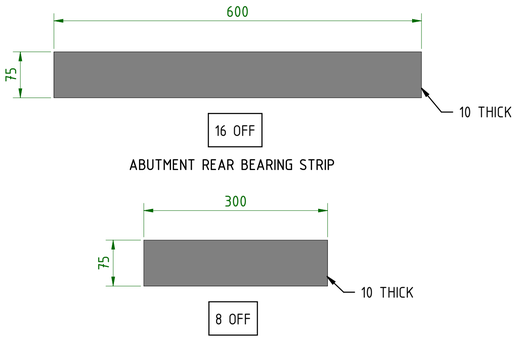
4/291 SECTION BEAM ANCHOR | 1 : 5



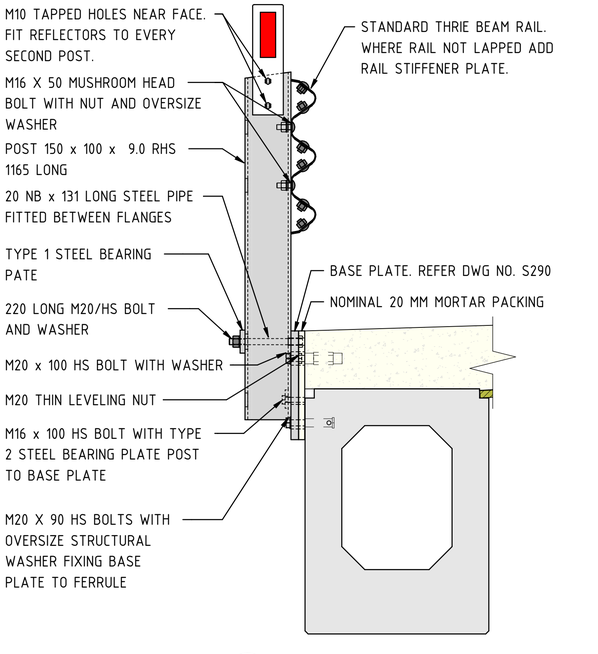
5/291 PLAN BEAM ANCHOR | 1 : 5



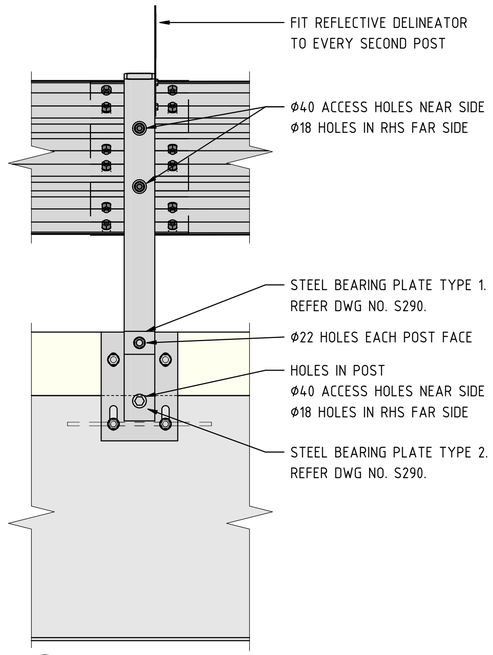
7/291 PLAN BARRIER BASEPLATE | 1 : 5



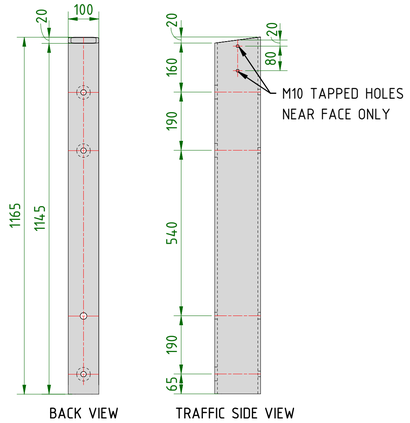
10/291 BEARING STRIP DETAILS 1 : 5



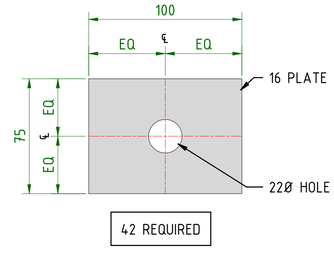
11/291 VIEW BARRIER ASSEMBLY | 1 : 10



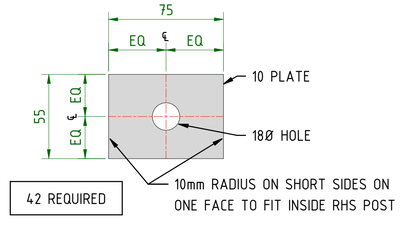
12/291 VIEW BARRIER ASSEMBLY | 1 : 10



6/291 ELEVATIONS BARRIER POST | 1 : 10



8/291 PLAN BEARING PLATE - TYPE 1 | 1 : 2



9/291 PLAN BEARING PLATE - TYPE 2 | 1 : 2

STEELWORK - MISCELLANEOUS
DIMENSIONS IN MILLIMETERS.
STEEL SECTIONS GRADE 300 TO AS3679.1.
STEEL PLATE MINIMUM GRADE 250 TO AS3678.
COLD ROLLED HOLLOW SECTIONS GRADE 350LO TO AS1163 USO.
BOLTING CATEGORY 8.8/TB TO AS5100.6 USO.
WELDING ELECTRODES E48XX OR W50X.
WELDING SYMBOLS TO AS1101.3.
SURFACE PROTECTION - HOT DIP GALVANIZING.
HOT DIP BOLTS ETC. TO AS1214.
IF NOT SPECIFIED ON THE DRAWING:
- BOLTS ARE TO BE M20.
- EDGE DISTANCE FOR BOLT HOLES TO BE 30 MIN.
- WELDING TO BE 5 FILLET, CONTINUOUS.
USO - UNLESS SPECIFIED OTHERWISE.

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1:5 0 25 50 75 100 125 / 25 13
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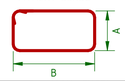
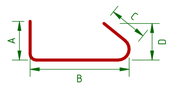
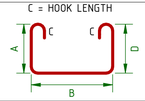
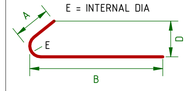
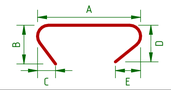
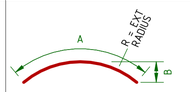
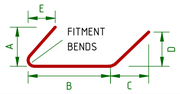
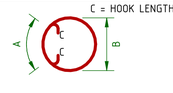
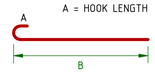
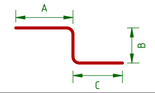
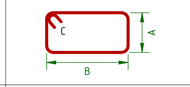
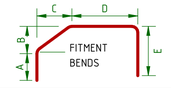
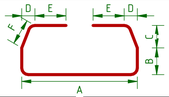
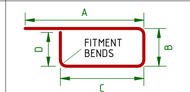
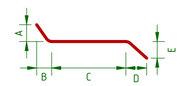
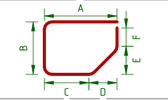
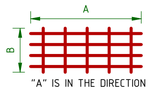
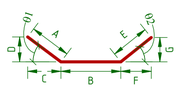
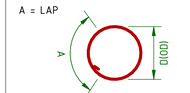
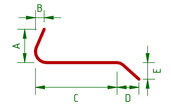
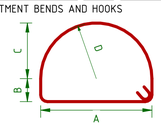
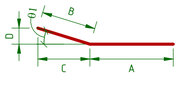
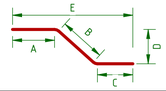
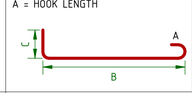
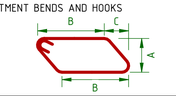
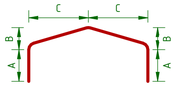
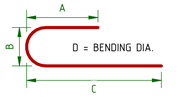
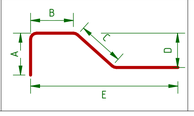
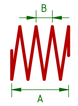
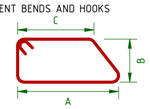
BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

MISCELLANEOUS DETAILS

Project Number	24_010
Sheet	24 OF 25
Issue	P1
Drawing Number	24_010-S291

SHAPE CODE	AUSTRALIAN STANDARD BAR SHAPE	SHAPE CODE	AUSTRALIAN STANDARD BAR SHAPE	SHAPE CODE	AUSTRALIAN STANDARD BAR SHAPE	SHAPE CODE	NON STANDARD BAR SHAPE	SHAPE CODE	NON STANDARD BAR SHAPE	SHAPE CODE	NON STANDARD BAR SHAPE
S		T	FITMENT BENDS 	JJ		B		Q	FITMENT BENDS AND HOOKS 		
L		SH	C = HOOK LENGTH 	A		C		W	FITMENT BENDS AND HOOKS 		
LL		CC		R		E		Y	C = HOOK LENGTH 		
H	A = HOOK LENGTH 	RC		HT	C = HOOK LENGTH 	G		NS1			
HH	A = HOOK LENGTH C = HOOK LENGTH 	VL		XT		K		NS2			
F		VV		CT	A = LAP 	M		NS3	FITMENT BENDS AND HOOKS 		
V		J		LH	A = HOOK LENGTH 	N	FITMENT BENDS AND HOOKS 	NS4			
U		LJ		SP		P	FITMENT BENDS AND HOOKS 				

GENERAL NOTES

AUSTRALIAN STANDARD BAR SHAPES ARE IN ACCORDANCE WITH AS1100.501.
BAR SIZE IS THE NOMINAL DIAMETER IN MILLIMETRES OR THE AS4671 FABRIC SIZE.
BARS SHALL BE DEFORMED BAR GRADE D500N TO AS4671 USO.
W DENOTES PLAIN BAR GRADE D500L TO AS4671.
RL AND SL DENOTES WELDED REINFORCING FABRIC, RECTANGULAR AND SQUARE RESPECTIVELY.
BAR BENDING INCLUDING STANDARD BENDS, HOOKS AND COGS SHALL BE IN ACCORDANCE WITH SECTION 5.13 OF AS5100.
BARS OF DIAMETER GREATER THAN 16mm SHALL NOT BE REBENT.
A WELDED LAP MAY BE USED IN LIEU OF STIRRUP HOOKS. SEE TABLE 1 FOR SIZE AND LENGTH OF WELD. WELDING PROCEDURES TO AS1554.3

BAR SIZE	SINGLE LAP WELD	DOUBLE LAP WELD
6	40	25
8	50	25
10	65	35
12	75	40
16	100	50

TABLE 1
LAP SPLICE WELDS FOR REINFORCEMENT

BAR MARKING:

THE REINFORCEMENT ON THE DRAWINGS IS DESCRIBED BY THE FOLLOWING NOTATION

A2 16 - N16 - S - 300EF

- PLACING INFORMATION
- SPACING ALONG LIMIT LINE
- BAR SHAPE CODE
- BAR SIZE
- BAR STRUCTURAL PROPERTIES
- NUMBER OF BARS IN SET
- BAR NUMBER IN SEQUENCE
- STRUCTURE ELEMENT DENOTATION

STRUCTURE ELEMENT NOTATIONS:

A - ABUTMENT
P - PIER HEADSTOCKS
Q - PIER PILECAPS
G - GIRDER
D - DECK
W - WING WALL
K - KERB

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\CAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
P1	Preliminary 50%	P.LOWNDES	PAL	09/08/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

BAR SHAPES DIAGRAM

Project Number	24_010
Sheet	25 OF 25
Issue	P1
Drawing Number	24_010-S299

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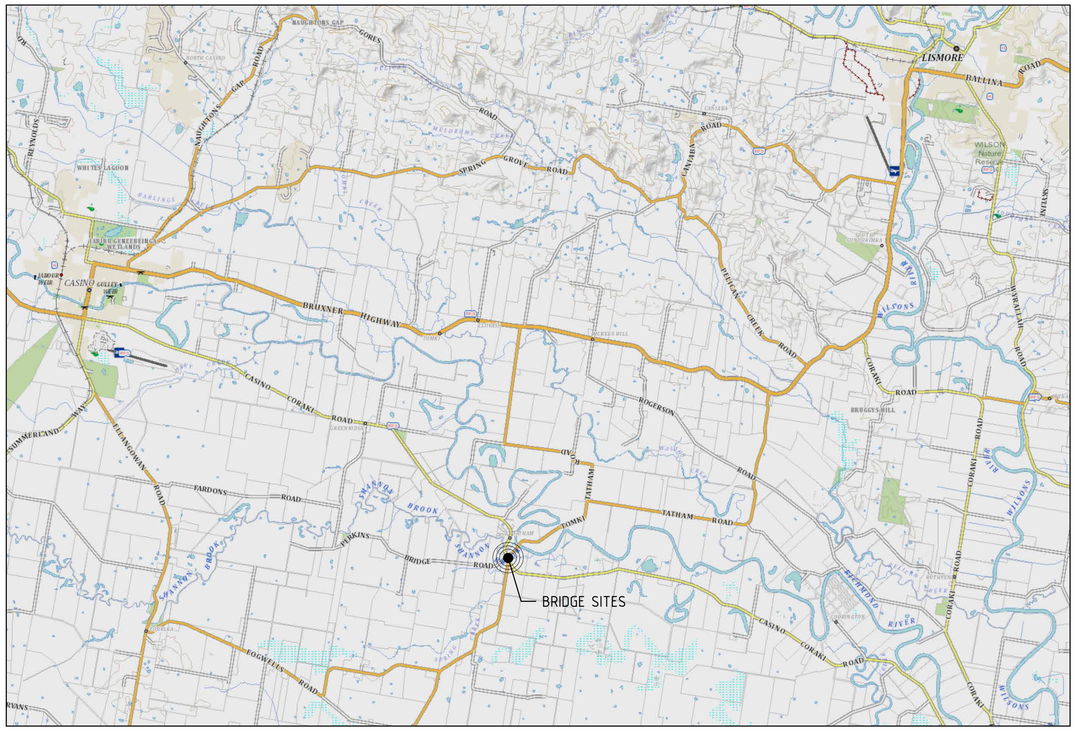
BRIDGES OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

AUTHORITY: RICHMOND VALLEY COUNCIL



1/001 **LOCATION**
N.T.S.

DRAWING LIST

SHEET No.	SHEET NAME	REV.	DATE
GENERAL			
VP402530-G001	COVER SHEET	T2	13/06/24
VP402530-S201	STRUCTURAL NOTES - SHEET 1	T2	13/06/24
VP402530-S202	STRUCTURAL NOTES - SHEET 2	T2	13/06/24
VP402530-S203	STRUCTURAL NOTES - SHEET 3	T2	13/06/24
STRUCTURAL (DEEP CREEK BRIDGE)			
VP402530-S210	GENERAL ARRANGEMENT	T2	13/06/24
VP402530-S211	TYPICAL SECTIONS - SHEET 1	T2	13/06/24
VP402530-S212	TYPICAL SECTIONS - SHEET 2	T2	13/06/24
VP402530-S213	PERSPECTIVE VIEW	T2	13/06/24
STRUCTURAL (SPRING GULLY BRIDGE)			
VP402530-S310	GENERAL ARRANGEMENT	T2	13/06/24
VP402530-S311	TYPICAL SECTIONS - SHEET 1	T2	13/06/24
VP402530-S312	TYPICAL SECTIONS - SHEET 2	T2	13/06/24
VP402530-S313	PERSPECTIVE VIEW	T2	13/06/24

BRIDGE DESIGN:
BRIDGE DESIGN TO AS5100-2017
TRAFFIC LOADING SM1600. DESIGN SPEED 100km/h.
EARTHQUAKE DESIGN CLASSIFICATION BEDC-2.
ALLOWANCE FOR SUPERIMPOSED DEAD LOADS 1.7kPa (serviceability)
TRAFFIC BARRIERS 'LOW PERFORMANCE' LEVEL.

WATERWAY DATA (EXCLUDING AFFLUX):

ANNUAL EXCEEDENCE PROBABILITY (%)	FLOW m^3/s	VELOCITY (AVERAGE) m/s	WATER LEVEL (excl. AFFLUX) RL (m)	ULTIMATE LOAD FACTOR γ_{WF}
5		max. 3	≈12.0	1.0
1		max. 3	≈12.25	1.3
0.05		max. 3	≈15.25	1.3

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

COVER SHEET

Project Number: **VP402530**
Sheet: **1 OF 12**
Issue: **T2**
Drawing Number: **VP402530-G001**

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GENERAL:

G1. DESIGN SPECIFICATIONS: AS5100-2017 EXCEPT WHERE NOTED

G2. PRODUCT TRADE NAMES HAVE BEEN USED TO ESTABLISH A QUALITY REQUIREMENT NO SUBSTITUTIONS SHALL BE MADE WITHOUT WRITTEN APPROVAL.

G3. RESPONSIBILITY FOR DESIGN CERTIFICATION OF ITEMS SHOWN ON THESE DRAWINGS:
- ALL STRUCTURAL ELEMENTS: PETER LOWNDES CONSULTING ENGINEER.

G4. DRAWINGS TO BE READ IN CONJUNCTION WITH:
- GEOTECHNICAL REPORT: REGIONAL GEOTECHNICAL SOLUTIONS REPORT REF. NO. RGS32900.1-AB DATED JANUARY 2022

G5. EXTENTS OF SUPPLIED GEOTECHNICAL INFORMATION:
GENERAL INDICATION ONLY OF THE CONDITIONS LIKELY TO BE ENCOUNTERED.
GROUND CONDITIONS COULD VARY.

G6. ENGINEERING DESIGN IS BASED ON SURVEY SUPPLIED BY: RICHMOND VALLEY COUNCIL
IMPORTANT SURVEY NOTES:
- DESIGN USES DATA TERRAIN MODEL COMPUTER GENERATED FROM THE SITE SURVEY.
- SOME ELEMENTS OF THE SURVEY DATA ARE INTERPOLATED AND MAY VARY FROM THE ACTUAL SITE CONDITIONS.
- CONTRACTOR SHALL LIAISE WITH THE SURVEYOR AND SET OUT THE WORKS ONLY FROM APPROVED BENCHMARKS.

G7. CONSTRUCTION TO BE SET OUT USING FOLLOWING SURVEY INFORMATION:
BENCHMARKS PROVIDED BY RICHMOND VALLEY COUNCIL'S SURVEYOR.

G8. CONTRACTOR TO OBTAIN APPROVAL FOR FULL EXTENT OF VEGETATION CLEARING BEFORE COMMENCING WORKS.

G9. CONTRACTOR TO MAINTAIN 'AS CONSTRUCTED' RECORDS TO FOLLOWING STANDARD:
COUNCIL'S 'AS CONSTRUCTED' REQUIREMENTS

G10. CURRENT EDITION OF STANDARDS (AT TIME OF CONSTRUCTION) TO BE USED, UNO.

DIMENSIONS / LEVELS:

L1. REDUCED LEVELS, CHAINAGES AND COORDINATES ARE ALL IN METRES.

L2. ALL OTHER DIMENSIONS ARE IN MILLIMETRES.

L3. ALL LEVELS ARE TO LOCAL SITE DATUM ONLY

L4. ALL COORDINATES ARE TO LOCAL GRID DATUM ONLY

L5. DIMENSIONS SHALL NOT BE SCALED FROM DRAWINGS.

L6. BRIDGE LEVELS AND SETOUT POINTS ARE TO BE CONFIRMED ON SITE BY A REGISTERED SURVEYOR PRIOR TO CONSTRUCTION. ADVISE ANY DISCREPANCY BEFORE PROCEEDING.

EXISTING SERVICES:

ES1. LOCATE SERVICES BEFORE STARTING: SERVICE LOCATIONS SHOWN ON DRAWINGS ARE APPROXIMATE ONLY.

ES2. POTHOLE AND PROTECT SERVICES: ACCURATELY LOCATE SERVICES ADJACENT TO BRIDGE STRUCTURE BEFORE COMMENCING CONSTRUCTION. PROTECT SERVICES FROM DAMAGE.

TEMPORARY WORKS:

T1. OBTAIN DESIGN AND INSTALLATION CERTIFICATION FOR TEMPORARY WORKS:
STRUTS, PROPPING, TIE BACKS, EXCAVATION SHORING, PROTECTION WORKS, DE-WATERING SYSTEMS, FORMWORK, EARLY LOADING OF STRUCTURES AND THE LIKE.

T2. INSTALL SUITABLE AND STRONG BARRIERS FOR THE PROTECTION AND SAFEGUARDING OF TRAFFIC AND PEDESTRIANS.

T3. ANY TEMPORARY ROAD SURFACES TO BE TRAFFIC-ABLE AT ALL TIMES AT LOW SPEED (30 km/hr). POTHOLES, ETC. TO BE MONITORED AND REPAIRED.

DEMOLITION OF EXISTING BRIDGE:

DB1. DISMANTLE EXISTING BRIDGE SUPERSTRUCTURE. STACK GOOD TIMBER ON SITE FOR COUNCIL. CONTRACTOR TO DISPOSE OF REMAINDER.

DB2. CUT EXISTING HARDWOOD PILES OFF AT EXISTING GROUND LEVEL.

PROGRAM AND CONSTRUCTION CONSTRAINTS:

PR1. CONSTRUCTION CONSTRAINTS:
- ALLOW FOR LIKELIHOOD OF FLOODING WITHIN THE CREEK:
PROTECT CONSTRUCTION EQUIPMENT AND WORKS
- PROGRAM CONSTRUCTION WORKS TO OCCUR DURING DRY WINTER MONTHS (JUNE TO SEPTEMBER), TO REDUCE LIKELIHOOD OF FLOODING

PR2. PROVIDE WORK SCHEDULE AND CONSTRUCTION SITE PLAN INDICATING ACCESS, PROTECTIVE FENCING, BARRIERS, BOARDING'S, SIGNAGE AND SEDIMENT & EROSION CONTROL.

PR3. PROVIDE A TRAFFIC MANAGEMENT PLAN INCORPORATING:
- RICHMOND VALLEY COUNCIL REQUIREMENTS
- DETAILS OF PUBLIC NOTIFICATION PROPOSALS (IN ACCORDANCE WITH PROJECT SPECIFICATION)
- PROVISION TO ADVISE THE SUPERINTENDENT OF ALL IMPENDING CHANGES TO TRAFFIC CONDITIONS
- INFORMATION SIGNAGE FOR ALTERED TRAFFIC CONDITIONS INCLUDING TRAFFIC DETOURS AND ACCESS FOR PRIVATE PROPERTIES.
- CONTACT DETAILS OF PERSON RESPONSIBLE FOR MAINTENANCE OUTSIDE WORKING HOURS.
- DETAILS OF PROPOSED SIGNAGE LAYOUTS, INCLUDING REQUIREMENTS FOR NIGHT WORK AND TEMPORARY DIRECTION.

PR4. PROVIDE COMMENCEMENT NOTICE, OPERATIONAL WORKS SIGNAGE AND COMPLETION NOTICE AS REQUIRED BY THE ENVIRONMENTAL APPROVALS.

DESIGN LOADINGS / PARAMETERS:

D1. CONCRETE UNIT WEIGHT (INCL. REINFORCING): 25.5 kN/m^3

D2. ASPHALT UNIT WEIGHT: 24.5 kN/m^3

D3. TRAFFIC LOADING:
STANDARD HIGHWAY LOADING: SM1600, W80, A160 AS PER AS5100-2017

D4. ALLOWANCE FOR SUPERIMPOSED DEAD LOADS: 1.7 kPa (SERVICEABILITY)

D5. MINIMUM DESIGN LATERAL LOADING: 500 kN

D7. DESIGN LIFE: 100 YEARS FOR ALL CONCRETE ELEMENTS

D8. AVERAGE BRIDGE TEMPERATURE RANGES: +45°C, -5°C

D9. AVERAGE BRIDGE TEMPERATURE: 20-25 °C FOR SETTING BEARINGS AND JOINTS.

D10. WATERWAY/FLOOD DATA (EXCLUDING AFLUX):
HYDROLOGY/HYDRAULIC DATA TAKEN PRELIMINARY CALCULATIONS ONLY.
- AEP 5 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.0 m, γw=1.0
- AEP 1 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.25 m, γw=1.3
- AEP 0.05 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈15.25 m, γw=1.3

D11. THE FOLLOWING MAXIMUM SCOUR HAS BEEN CONSIDERED FOR BRIDGE ABUTMENT/PIER DESIGN:
ABUTMENT SCOUR TO APPROX. 2m
ABUTMENTS A & B - SCOUR PROTECTION SIZED TO ARI100 FLOOD VELOCITIES
PIER SCOUR TO APPROX. 3m

D12. DESIGN GUST WIND SPEED (ULTIMATE): V_{SITE} = 63 m/s; (TERRAIN CATEGORY 2; REGION B)

D13. EARTHQUAKE: BEDC-2

D14. PROBABILITY FACTOR: k_p = 1.0
SEISMIC HAZARD FACTOR: z = 0.08

D15. DESIGN LANE WIDTH: 3.2m

D16. ROAD DESIGN SPEED AS FOLLOWS: - ALL: 100 km/h

D17. DESIGN TRAFFIC VOLUMES: - CURRENT AADT:

D18. BRIDGE TRAFFIC BARRIERS: 'LOW PERFORMANCE' PERFORMANCE LEVEL (DETERMINED IN ACCORDANCE WITH AS5100)

STANDARD SPECIFICATIONS:

TRANSPORT FOR NEW SOUTH WALES (TfNSW) SPECIFICATIONS
R44 *EARTHWORKS*
B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*
B50 *DRIVEN REINFORCED CONCRETE PILES*
B53 DRIVEN H-SECTION STEEL PILES
B58 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITH PERMANENT STEEL CASINGS*
B59 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITHOUT PERMANENT STEEL CASINGS*
B80 *CONCRETE WORK FOR BRIDGES*
B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B150 *ERECTION OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B170 *SUPPLY AND INSTALLATION OF VOID FORMERS*
B201 *STEELWORK FOR BRIDGES*
B220 *PROTECTIVE TREATMENT OF BRIDGE STEELWORK*
B240 *SUPPLY OF BOLTS, NUTS, SCREWS AND WASHERS*
B264 *ERECTION OF BARRIER RAILINGS AND MINOR COMPONENTS*
B280 *UNREINFORCED ELASTOMERIC BEARING PADS AND STRIPS*
B281 *LAMINATED ELASTOMERIC BEARINGS*
B284 *INSTALLATION OF BRIDGE BEARINGS*
3552 SUBSURFACE DRAINAGE PIPE (CORRUGATED PERFORATED AND NON-PERFORATED PLASTIC)

CONSTRUCTION SEQUENCE NOTES:

BRIDGE DESIGN IS BASED ON THE CONSTRUCTION SEQUENCE AS FOLLOWS:

CS1. DEMOLISH EXISTING BRIDGE SUPERSTRUCTURE AND PIERS AND REMOVE COMPLETLEY.
CUT DOWN EXISTING BRIDGE ABUTMENTS TO LEVEL OF UNDERSIDE OF NEW ABUTMENTS.

CS2. WHERE REQUIRED, CONSTRUCT ROCKWORK RETAINING STRUCTURES AROUND ABUTMENTS

CS3. CONSTRUCT WORKING SLABS UNDER NEW ABUTMENTS AND TIE IN TO RETAINED PORTIONS OF EXISTING ABUTMENT STRUCTURES.

CS4. INSTALL PILE/ROCK ANCHOR FOUNDATIONS.

CS5. LOCALLY INSTALL ANY ADDITIONAL ROCK PROTECTION AROUND ABUTMENTS.

CS6. CONSTRUCT ABUTMENT HEADSTOCKS AND WING WALLS.

CS7. PREPARE BEARING/GROUT PADS FOR DECK UNIT ERRECTION.

CS8. ERECT DECK UNITS ON BEARINGS/GROUT PADS AND GROUT INTO PLACE. ERECT NO EARLIER THAN 30 DAYS AFTER DECK UNIT MANUFACTURE.

CS9. CONSTRUCT DECK SLAB.

CS10. BACKFILL BEHIND ABUTMENTS. BACKFILL TO OCCUR NO EARLIER THAN 7 DAYS AFTER DECK CONSTRUCTION OF DECK SLAB. BACKFILL SHALL BE UNDERTAKEN IN A MANNER SUCH THAT THE FILL DEPTHS AT THE TWO OPPOSING ABUTMENTS DO NOT VARY BY MORE THAN 600mm.

CS11. INSTALL BRIDGE TRAFFIC BARRIERS.

CS12. COMPLETE APPROACH ROAD WORKS AND REMOVE EXISTING BRIDGE STRUCTURE,

CS13. COMPLETE ROCK PROTECTION WORKS AS REQUIRED.

NOT FOR CONSTRUCTION

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Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\ICAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

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Do not scale, use figured dimensions only

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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 1

Project Number: VP402530
Sheet: 2 OF 12
Issue: T2
Drawing Number: VP402530-S201

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EARTHWORKS:

EW1. EARTHWORKS SHALL BE IN ACCORDANCE WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*.

EW2. CLEAR ALL VEGETATION FROM AREAS TO BE EXCAVATED OR FILLED. ALL RUBBISH INCLUDING DEBRIS FROM CLEARING TO BE DISPOSED IN ACCORDANCE WITH LOCAL AUTHORITY STANDARDS. BURNING NOT ALLOWED.

EW3. ALL ORGANIC MATERIAL, TOPSOIL AND UNSUITABLE SUBGRADES ARE TO BE STRIPPED FROM THE AREA TO BE FILLED AND REMOVED FROM THE SITE. SUFFICIENT TOPSOIL IS TO BE RETAINED FOR RE-SPREADING TO A MINIMUM DEPTH OF 75 mm ALL OVER THE SITE AFTER EARTHWORKS. AFTER STRIPPING AS ABOVE THE WHOLE SITE IS TO BE COMPACTED AND PROOF ROLLED TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT PRIOR TO PLACING OF EMBANKMENT.

EW4. FILLING IS TO BE CARRIED OUT IN CONTROLLED LAYERS NOT TO EXCEED 200mm DEPTH. EACH LAYER IS TO BE COMPLETELY COMPACTED TO A MINIMUM OF 95% RELATIVE DRY DENSITY FOR COHESIVE SOILS OR A MINIMUM DENSITY INDEX OF 70% FOR NON-COHESIVE SOILS AND TESTED AND APPROVED BY THE GEOTECHNICAL CONSULTANT PRIOR TO THE PLACEMENT OF THE NEXT LAYER. THE TOP 300mm OF THE ROAD SUBGRADE IS TO BE COMPACTED TO A MINIMUM OF 98% RELATIVE DRY DENSITY.

EW5. MATERIAL IN ANY PARTICULAR LAYER SHOULD BE HOMOGENOUS. IF NECESSARY, SMALL QUANTITIES OF FILL DIFFERING FROM THE REST SHOULD BE SPREAD AS A THIN LAYER OVER THE WHOLE SITE AND INCORPORATED INTO A FULL LAYER. IN A CUT/FILL SITUATION THE GEOTECHNICAL CONSULTANT MAY DIRECT THAT ANY EXISTING SOIL WITHIN 600mm OF THE FINISHED SURFACE LEVEL BE REMOVED AND REPLACED WITH FILL EQUIVALENT TO THE GENERAL FILL MATERIAL. THE MATERIAL SO REMOVED MAY, IF IT OTHERWISE MEETS THE SPECIFICATION, BE USED AS GENERAL FILL AS ABOVE.

EW6. FILL (IMPORTED OR IN-SITU) IN ROADWAYS IS TO CONSIST OF HOMOGENOUS SITE MATERIAL CONTINUOUSLY GRADED WITH A MAXIMUM PARTICLE SIZE OF 75mm, A MINIMUM CBR OF 8 AND A MOISTURE CONTENT BETWEEN -2% TO +2% OF OPTIMUM MOISTURE CONTENT AT TIME OF COMPACTION. REFER NOTES BA1, BA2 FOR BACKFILL BEHIND STRUCTURES.

EW7. ALL TESTING IS TO BE CARRIED OUT BY A NATA CERTIFIED LABORATORY.

EW8. ALL "UNCONTROLLED FILL" IDENTIFIED ON SITE SHALL BE REMOVED TO NATURAL SURFACE LEVEL AND, IF SUITABLE, REUSED AND PLACED AS SPECIFIED ABOVE.

EW9. VISIBLE SUBGRADE MOVEMENT SHALL BE ASSESSED USING A WATER TRUCK WITH A SINGLE REAR AXLE AND A GROSS MASS OF NOT LESS THAN 15 TONNES OR APPROVED SIMILAR.

LEVELLING GROUT, INJECTION EPOXY AND NON-SHRINK GROUT:

LG1. GENERAL PURPOSE SHRINKAGE COMPENSATED CEMENTITIOUS GROUT TO BE PARCHEM "CONSTRUCTION GROUT" OR APPROVED EQUIVALENT.

LG2. LEVELLING GROUT FOR BEARING PADS TO BE PARCHEM "RENDEROC BB", OR APPROVED EQUIVALENT, SUITABLE FOR 20mm - 150mm THICKNESS.

LG3. INJECTION EPOXY FOR EPOXYING OF FIXING BOLTS AND REINFORCEMENT BARS TO BE RAMSET "CHEMSET REO502", OR APPROVED EQUIVALENT. HOLES TO BE BLOWN/VACUUMED AND DRY PRIOR TO INSTALLATION OF EPOXY.

CONCRETE:

C1. CONCRETE WORKS TO BE IN ACCORDANCE WITH: TfNSW B80 *CONCRETE WORKS FOR BRIDGES*.

C2. CONCRETE STRENGTH, EXPOSURE CLASSIFICATION AND REINFORCEMENT COVER SHALL BE AS FOLLOWS:

ITEM	EXPOSURE	f'c (MPa) & AGGREGATE SIZE	REINFORCEMENT COVER (ALL FACES) (mm)	TARGET SLUMP (mm)	SURFACE FINISH
ABUTMENTS & WINGWALLS	B1	S40/20	45	100	FORMED
DECK	B1	S40/20	45	100	LIGHT BROOM
PIER PILECAP, COLUMNS & HEADSTOCK	B1	S40/20	45	100	FORMED
PRECAST PILES	B1	S50/20	40	100	FORMED
PSC BEAMS	B1	S50/20	40	100	FORMED

NOTE: N = NORMAL PLACEMENT OF CONCRETE, T = TREMIE PLACEMENT OF CONCRETE

C3. CONCRETE SHALL BE VIBRATED AS FOLLOWS:
- PRECAST ELEMENTS TO BE CAST IN RIGID FORMS AND SUBJECTED TO INTENSE VIBRATION.
- ALL OTHER CONCRETE TO BE VIBRATED UNO.

C4. CONCRETE ELEMENT EDGE FINISHING:
- CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
- NCF DENOTES NO CHAMFER OR FILLET.

C5. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER.

C6. REINFORCEMENT SHALL BE SUPPORTED TO GIVE THE CORRECT CONCRETE COVER ON CHAIRS AS FOLLOWS:
- ALL BRIDGE ABUTMENTS, PIERS AND PRECAST DECK UNITS: EXTRUDED FIBRE CONCRETE BLOCKS (60MPa MINIMUM COMPRESSIVE STRENGTH) OR STAINLESS STEEL NIBS WELDED TO THE REINFORCEMENT
- PILES IN GROUND: PLASTIC CHAIRS AND SPACERS
- ALL OTHER CONCRETE: PLASTIC CHAIRS AND SPACERS.

C7. CONSTRUCTION JOINTS SHALL BE USED ONLY AS SHOWN ON THE DRAWINGS. NO CONSTRUCTION JOINT SHOWN ON THE DRAWINGS SHALL BE OMITTED WITHOUT THE WRITTEN APPROVAL OF THE DESIGN ENGINEER.

C8. TIME FOR SAWCUTTING (WHERE SHOWN ON DRAWINGS): WITHIN 8-10 HOURS OF FINISHING WORKS.

C9. ANY CONCRETE FACE AGAINST WHICH NEW CONCRETE IS TO BE PLACED SHALL BE THOROUGHLY SCABBLED. CLEAN OFF DUST AND CONTAMINANTS BEFORE NEW POUR.

C10. FORMWORK TO REMAIN IN POSITION FOR FOLLOWING TIMEFRAMES UNO:
- SOFFITS OF SUSPENDED SLABS, BEAMS, HEADSTOCKS CONCRETE: COMPRESSIVE STRENGTH TO EXCEED 70% OF F'C AND MINIMUM CONCRETE AGE OF 7 DAYS
- SIDEFORMS: COMPLY WITH REQUIREMENTS OF AS5100.5 cl17.8 AND TIMEFRAMES DETAILED IN ITP FOR ELEMENT.

C11. LOADING OF STRUCTURES WITH COMPRESSIVE STRENGTH LESS THAN *f'c*: OBTAIN APPROVAL BEFORE APPLYING LOADS OR DESIGN & INSTALL SUITABLE PROPPING IN ACCORDANCE WITH NOTE T1.

C12. CONCRETE TO BE CURED TO THE STANDARD (SHOWN IN NOTE C1) AND BELOW REQUIREMENTS:
- ALL EXPOSED SURFACES: SPRAY WITH ALIPHATIC ALCOHOL AFTER FIRST SCREED, AND AGAIN AFTER EACH FINISHING OPERATION.

CURING PERIODS:
- ABUTMENT HEADSTOCKS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.
- BRIDGE DECK AND APPROACH SLABS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.

PREFERRED CURING METHODS:
- UNDER PLASTIC, LAPPED AND TAPED. HOSE WITH WATER ONCE DAILY UNDER PLASTIC AND RETAPE; OR
- COAT WITH FOSROC CONCURE A99 CURING COMPOUND TO TfNSW B80 cl8.4 REQUIREMENTS.
- PRECAST ELEMENTS TO BE STEAM CURED TO TfNSW B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*.

REINFORCEMENT:

R1. REINFORCEMENT SHALL CONFORM WITH TfNSW B80 *CONCRETE WORK FOR BRIDGES*. ALL REINFORCEMENT TO BE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL) CERTIFIED.

R2. REINFORCEMENT SHALL BE GRADE D500N HOT ROLLED HIGH YIELD BARS TO AS4671 UNO. WHERE R BARS ARE SPECIFIED, THESE SHALL BE ROUND BARS GRADE R250N.

R3. BAR SHAPES ARE AS SHOWN ON DRAWING

R4. HOOKS AND COGS SHALL BE IN ACCORDANCE WITH AS5100 cl 13.1.2.7.

R5. LAPS AND OTHER SPLICES IN REINFORCEMENT SHALL ONLY BE MADE AT THE POSITIONS SHOWN ON THE DRAWINGS UNLESS ALTERNATIVE OR EXTRA LOCATIONS ARE APPROVED IN WRITING BY THE SUPERINTENDENT.

R6. DO NOT CUT REINFORCEMENT TO CLEAR PENETRATION, SLEEVES OR H.D. BOLTS. DISPLACE REINFORCEMENT SLIGHTLY AS NECESSARY AND PROVIDE CORRECT COVER TO THE PENETRATION, SLEEVES OR H.D. BOLTS.

R7. SIDE AND END LAPS IN WELDED MESH REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS5100.5 cl 13.2.3.

R8. REINFORCEMENT LAP SPLICE LENGTHS (UNO ON DRAWINGS) AS FOLLOWS ♦:

EXPOSURE CLASSIFICATION	f'c (MPa)	DEFORMED BAR DIAMETER								
		N10	N12	N16	N20	N24	N28	N32	N36	N40
B1	32	350	400	550	800	1050	1350	1650	2000	2350
	40	300	350	500	750	1000	1250	1500	1800	2150
B2	40	300	350	500	650	900	1150	1400	1700	2000
	50	300	350	500	650	850	1050	1300	1600	1850
C1	50	300	350	500	600	700	950	1200	1450	1750
	≥55	300	350	500	600	700	900	1150	1400	1650
C2	≥55	300	350	500	600	700	850	1050	1300	1600

♦ FOR HORIZONTAL BARS WITH MORE THAN 300 OF CONCRETE BELOW THE ABOVE BARS, THE LAP LENGTHS IN THIS TABLE SHALL BE MULTIPLIED BY 1.3. WHERE LAPS ARE REQUIRED BUT NOT SHOWN ON THE DRAWINGS, THEY SHOULD BE STAGGERED AND POSITIONED AWAY FROM POINTS OF MAXIMUM STRESS. WHERE MORE THAN 50% OF REINFORCEMENT IS SPLICED AT POINTS OF MAXIMUM STRESS, LAP LENGTHS SHOWN IN THE TABLE ABOVE ARE TO BE MULTIPLIED BY 1.3.

R9. REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE
NF	NEAR FACE
EF	EACH FACE
EE	EACH END
NSOP	NOT SHOWN ON PLAN
NSOE	NOT SHOWN ON ELEVATION
+	LENGTH VARIES

NOT FOR CONSTRUCTION

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Design Checked	Signed:
Drawing Checked	Signed:
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Issue	Description	Name	Initial	Date
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Do not scale, use figured dimensions only

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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 2

Project Number	VP402530
Sheet	3 OF 12
Issue	T2
Drawing Number	VP402530-S202

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ELASTOMERIC BEARING PADS/STRIPS:

EB1. ELASTOMERIC BEARING STRIPS SHALL BE UNREINFORCED NATURAL RUBBER BEARING STRIP, TYPE 60H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB2. LAMINATED ELASTOMERIC BEARING PADS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE REQUIREMENTS OF AS5100.4 cl 12 FROM TYPE 50H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB3. LAMINATED ELASTOMERIC BEARING PADS SHALL BE SUPPLIED WITH HOLES TO SUIT THE BEARING RESTRAINT PINS. HOLE SETOUT SHALL BE AS SHOWN ON THE BEARING DETAIL DRAWINGS.

EB4. STORE BEARINGS UNDER COVER UNTIL INSTALLATION. ONCE INSTALLED, KEEP PROTECTED FROM THE ELEMENTS WITH COVER SHEET UNTIL DECK UNITS INSTALLED.

INSTALLATION OF ELASTOMERIC BEARINGS

PROCEDURE AS FOLLOWS:

BI1. PREPARE BEARING GROUT PAD TO LEVEL SPECIFIED (BEARING RL MINUS BEARING THICKNESS).

BI2. IF BEARING PIN NOT CAST INTO HEADSTOCK THEN DRILL AND CHEMSET BEARING RESTRAINT PIN IN POSITION (TOP OF PIN TO BE INSTALLED 12mm ABOVE LEVEL OF GROUT PAD).

BI3. INSTALL BEARING ON TOP OF PREPARED GROUT PAD, ENSURE BEARING IS IN FULL CONTACT WITH GROUT PAD.

BI4. IMMEDIATELY PRIOR TO PLACEMENT OF GIRDER PLACE NOMINAL 5mm LAYER OF MEGAPOXY PM OVER TOP SURFACE OF BEARING.

BI5. LOWER PSC GIRDER INTO POSITION OVER BEARING UNTIL GIRDER LIGHTLY CONTACTS THE TOP SURFACE OF THE BEARING. (CONTACT DOES NOT HAVE TO OCCUR ON ALL EDGES OF BEARING, LIGHT CONTACT IS DESCRIBED AS THE FIRST POINT OF CONTACT BETWEEN THE BEARING AND GIRDER).

BI6. SUSPEND GIRDER IN THIS POSITION WITH TIMBER WEDGES. WEDGES TO REMAIN IN POSITION UNTIL MEGAPOXY PM HAS CURED (NOMINAL 24hrs AT 25°C).

BI7. REMOVE WEDGES AND INSTALL ANY PERMANENT GIRDER FIXINGS.

PRESTRESSED BEAM NOTES

PB1. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE REQUIRED TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.

PB2. REFER DWG NO. TENDER-S260 FOR MASS OF BEAMS

PB3. DURING STORAGE, TRANSPORT AND HANDLING, KEEP BEAM UPRIGHT AND SUPPORTED AT NOT MORE THAN 600 mm FROM EACH END.

PB4. PROVIDE SUITABLE LIFTING DEVICES NOT FURTHER THAN 600mm FROM BEAM ENDS.

PB5. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT TRANSFER 40MPa.

PB6. STRANDS AS 4672.1 – 7 WIRE ORDINARY – 15.2 – 1 750 – RELAX 2.

PB7. THE FORCE REMAINING IN EACH STRAND AT BEAM MIDSPAN IMMEDIATELY AFTER TENSIONING SHALL BE: AS SHOWN ON DWG NO. TENDER-S260

PB8. CUT STRANDS FLUSH WITH THE END OF THE BEAM AND SEAL EXPOSED STRANDS AGAINST CORROSION WITH 3 mm THICK EPOXY RESIN – MEGAPOXY H THIXOTROPIC OR EQUIVALENT.

PB9. REFER DWG NO. TENDER-S260 FOR BEAM HOGS

BRIDGE TRAFFIC BARRIER NOTES:

SB1. DIMENSIONS ARE GIVEN TO THE NEAREST MILLIMETER AFTER FABRICATION.

SB2. STEELWORK SHALL BE FABRICATED TO THE REQUIREMENTS OF TfNSW B201.

SB3. RHS AND SHS TO BE GRADE C450LO TO AS/NZS 1163.

SB4. STEEL PLATE TO AS/NZS 3678.

SB5. FLAT BAR TO BE GRADE 300 TO AS/NZS 3679.1.

SB6. BOLTS CLASS 8.8, NUTS CLASS 8 AND WASHERS FOR CLASS 8.8 BOLTS SHALL BE FABRICATED IN ACCORDANCE WITH TfNSW B240 AND AS/NZS 1252, THIN NUTS CLASS 5 TO AS 1112.4.

SB7. THE EXPOSED END OF THREADED BAR SHALL HAVE THE ORIGINAL GALVANIZING FINISH.

SB8. ALL THREADED BARS, BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANIZED TO AS/NZS 4680 USO.

SB9. PRIOR TO GALVANIZAING ALL WELD SPLATTER AND WELDING SLAG IS TO BE REMOVED.

SB10. MEMBERS TO BE BRANDED WITH SUITABLE TYPE NUMBER AFTER FABRICATION.

SB11. EDGES TO BE PROTECTIVE TREATED SHALL BE ROUNDED TO A RADIUS OF 1.5mm USO.

SB12. ALL WELDING TO CONFORM TO AS/NZS 1554.1.

SB13. ALL WELDS EXCEPT LOCATION TACK WELDS TO BE SP CATEGORY.

SB14. WELDING CONSUMABLES TO BE CONTROLLED HYDROGEN TYPE: G493 TO AS/NZS ISO 14341-B OR T493 TO AS/NZS ISO 17632-B USO.

SB15. DELINEATION ON THE BRIDGE TRAFFIC BARRIER SYSTEM SHALL BE INSTALLED IN THE LOCATION AND TO THE MAXIMUM SPACING SHOWN ON THE DRAWINGS. DELINEATORS SHALL BE CONSISTENT WITH THE REQUIREMENTS SPECIFIED IN TfNSW R131.

STEELWORK GENERAL:

S1. ALL STEELWORK IS TO BE IN ACCORDANCE WITH TfNSW B201 *STEELWORKS FOR BRIDGES*.

S2. FILLET WELDS SHALL BE 6mm, CATEGORY SP, UNO.

S3. ALL WELDING ELECTODES TO BE E4916, E4918 OR W50X TO AS 4855, UNO.

S4. ALL STEELWORK, UNLESS OTHERWISE NOTED, SPECIFIED OR APPROVED, SHALL BE HOT DIP GALVANISED AFTER FABRICATION TO AS 4680. HIGH STRENGTH STRUCTURAL BOLTS (GRADE 8.8) TO BE UTILISED UNO. ALL BOLTS, NUTS AND WASHERS TO BE HOT DIP GALVANISED TO AS 1214 UNO.

BACKFILLING BEHIND ABUTMENTS:

BA1. BACKFILL MATERIAL SHALL BE AS FOLLOWS:
- BEHIND HEADSTOCKS, WINGWALLS AND RETAINING WALLS: FREE-DRAINING GRANULAR MATERIAL COMPLYING WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS* cl 6.2.2.
- COMPACTION SHALL BE IN ACCORDANCE WITH TfNSW B30 cl 6.4.

BA2. WITHIN 1m OF WALLS AND HEADSTOCKS: PLACE IN LAYERS NOT EXCEEDING 100mm AND COMPACT TO 95% RELATIVE COMPACTION (70% MINIMUM DENSITY INDEX IN SAND) USING A HANDHELD VIBRATING PLATE COMPACTOR OR EQUAL. LARGE COMPACTION EQUIPMENT IS NOT PERMITTED IN THESE ZONES.

ROCK FACING:

ROCK GRADING		
	MIN	MAX
D15	185	265
D50	290	355
D85	395	470
D100		610

RF1. ROCK SHALL BE WELL GRADED WITH NOT LESS THAN 50% LARGER THAN A SIZE TWICE THE MINIMUM SIZE SPECIFIED.

RF2. ROCK SHALL BE CLEAN, HARD, DENSE AND DURABLE IGNEOUS OR METAMORPHIC ROCKS.

RF3. ROCK SHALL BE RESISTANT TO WEATHERING, FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER.

RF4. ROCK THAT IS LAMINATED, FRACTURED, POROUS, WITH DISCONTINUITIES OR OTHERWISE PHYSICALLY WEAK SHALL NOT BE USED.

RF5. THE BREADTH OF THICKNESS OF A SINGLE STONE SHALL NOT BE LESS THAT ONE-THIRD ITS LENGTH.

RF6. ROCK PROTECTION SHALL BE CONSTRUCTED IN THE LOCATIONS AND IN ACCORDANCE WITH THE DRAWINGS.

RF7. ROCK PROTECTION SHALL HAVE A UNIFORM APPEARANCE OVERALL AND SHALL NOT HAVE NOTICEABLE IRREGULARITIES IN HORIZONTAL AND VERTICAL ALIGNMENTS.

RF8. ROCK PROTECTION SHALL BE PLACED IN A MANNER WHICH ENSURES THAT THE LARGER ROCKS ARE UNIFORMLY DISTRIBUTED THROUGHOUT THE PROTECTION WORK AND THAT THE SMALLER ROCKS EFFECTIVELY FILL THE SPACES BETWEEN THE LARGE ROCKS WITHOUT LEAVING ANY LARGE VOIDS.

RF9. THE LAYERS OF PLACED ROCK SHALL BE OF EVEN THICKNESS AND OF EVEN GRADING.

NOT FOR CONSTRUCTION

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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 3

Project Number: VP402530
Sheet: 4 OF 12
Issue: T2
Drawing Number: VP402530-S203

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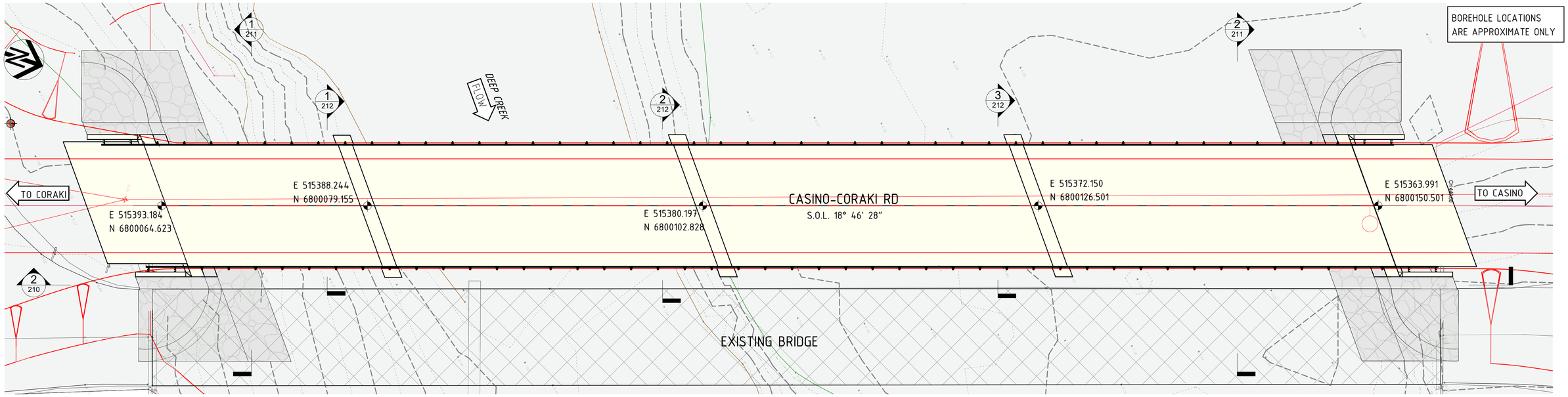
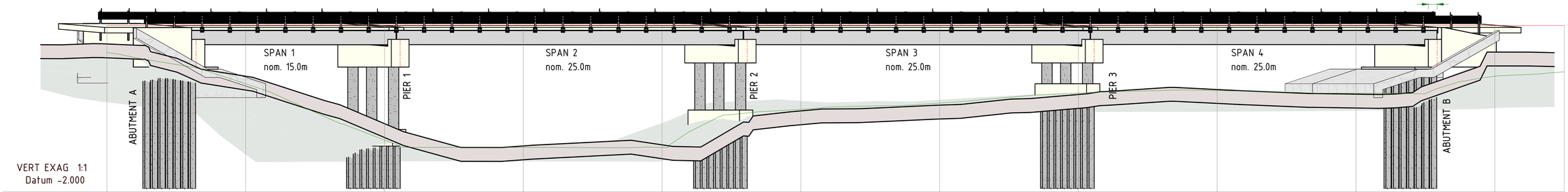


1 / 210 PLAN
DEEP CREEK BRIDGE | 1 : 150



DEPTH	1.953	4.209	8.267	8.791	8.802	6.051	5.597	4.875	4.696	4.888	4.913	3.660	3.343
DESIGN LEVELS	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
EXISTING LEVELS	8.047	5.791	1.733	1.209	1.198	3.949	4.403	5.125	5.304	5.112	5.087	6.340	6.657
CHAINAGE	340.000	350.000	360.000	370.000	380.000	390.000	400.000	410.000	420.000	430.000	433.939	440.000	445.000

2 / 210 SECTION
DEEP CREEK BRIDGE | 1 : 150

GENERAL NOTES

SCALES AS SHOWN.
DIMENSIONS ARE IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE RELATED TO AHD DATUM.

LEGEND

Ⓕ DENOTES FIXED BEARING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
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Email: peter.lowndes@alengineer.com.au
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Silverwater NSW 2128
Tel: 02 9644 6333 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:100 0 500 1000 1500 2000 2500 / 500 250
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

GENERAL ARRANGEMENT

Project Number: VP402530
Sheet: 5 OF 12
Issue: T2
Drawing Number: VP402530-S210

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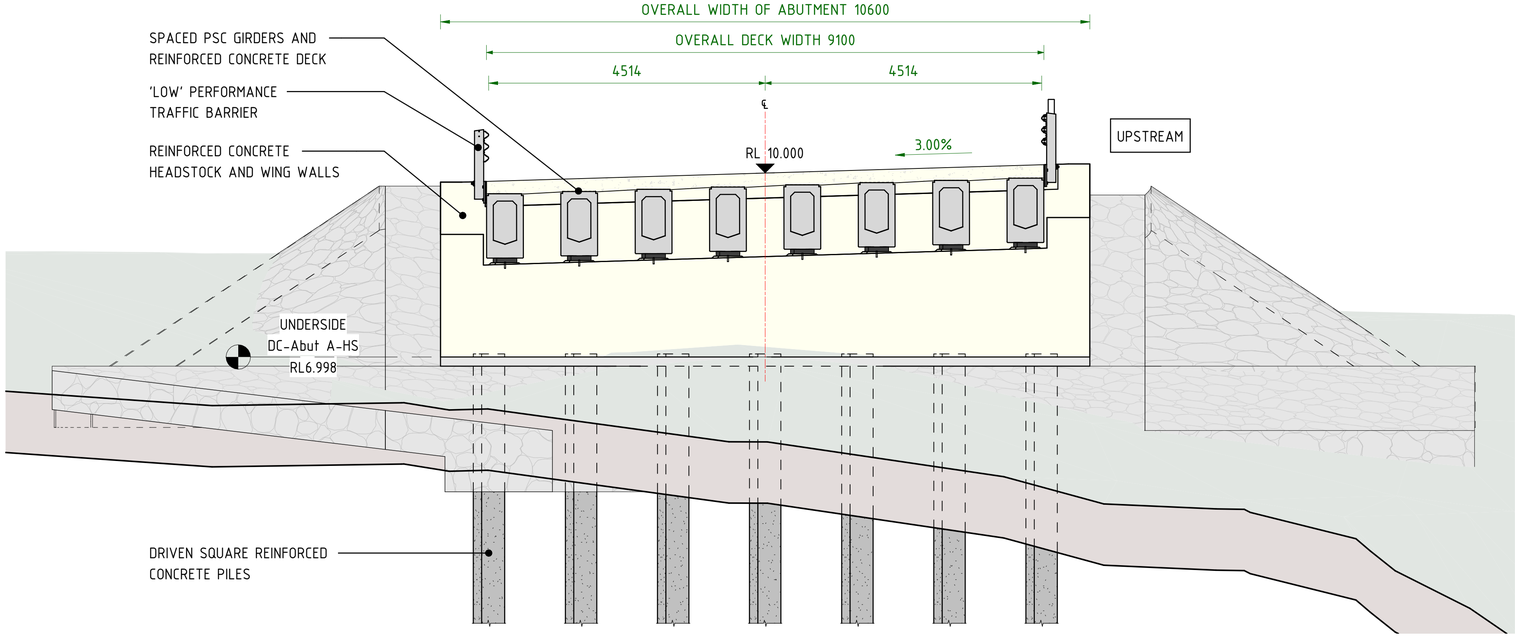
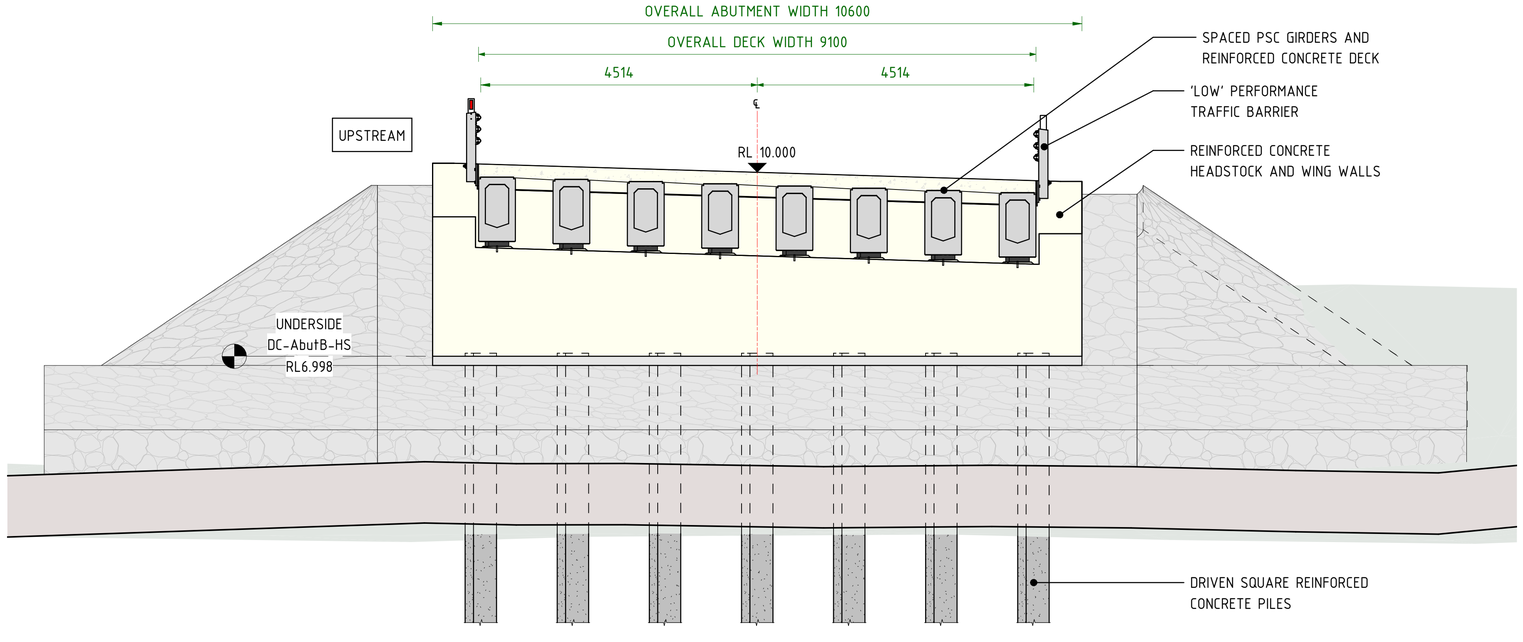


1 / 211 TYPICAL SECTION
DEEP CREEK BRIDGE - ABUTMENT A | 1 : 50



2 / 211 TYPICAL SECTION
DEEP CREEK BRIDGE - ABUTMENT B | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 1

Project Number: VP402530
Sheet: 6 OF 12
Issue: T2
Drawing Number: VP402530-S211

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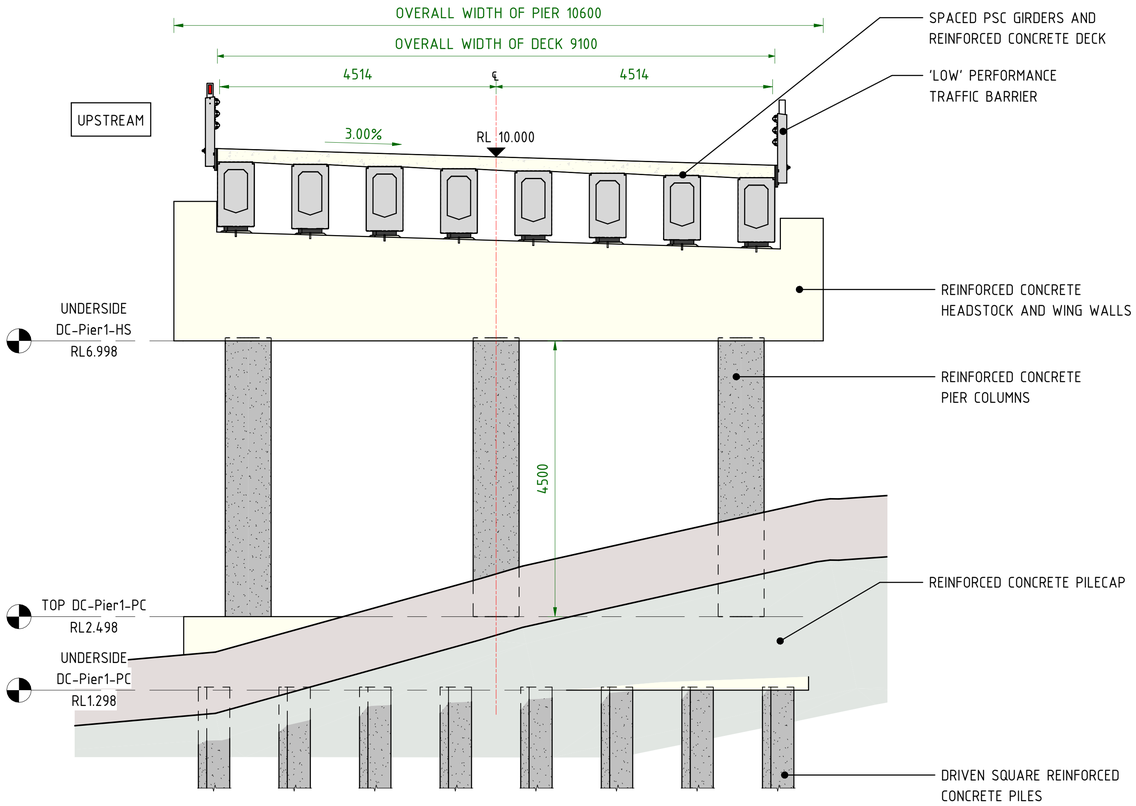
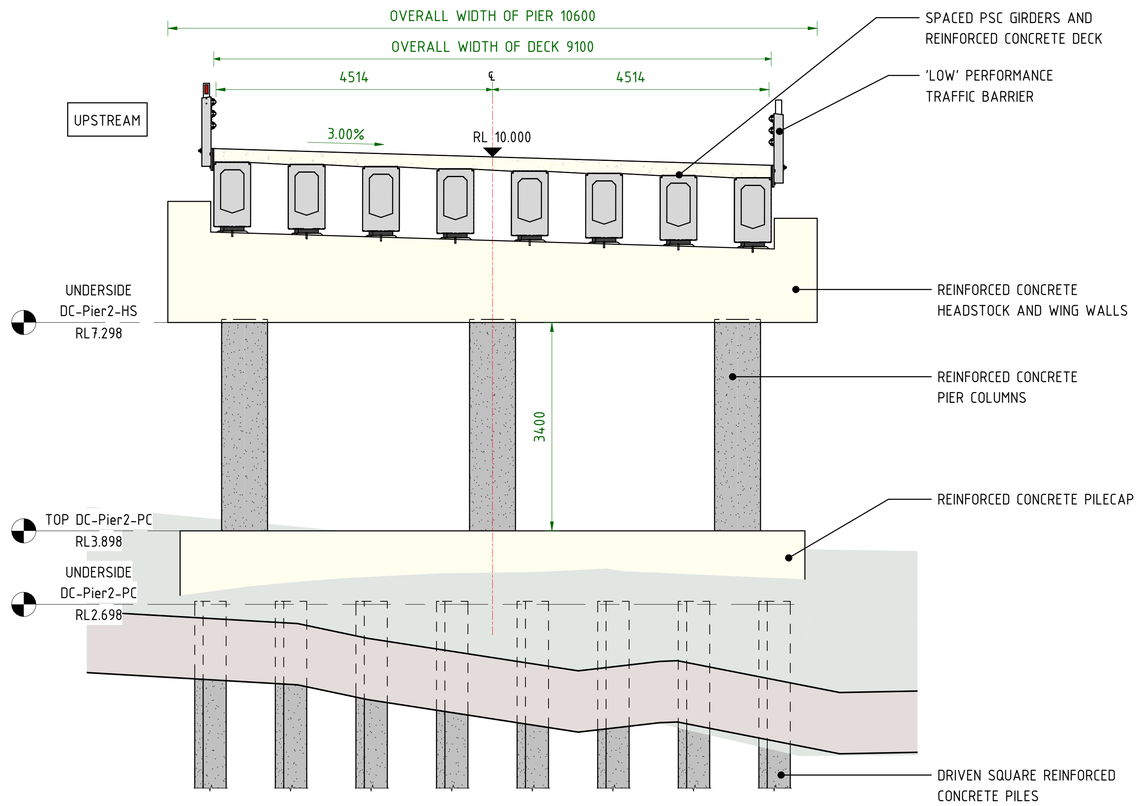
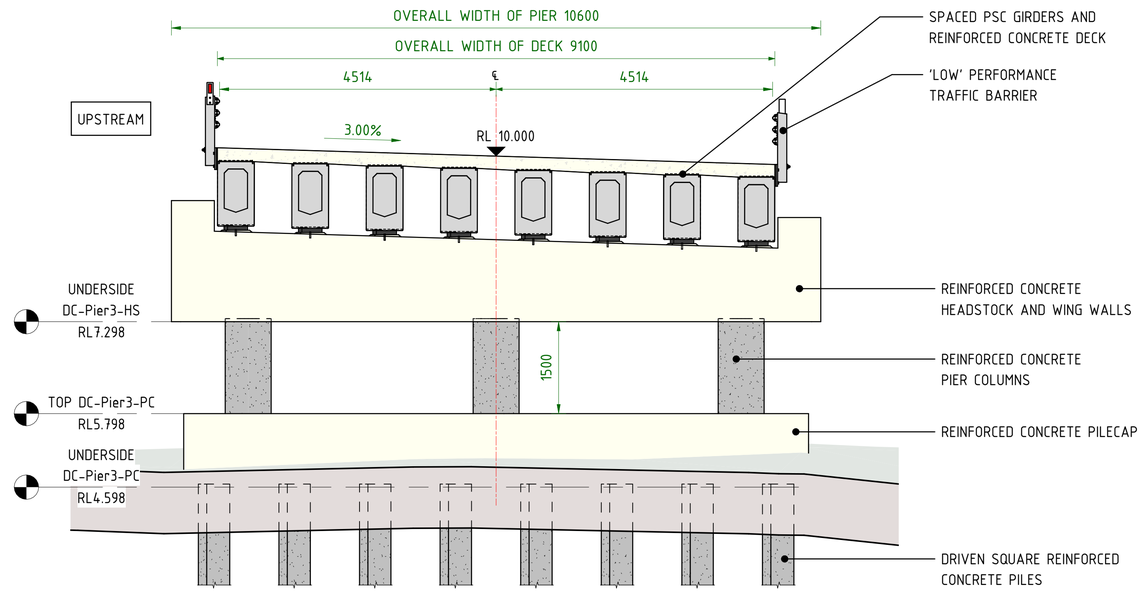


1/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 1 | 1 : 50



2/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 2 | 1 : 50



3/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 3 | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Silverwater NSW 2128 www.quickway.com.au

Designer: PAL | Design Checked | Signed:
Drafter: PAL | Drawing Checked | Signed:
Approved By: PAL | Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number
Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 2

Project Number: VP402530
Sheet: 7 OF 12
Issue: T2
Drawing Number: VP402530-S212

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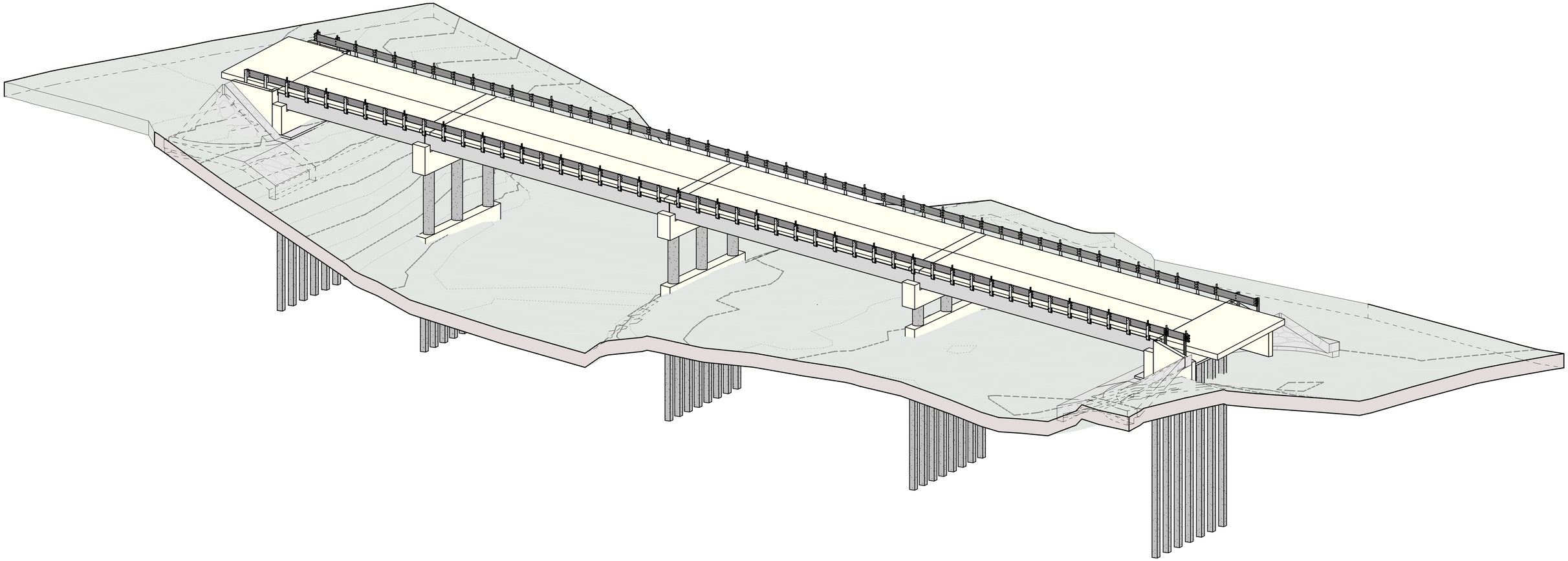

1/213 PERSPECTIVE VIEW
DEEP CREEK BRIDGE | NTS

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Consulting Engineer
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

PERSPECTIVE VIEW

Project Number: **VP402530**

Sheet: **7 OF 12** Issue: **T2**

Drawing Number: **VP402530-S213**

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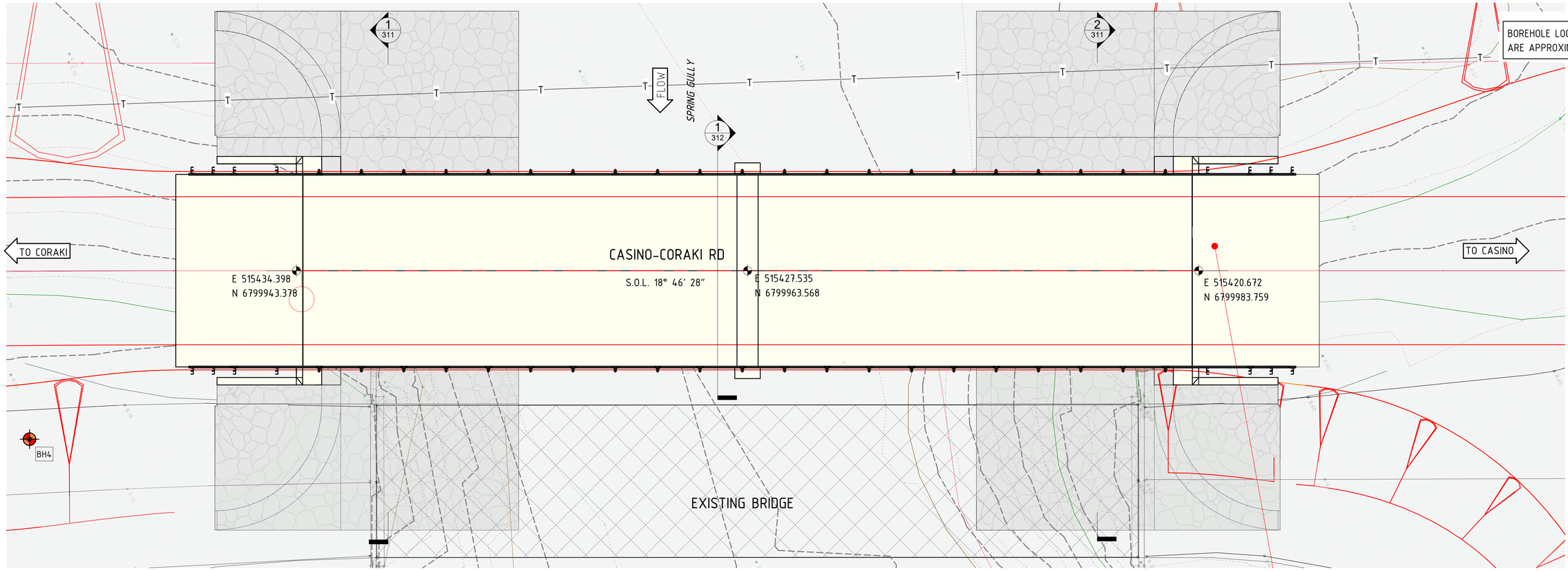
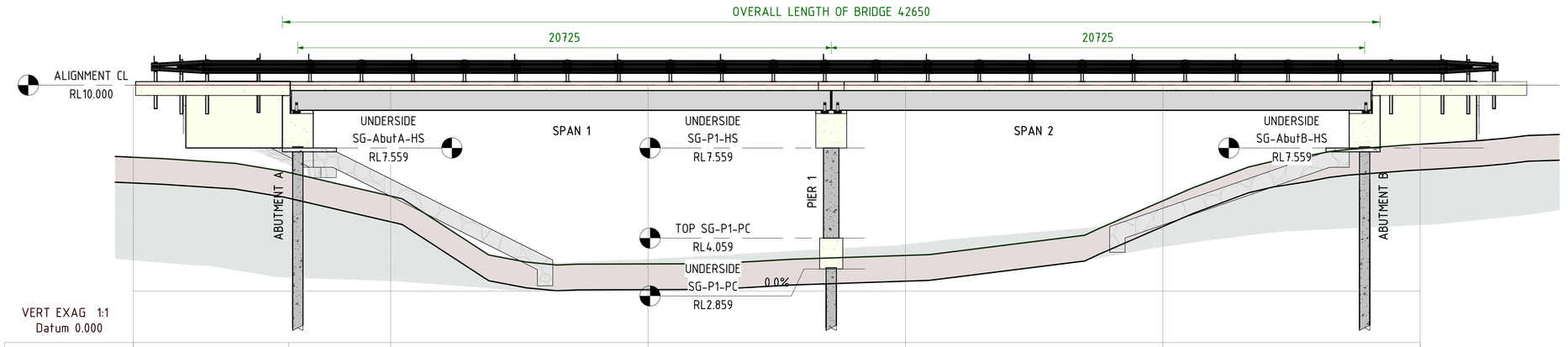


1/310 PLAN
SPRING GULLY BRIDGE | 1 : 100



DEPTH	2.799	3.392	4.313	6.944	6.615	4.493	2.289
DESIGN LEVELS	10.000	10.000	10.000	10.000	10.000	10.000	10.000
EXISTING LEVELS	7.201	6.608	5.687	3.056	3.385	5.507	7.711
CHAINAGE	210.000	216.040	220.000	230.000	240.000	250.000	260.000

2/310 SECTION
1 : 100

GENERAL NOTES
SCALES AS SHOWN.
DIMENSIONS ARE IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE RELATED TO AHD DATUM.

LEGEND
Ⓕ DENOTES FIXED BEARING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:100 0 500 1000 1500 2000 2500 / 500 250
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

GENERAL ARRANGEMENT

Project Number: VP402530
Sheet: 9 OF 12
Issue: T2
Drawing Number: VP402530-S310

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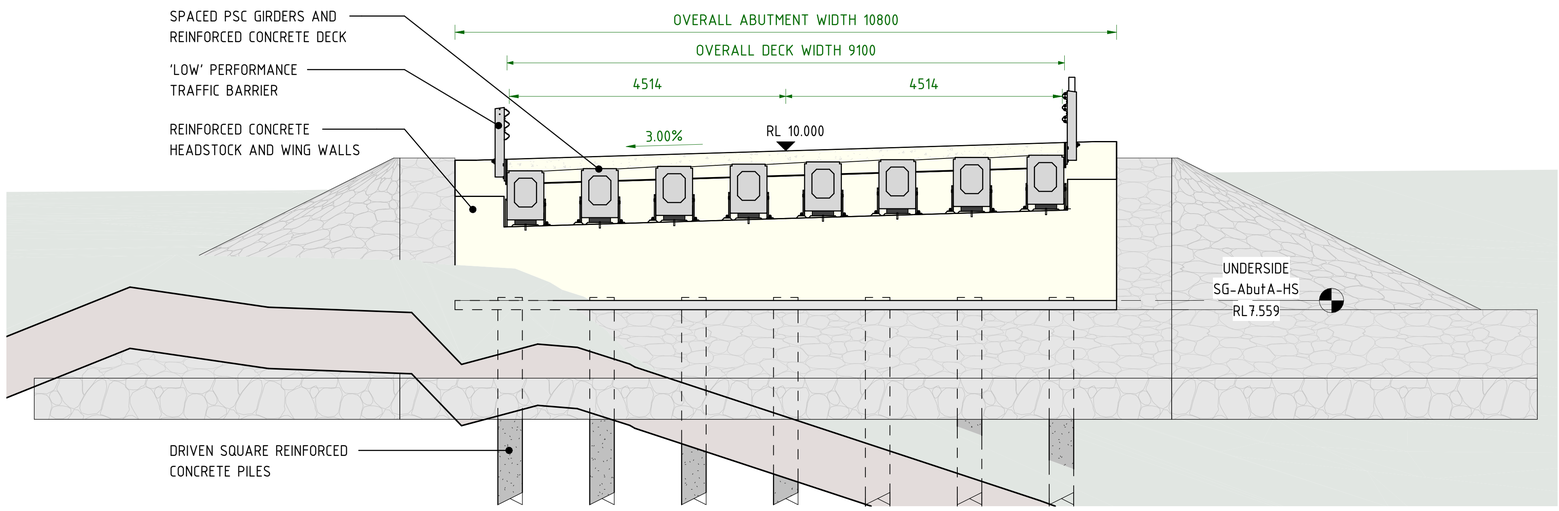
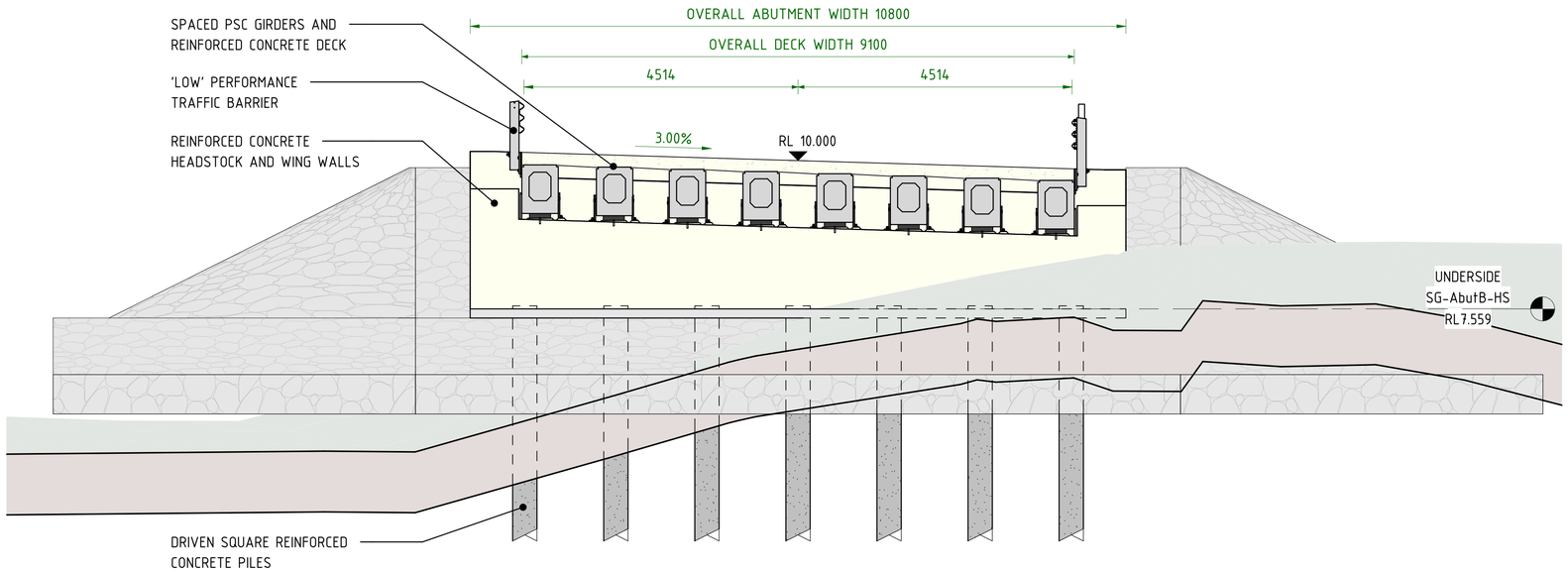


1/311 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT A | 1 : 50



2/311 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT B | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
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Email: peter.lowndes@plengineer.com.au
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL | Design Checked: Signed:
Drafter: PAL | Drawing Checked: Signed:
Approved By: PAL | Survey Folder Number:
Project Identifier\-\CAD File Name:
Records File Number:
Design Certifier Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

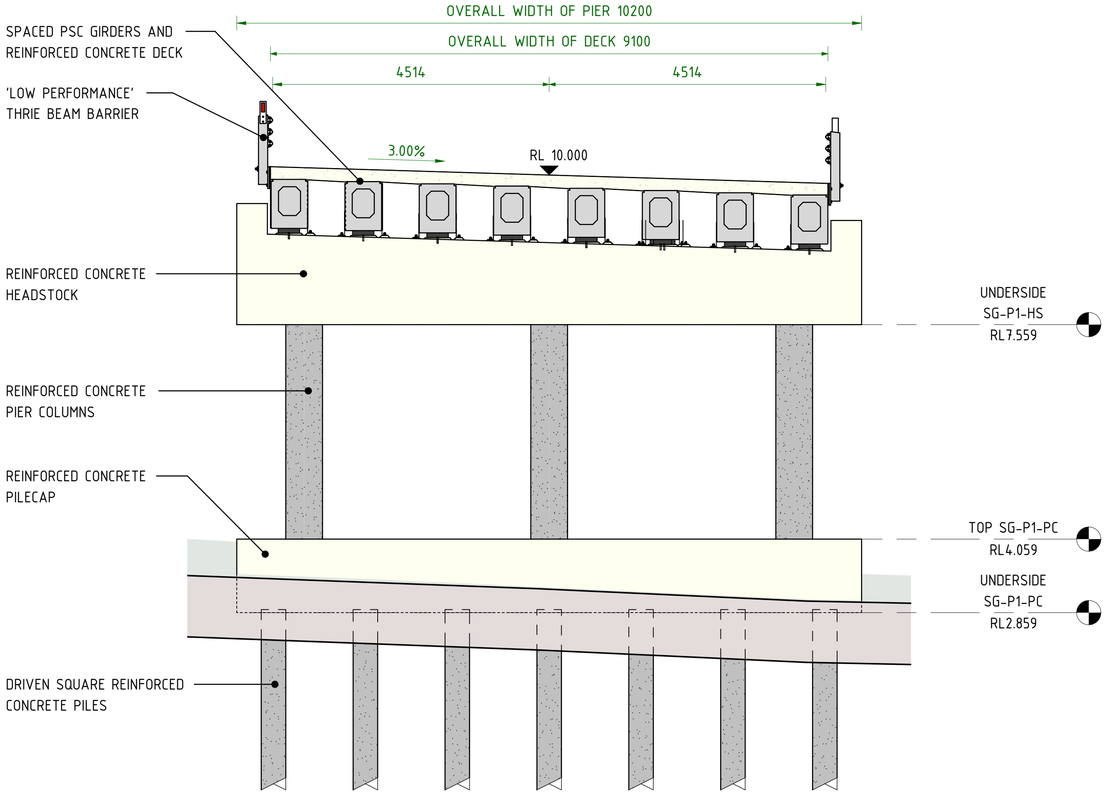
Bar Scales: 1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 1

Project Number: **VP402530**
Sheet: **10 OF 12** | Issue: **T2**
Drawing Number: **VP402530-S311**



1 / 312 TYPICAL SECTION
SPRING GULLY BRIDGE - PIER | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number
Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

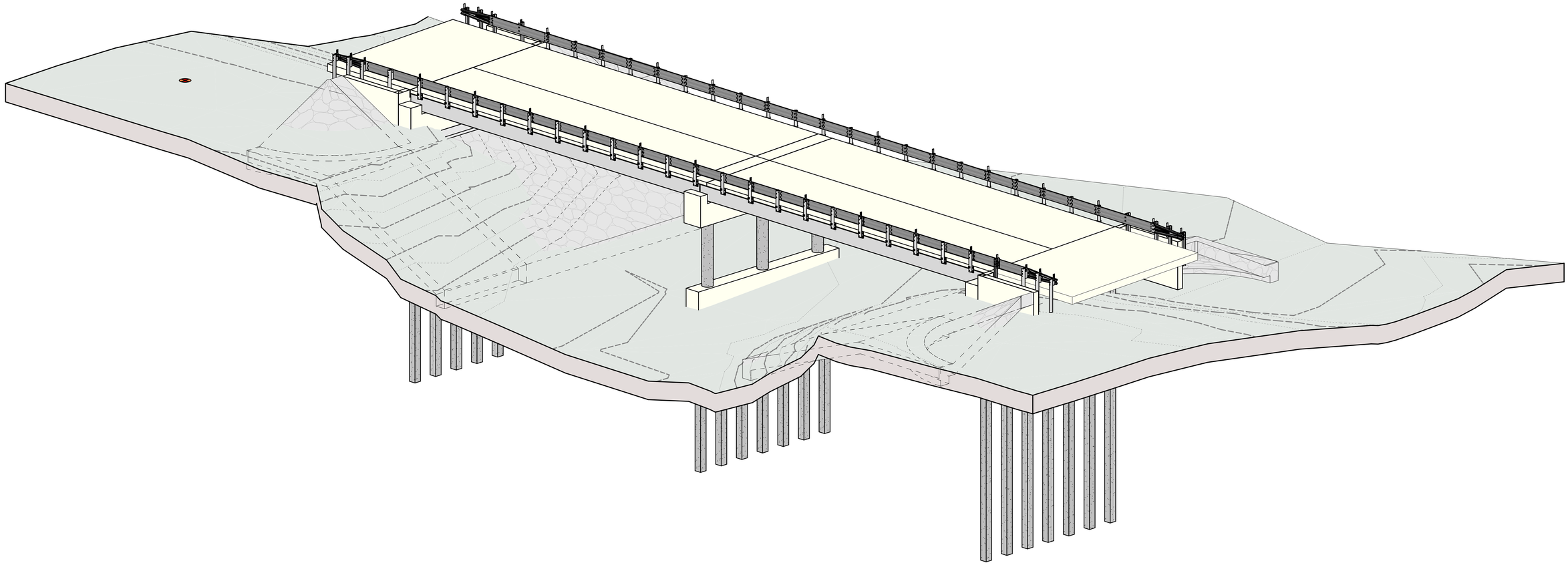
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 2

Project Number: VP402530
Sheet: 11 OF 12
Issue: T2
Drawing Number: VP402530-S312

W:\Jobs\2024 Jobs\Quotes\Quickway\VP402530 RVC Eltham\Tender Dwgs\Eltham\Br_Tender Model.rvt 13/06/2024 2:35:23 PM



1 / 313 PERSPECTIVE VIEW
SPRING GULLY BRIDGE | NTS

NOT FOR CONSTRUCTION

W:\Jobs\2024 Jobs\Quotes\Quickway\VP402530 RVC Tatham\Tender Design\Tatham\Br_Tender Model.rvt 13/06/2024 2:33:32 PM

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

PERSPECTIVE VIEW

Project Number: VP402530
Sheet: 12 OF 12
Issue: T2
Drawing Number: VP402530-S313

Appendix B

Biodiversity 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: -28.88 West: 153.11 East: 153.21 South: -28.98] returned a total of 231 records of 19 species.
Report generated on 19/08/2024 10:38 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Aves	Anatidae	0216	*Oxyura australis*		Blue-billed Duck	V,P		2	
Animalia	Aves	Anatidae	0214	*Stictonetta naevosa*		Freckled Duck	V,P		2	
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	V,P	V,C,J,K	1	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		24	
Animalia	Aves	Accipitridae	0218	*Circus assimilis*		Spotted Harrier	V,P		5	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P		17	
Animalia	Aves	Gruidae	0177	*Grus rubicunda*		Brolga	V,P		2	
Animalia	Aves	Jacanidae	0171	*Irediparra gallinacea*		Comb-crested Jacana	V,P		9	
Animalia	Aves	Scolopacidae	0168	*Gallinago hardwickii*		Latham's Snipe	V,P	V,J,K	9	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*		Little Lorikeet	V,P		1	
Animalia	Aves	Strigidae	0246	*Ninox connivens*		Barking Owl	V,P,3		1	
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	E1,P	E	148	
Animalia	Mammalia	Pseudocheiridae	1133	*Petauroides volans*		Southern Greater Glider	E1,P	E	1	
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	2	
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*		Southern Myotis	V,P		1	
Plantae	Flora	Myrtaceae	11894	*Gossia fragrantissima*		Sweet Myrtle	E1	E	2	
Plantae	Flora	Myrtaceae	4282	*Rhodamnia maideniana*		Smooth Scrub Turpentine	E4A	CE	2	
Plantae	Flora	Myrtaceae	4290	*Syzygium hodgkinsoniae*		Red Lilly Pilly	V	V	1	
Plantae	Flora	Proteaceae	5446	*Macadamia tetraphylla*		Rough-shelled Bush Nut	V	V	1	

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: -28.88 West: 153.11 East: 153.21 South: -28.98] returned 0 records for 16 entities.
Report generated on 19/08/2024 10:42 AM

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				*Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*		Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland		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				*Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion*		Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion	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	*Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions*	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions		E	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	
Community	*White Gum Moist Forest in the NSW North Coast Bioregion*	White Gum Moist Forest in the NSW North Coast Bioregion	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: 19-Aug-2024

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:	6
Listed Threatened Species:	62
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:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	24
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:	2
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	3
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
Dunn's white gum (Eucalyptus dunnii) moist forest in north-east New South Wales and south-east Queensland	Endangered	Community may occur within area	In buffer area only
Grey box-grey gum wet forest of subtropical eastern Australia	Endangered	Community may 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area	In buffer area only
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may 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			
Maccullochella ikei Clarence River Cod, Eastern Freshwater Cod [26170]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area	In feature area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat may occur within area	In buffer area only
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma Parma Wallaby [89289]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may 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
PLANT			
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area	In feature area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Clematis fawcettii Stream Clematis [4311]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Endiandra floydii Floyd's Walnut, Crystal Creek Walnut [52955]	Endangered	Species or species habitat may occur within area	In buffer area only
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hibbertia marginata [21970]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat may occur within area	In buffer area only
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
Myrsine richmondensis Purple-leaf Muttonwood, Lismore Muttonwood [83888]	Endangered	Species or species habitat known to occur within area	In feature area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Paspalidium grandispiculatum a grass [10838]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pedleya acanthoclada listed as Desmodium acanthocladum Thorny Pea [93275]	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
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area	In buffer area only
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may 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
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

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [15701]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11257]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11256]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may 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]		Breeding likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
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
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Sterna striata White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat likely to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Bungawalbin	State Conservation Area	NSW	In buffer area only
Bungawalbin	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

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

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

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
330 kV Transmission Line, 205km in Length	2010/5326	Controlled Action	Completed	In feature area
Casino Ipswich Pipeline	2007/3877	Controlled Action	Completed	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 [Resource Information]

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

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

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

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

Please feel free to provide feedback via the Contact us page.

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Appendix C

Threatened Species Potential Occurrence Assessment

Threatened Species Potential Occurrence Assessment

A potential of occurrence assessment was completed to assess the likelihood of occurrence of threatened species or populations at the subject site. All threatened biodiversity identified in background research were considered. The assessment is based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (DPE Environment and Heritage Group). The assessment also takes into consideration the dates and locations of nearby records and information about species populations in the locality.

For the Activity, the likelihood of occurrence of threatened species and populations was determined based on the criteria shown in **Table C.1.**

Table C.1 Potential of Occurrence Criteria for Threatened Species and Populations of Fauna

Potential of occurrence	Criteria
Known	The species was observed in the subject site either during the current survey or during another survey less than one year prior.
High	A species has a high likelihood of occurrence if: ■ the subject site contains or forms part of a large area of high-quality suitable habitat ■ important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site ■ the species has been recorded recently in similar habitat in the locality ■ the subject site is likely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if: ■ the subject site contains or forms part of a small area of high-quality suitable habitat ■ the subject site contains or forms part of a large area of marginal habitat ■ important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site ■ the subject site is unlikely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	A species has a low likelihood of occurrence if: ■ potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) ■ the species is considered to be a rare vagrant, likely only to visit the subject site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Suitable habitat is absent from the subject site.

Table C.2 Threatened Fauna Potential Occurrence Assessment

Scientific Name	Common Name	Status BC Act	Status EPBC Act	Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
Amphibia						
Litoria olongburensis	Olongburra Frog	V	V	An "acid" frog confined to the coastal sandplain Paperbark swamps and sedge swamps of the coastal 'wallum' country amongst sedges and rushes. Their life-cycle is adapted to the acidic pH (2.8-5.5) of these wetlands. Frogs are highest in abundance in relatively undisturbed wallum swamps.	None	No suitable habitat occurs within the site. No BioNet records within the locality. Not considered further.
Mixophyes fleayi	Fleay's Barred Frog	E	E	Rainforest and wet eucalypt forest of the escarpment and foothills, close to gravely streams. The species occurs along stream habitats from first to third order streams (i.e. small streams close to their origin through to permanent streams with grades of 1 in 50) but is not found in ponds or ephemeral pools.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Aves						
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.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Calyptorhynchus lathami lathami	South-eastern 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. Hollow nesters. In central NSW, a very high preference for *E.crebra* among other	**Moderate**	**No BioNet records within the locality. However potential foraging habitat occurs within the site and the**

Scientific Name	Common Name	Status BC Act	Status EPBC Act	Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
				Eucalyptus, living or dead trees, >8m above ground, in branches >30cm diam, steeply angled.		**locality. AoS undertaken.**
Circus assimilis	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe. Most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Low	Marginal habitat occurs within the site. May flyover site. Not considered further.
Climacteris picumnus victoriae	Brown Treecreeper	V	V	Inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges. Inhabits eucalypt forests and woodlands commonly dominated by stringybarks or other rough-barked eucalypts. Usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Fallen timber is an important habitat component.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	CE	CE	Drier rainforests and adjacent wet eucalypt forest, wetter lowland rainforests. Limited to about five populations scattered between Bundaberg in Queensland and the Hastings River in NSW.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Dasyornis brachypterus	Eastern Bristlebird	E	E	High elevation open forest, woodland with dense tussock or sedge understorey adjacent to rainforest or wet eucalypt forest.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**
Erythrotriorchis radiatus	Red Goshawk	CE	E	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	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.

Scientific Name	Common Name	Status BC Act	Status EPBC Act	Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
				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.		
Falco hypoleucos	Grey Falcon	V	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. Frequents timbered lowland plains, particularly Acacia shrublands with watercourses, but also hunts in tussock grassland and open woodland, feeding almost entirely on small birds and rarely small mammals. Nests in tall trees such as *E.camaldulensis* and *E.coolabah*, reusing other raptors nests.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
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. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**
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*.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Grus rubicunda	Brolga	V	-	Feeds in dry grassland, ploughed paddocks and desert claypans. Depend on shallow swamps, floodplains, grasslands and pastoral lands, usually in pairs or parties.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-	Coastal habitats and around terrestrial wetlands characterised by the presence of large areas of open water (larger rivers, swamps, lakes, ocean). Habitats may include freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds in addition to bays and inlets, beaches, reefs, lagoons, estuaries and mangroves.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**

Scientific Name	Common Name	Status		Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
		BC Act	EPBC Act			
Irediparra gallinacea	Comb-crested Jacana	V	-	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	Low	Marginal habitat occurs within the site. Not considered further.
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*.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	E	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Ninox connivens	Barking Owl	V	-	Eucalypt woodland, open forest, swamp woodlands and timber along watercourses, including fragmented remnants and partly cleared farmland. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.	Low	Marginal habitat occurs within the site. Not considered further.
Oxyura australis	Blue-billed Duck	V	-	Deep water in large permanent wetlands and swamps with dense aquatic vegetation.	Low	Marginal habitat occurs within the site. Not considered further.
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	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Stagonopleura guttata	Diamond Firetail	V	V	Grassy eucalypt woodlands, open forest, mallee, temperate grassland, and secondary grassland derived from other communities, riparian areas, and sometimes in lightly wooded farmland.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.

Scientific Name	Common Name	Status		Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
		BC Act	EPBC Act			
Stictonetta naevosa	Freckled Duck	V	-	Permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. In drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Low	Marginal habitat occurs within the site. Not considered further.
Turnix melanogaster	Black-breasted Button-quail	CE	V	Drier rainforests and vine scrubs, often in association with hoop pine, bottletree scrubs and a deep moist leaf litter layer. During drought it may move to adjacent wetter rainforests.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Lophochroa leadbeateri leadbeateri	Major Mitchell's Cockatoo (eastern)	-	E	Lives in arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*). Within these vegetation types, the main requirements are fresh surface water and trees with suitable nesting hollows.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Fish						
Maccullochella ikei	Eastern Freshwater Cod	E (FM Act)	E	Permanent clear rocky streams with instream cover and deep pools. Native to only the Clarence and Richmond Rivers in northern New South Wales.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Insecta						
Argynnis hyperbius	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (*Viola betonicifolia*) occurs.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The species requires a combination of sandstone cliff/ escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/ rainforest corridors which are used for foraging. Uses a large range of vegetation types including: dry and wet sclerophyll forest; Cyprus Pine dominated forest; tall open eucalypt forest with a rainforest sub-canopy; sub-alpine woodland.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.

Scientific Name	Common Name	Status		Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
		BC Act	EPBC Act			
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Large rocky outcrops. Hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Macropus parma	Parma Wallaby	V	V	Moist eucalypt forest with thick shrubby understorey, often with nearby grassy areas and rainforest margins.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Myotis macropus	Southern Myotis	V	-	Generally, roost in groups of 10 - 15 close to bodies of water, rainforest streams, large lakes and reservoirs. Roosts in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**
Petauroides volans	Southern Greater Glider	E	E	Ranges and coastal plains of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Feeds on Eucalyptus leaves, with some buds and flowers, favoured species vary regionally. Prefers large hollows in large old trees.	Low	Marginal habitat occurs within the site. No Hollow-bearing trees within the site. Not considered further.
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	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.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves, overhangs during the day, and foraging in grassy areas nearby at night.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Phascolarctos cinereus	Koala	E	E	Appropriate food trees in forests and woodlands, and treed urban areas. Ideally rainfall 700-1500mm, but can be found in more extreme environments. Home ranges for individuals vary	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in**

Scientific Name	Common Name	Status		Habitat Requirement	Potential of occurrence	Outcome - Assessment of Significance?
		BC Act	EPBC Act			
				widely from 3-500ha. Utilise more than 400 species of tree, with localised preferences.		**the locality. AoS undertaken.**
Potorous tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. Social animal, living predominantly in burrows shared with other individuals.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.
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. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	**Moderate**	**Potential foraging habitat occurs within the site. BioNet records in the locality. AoS undertaken.**
Reptilia						
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	E	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	Low	Marginal habitat occurs within the site. No BioNet records within the locality. Not considered further.

Appendix D

Flora and Fauna Inventory

Table D.1 Flora inventory

Family	Scientific Name	Common Name
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair
Apiaceae	*Centella asiatica*	Pennywort
Apiaceae	*Cyclospermum leptophyllum**	Slender Celery
Apocynaceae	*Gomphocarpus physocarpus**	Balloon Cotton Bush
Apocynaceae	*Parsonsia straminea*	Monkey Rope
Asteraceae	*Ageratina adenophora**	Crofton Weed
Asteraceae	*Ageratum houstonianum**	Blue Billygoat Weed
Asteraceae	*Ambrosia artemisiifolia**	Annual Ragweed
Asteraceae	*Aster subulatus**	Wild Aster
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Cirsium vulgare**	Spear Thistle
Asteraceae	*Conyza sp.**	A Fleabane
Asteraceae	*Emilia sonchifolia**	Purple Sow Thistle
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Sonchus oleraceus**	Common Sowthistle
Asteraceae	*Tagetes minuta**	Stinking Roger
Asteraceae	*Taraxacum officinale**	Dandelion
Asteraceae	*Sphagneticola trilobata**	Singapore Daisy
Caryophyllaceae	*Stellaria media**	Common Chickweed
Casuarinaceae	*Casuarina cunninghamiana*	River Oak
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Commelinaceae	*Commelina benghalensis**	Hairy Commelina
Commelinaceae	*Commelina cyanea*	Scurvy Weed
Commelinaceae	*Tradescantia fluminensis**	Trad
Convolvulaceae	*Ipomoea cairica**	Coast Morning Glory
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Cyperus exaltatus*	Giant Sedge
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge
Cyperaceae	*Cyperus polystachyos*	Bunchy Sedge
Cyperaceae	*Juncus usitatus*	Pin Rush
Elaeocarpaceae	*Elaeocarpus grandis*	Blue Quandong
Elaeocarpaceae	*Elaeocarpus obovatus*	Hard Quandong
Euphorbiaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Euphorbiaceae	*Mallotus philippensis*	Red Kamala
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant
Fabaceae (Faboideae)	*Desmodium intortum**	Green-leaved Desmodium
Fabaceae (Faboideae)	*Trifolium repens**	White Clover
Fabaceae (Faboideae)	*Vicia sativa subsp. sativa**	Common Vetch
Fabaceae (Mimosoideae)	*Acacia concurrens*	Curracabah
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lauraceae	*Neolitsea dealbata*	White Bolly Gum
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Lythraceae	*Cuphea carthagenensis**	Cuphea
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Moraceae	*Ficus coronata*	Creek Sandpaper Fig
Moraceae	*Streblus brunonianus*	Whalebone Tree

Family	Scientific Name	Common Name
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Lophostemon suaveolens*	Swamp Turpentine
Myrtaceae	*Psidium guajava**	Guava
Myrtaceae	*Syzygium australe*	Brush Cherry
Myrtaceae	*Tristaniopsis laurina*	Water Gum
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues
Poaceae	*Chloris gayana**	Rhodes Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Melinis minutiflora**	Molasses Grass
Poaceae	*Melinis repens**	Red Natal Grass
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Paspalum mandiocanum**	Broad-leaved Paspalum
Poaceae	*Paspalum notatum**	Bahia Grass
Poaceae	*Cenchrus clandestinus**	Kikuyu
Poaceae	*Phragmites australis*	Common Reed
Poaceae	*Setaria sphacelata**	South African Pigeon Grass
Poaceae	*Sorghum halepense **	Johnson Grass
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Polygonaceae	*Persicaria hydropiper*	Water Pepper
Polygonaceae	*Persicaria strigosa*	Spotted Knotweed
Polygonaceae	*Rumex crispus**	Curled Dock
Proteaceae	*Grevillea robusta*	Silky Oak
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Solanaceae	*Solanum lycopersicum var. cerasiforme**	Cherry Tomato
Solanaceae	*Solanum nigrum**	Blackberry Nightshade
Ulmaceae	*Aphananthe philippinensis*	Rough-leaved Elm
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena bonariensis**	Purpletop

* Denotes exotic species

Table D.2 Fauna Inventory

Scientific Name	Common Name	Observation Type
Amphibians		
Limnodynastes peronii	Striped Marsh Frog	HC
Aves		
Acanthiza pusilla	Brown Thornbill	HC
Cracticus nigrogularis	Pied Butcherbird	O
Colluricincla harmonica	Grey Shrike-thrush	HC
Coracina novaehollandiae	Black-faced Cuckoo-shrike	HC
Corvus orru	Torresian Crow	O
Dacelo novaeguineae	Laughing Kookaburra	O
Elanus axillaris	Black-shouldered Kite	HC
Gerygone albogularis	White-throated Gerygone	HC
Grallina cyanoleuca	Magpie-lark	HC
Gymnorhina tibicen	Australian Magpie	O
Hirundo neoxena	Welcome Swallow	O
Malurus cyaneus	Superb Fairy-wren	O
Manorina melanocephala	Noisy Miner	HC
Meliphaga lewinii	Lewin's Honeyeater	HC
Strepera graculina	Pied Currawong	O
Threskiornis moluccus	Australian White Ibis	O
Threskiornis spinicollis	Straw-necked Ibis	O

HC = Heard call, O = Observed

Appendix E

Tests of Significance

BC Act Five-part Tests for Threatened Species

From **Appendix C** 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 communities and fauna species:

- TEC:
  - Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion
- Birds:
  - South Eastern Glossy Black-Cockatoo
  - Black-necked Stork*
  - Little Lorikeet
  - Brolga*
  - White-bellied Sea-eagle
- Microbats:
  - Southern Myotis
- Mammals:
  - Grey-headed Flying-fox
  - Koala

*Note: Black-necked Stork and Brolga have been grouped together for assessment due to similar ecological attributes.

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,

South-eastern Glossy Black-Cockatoo

Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.

Threatening processes for this species include:

- Reduction of suitable habitat through clearing for development.
- Decline of hollow bearing trees over time due to land management activities.
- Excessively frequent fire which eliminates sheoaks from areas, prevents the development of mature sheoak stands, and destroys nest trees.
- Firewood collection resulting in loss of hollow-bearing trees, reduced recruitment of hollow-bearing trees, and disturbance of breeding attempts.
- Decline in extent and productivity of sheoak foraging habitat due to feral herbivores.
- Reduced access to surface water in close proximity to foraging and nesting habitat.
- Limited information on the location of nesting aggregations and the distribution of high quality breeding habitat.
- Disturbance from coal seam gas and open cut coal mining causing loss of foraging and breeding habitat as well as disturbing reproductive attempts.

- Decline in extent and productivity of sheoak foraging habitat caused by moisture stress due to climate change.
- Forestry activity resulting in loss of hollow-bearing trees, reduced recruitment of hollow-bearing trees, degradation of foraging habitat, and disturbance of breeding attempts.
- Degradation of foraging habitat and reduced regeneration of sheoak stands due to grazing by domestic stock.
- Loss of foraging habitat due to slashing/ under scrubbing.
- Change in the spatial and temporal distribution of resources due to global warming.
- Illegal bird smuggling and egg-collecting.
- Habitat infestation by weeds such as African boxthorn, Gazania, buffel grass and other invasive grasses.
- Disenfranchisement or exclusion of Aboriginal custodians and knowledge holders.

Potential Impacts from the Activity

The Activity would result in the removal of 0.39 ha of native forest in the form of PCT 3428 and PCT 4070. The subject vegetation comprises a relatively minor amount of potential foraging habitat for the South-eastern Glossy Black-Cockatoo. This includes the potential removal of 12 River Oak and one Swamp Oak, a primary food tree for the South-eastern Glossy Black-Cockatoo that occur within the extent of works footprint. The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the South-eastern Glossy Black-Cockatoo in the context of the site and adjacent areas of suitable habitat. The Activity footprint does not support important breeding habitat for the species due to the lack large hollow bearing trees which these birds rely on for breeding and nesting.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the South-eastern Glossy Black-Cockatoo would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Black-necked Stork and Brolga

The Black-necked Stork and Brolga occupy similar habitat niches in flooded paddocks, floodplains and wetlands. Both species feed on frogs, invertebrates, fish and other small aquatic fauna. The Black-necked Stork build large nests high in tall trees close to water, while the Brolga nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water.

Threatening processes for this species include:

- Powerlines, especially close to wetlands or over floodplains, are a significant cause of mortality of Storks and one of the most critical threats to the species in NSW.
- Modification or degradation of wetlands through changes in natural water flows. It is important to maintain or reintroduce flows to provide wetland habitats suitable for foraging by Storks as they require large amounts of vertebrate prey from such habitats.
- Loss of wetland habitat through clearing and draining for development.
- Loss of key habitat as a result of wetland drainage for flood mitigation and agricultural development.
- Degradation of wetland habitats through pollution.
- Removal or lack of replacement for mature paddock trees for nests.
- Degradation of wetlands as a result of salinity.
- Disturbance to behaviour from the presence of people.
- Monitoring is required to assess the species population trends over time.
- At least in former times, Brolgas were poisoned and shot because of their feeding incursions into crops, following drainage of swamps.
- Loss of wetland habitat through clearing and draining for flood mitigation and agriculture.

Potential Impacts from the Activity

Approximately up to 3.18 ha of potential habitat will be impacted due to the Activity. Creek lines and associated floodplain (pastureland) are utilised by the species for foraging purposes; however, the species prefers either densely vegetated wetlands or larger high-quality wetlands for breeding purposes. It is unlikely that the Activity will impact preferred breeding habitat for the species but more so foraging habitat. Additionally, no nests were observed in the survey area. Although, habitat within the survey area represents potential foraging habitat attributes for these species, the ability of the Proposal to support such species is not considered a significant adverse effect which might be brought to bear upon local populations.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Black-necked Stork or Brolga would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet

The Little Lorikeet mostly forages in the canopy of open eucalypt forest and woodland, utilising Eucalyptus, Angophora, Melaleuca and other tree species. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. The species feeds mostly on nectar and pollen, but occasionally also on native fruits such as mistletoe. Nests are generally located (within hollows) in proximity to feeding areas if possible and entrances are small (three centimetres) and usually high above the ground (two to 15 metres). Nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like Allocasuarina. The nesting season extends from May to September, producing 3-4 young.

Threatening processes for this species include:

- Clearing of woodlands for agriculture
- Loss of old hollow-bearing trees
- Competition with the introduced Honeybee
- Infestation of habitat by invasive weeds
- Inappropriate fire regimes
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners
- Climate change impacts including reduction in resources due to drought
- Degradation of woodland habitat and vegetation structure due to overgrazing.

Potential Impacts from the Activity

The Activity would result in the removal of 0.39 ha of native forest in the form of PCT 3428 and PCT 4070. The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the Little Lorikeet in the context of the site and adjacent areas of suitable habitat. While native potential food trees would be removed, the Activity are unlikely to result in significant impacts to dispersal resources or breeding habitat due to the lack of suitable hollow bearing trees which may be utilised by the Little Lorikeet in a local context.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Little Lorikeet would occur such that a viable local population of the species is likely to be placed at risk of extinction.

White-bellied Sea-eagle

The White-bellied Sea-eagle is distributed around the Australian coastline, in NSW it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by

the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).

Feeds mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary or live-in pairs.

Breeding occurs between June and September. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Typically lays two eggs.

Threatening processes for this species include:

- Land clearing reduces the amount of suitable habitat available and this can force birds to nest in sub-optimal habitats where their breeding success is greatly reduced. Coastal development is increasing in density and spread impacting White-bellied Sea-Eagle habitat and populations.
- The White-bellied Sea-eagle is sensitive to disturbance when nesting, especially during the early stages of the breeding season, and may desert nests and young if confronted by humans or exposed to human activity. Residential development, coastal tourism developments, and coastal land sub-divisions have been implicated in the abandonment of White-bellied Sea-Eagle nest sites.
- In coastal areas potential threats to foraging resources include: clearing, degradation or reclamation of saltmarsh, mangroves, sea grass and other riparian or shallow water vegetation resulting in loss of fish nursery habitats and food resources.
- Off-road vehicles accessing remote coastal areas, and various forms of recreation (e.g. surfing, bushwalking, rock-climbing, fishing, hunting and intrusive photography), have each been implicated in the abandonment of White-bellied Sea-Eagle nest sites.
- Increased mortality due to entanglement in discarded fishing gear, and entanglement in fish farm nets.
- Increased mortality or reduced breeding success due to non-target poisoning during vertebrate pest control, exposure to industrial chemicals and pesticides used for agriculture (directly or indirectly through prey), and deliberate poisoning.
- Climate change, leading to sea-level rise will result in inundation of low-lying coastal areas with unknown impacts on this species. In inland areas increased drought frequency and duration may result in inland areas being increasingly unsuitable for nesting, compared with baseline levels.

Potential Impacts from the Activity

The Activity would result in the removal of 0.39 ha of native forest in the form of PCT 3428 and PCT 4070 and 2.79 ha of roadside vegetation. The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the White-bellied Sea-eagle in the context of the site and adjacent areas of suitable habitat. There will be short term disturbance (noise and vibration) during construction. No nests were observed within the survey area. Due to the mobility and large home range of the species and the relatively small extent of disturbed habitat associated with the Activity, any identified population of White-bellied Sea-eagle would not be restricted to habitat within the survey area. White-bellied Sea-eagle using the survey area are likely to be part of a viable population that extends through the Activity area and are likely to be present in other parts of the locality as there is a large amount of potentially suitable habitat occurring in the locality.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the White-bellied Sea-eagle would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Southern Myotis

The Southern Myotis occurs close to bodies of water, rainforest streams, large lakes and reservoirs where they feed on fish and aquatic macroinvertebrates by skimming or trawling the surface of the water with their large feet to catch prey. They generally roost in groups of 10 - 15 (sometimes hundreds) close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Within the region females typically have two young each year with the breeding season extending from October to mid-April (inclusive).

Threatening processes for this species include:

- Loss or disturbance of roosting sites.
- Clearing adjacent to foraging areas.
- Application of pesticides in or adjacent to foraging areas.
- Reduction in stream water quality affecting food resources.

Potential Impacts from the Activity

No Southern Myotis were recorded in either bridge within the survey area. Southern Myotis feed over water, therefore there would be the potential for short term disturbance to foraging while bridge construction and demolition works are undertaken. In addition to noise, dust and vibration from works associated with Casino-Coraki Road. Roosting habitat present in each bridge was minor (lack of good quality gaps or holes). Habitat impacted would not be of significance in a local context where roost sites and higher quality habitat would occur.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Southern Myotis would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox

Grey-headed Flying-foxes (GHFF) have a distribution that typically extends approximately 200 km from the coast of Eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. Foraging areas include subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit crops. GHFF feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines, as well as from cultivated gardens and orchards. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. GHFF may travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

Threatening processes for this species include:

- Clearing of woodlands for agriculture.
- Loss of roosting and foraging sites.
- Electrocution on powerlines, entanglement in netting and on barbed wire.
- Heat stress.
- Conflict with humans.
- Incomplete knowledge of abundance and distribution across the species' range.

Potential Impacts from the Activity

The Activity would result in the removal of 0.39 ha of native forest in the form of PCT 3428 and PCT 4070. The Activity would largely disturb habitat that might be opportunistically foraged by GHFF within

the locality. No breeding habitat (flying-fox camps) occur within the site and would not be impacted as part of the Activity. Habitat impacted would not be of significance in a local context where higher quality habitat would occur. The proportional impact to this potential habitat is very small and considered negligible.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of any GHFF would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Koala

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales it mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range.

Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species. Preferred browse species are different across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas would descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size. Generally solitary, the Koala has complex social hierarchies based on a dominant male with a territory that overlaps that of several females, with sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat
- Predation by feral and domestic dogs
- Intense fires that scorch or kill the tree canopy
- Road-kills
- Climate change and reduction in resources due to drought.

Potential Impacts from the Activity

The Activity would result in the removal of 0.39 ha of native forest in the form of PCT 3428 and PCT 4070. The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the Koala in the context of the site and adjacent areas of suitable habitat. While native Koala feed trees would be removed, they comprise of three small regrowth Forest Red Gum trees, the Activity is unlikely to result in significant impacts to dispersal resources or breeding habitat. Any population of koala potentially traversing through the survey area are likely to be part of a viable population extending throughout the locality and are likely to be present in other parts of the locality.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Koala would occur such that a viable local population of the species is likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

- **TEC:** up to 0.01 ha of the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* (in the form of PCT 3428) would be removed as part of the Activity. This minor disturbance will be undertaken at the edge of the TEC that occurs adjacent to the pastureland/ road reserve. The impact to the subject TEC as a result of the Activity is incremental

vegetation loss. The local occurrence of the subject TEC (outside of impact areas) is expected to persist and remain unaffected by the Activity. The Activity is not expected to significantly affect or alter the extent or composition of the TEC such that the local occurrence of any subject TEC is likely to be placed at risk of extinction. The occurrence of the subject TEC within the survey area is generally in a degraded state. On this basis, the Activity is not expected to significantly affect or alter the extent or composition of the subject TEC 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 have a minor contraction of the subject TEC (0.01 ha) in the form of PCT 3428 within the site. Retained areas of PCT within the survey area and the locality would remain undisturbed.
- **Threatened Fauna:** A minor reduction in potential foraging habitat or temporary restriction to foraging available habitat during works for all threated 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

Vegetation at the site is already partly fragmented as a result of historic land clearing and road works in the locality. The Activity footprint is utilising existing cleared areas where possible to minimise impacts. The Proposal would not increase this fragmentation or isolate any areas of habitat for the subject TEC or threatened fauna species to any significant degree

Once the clearing and bridge repair works are complete the habitat at the site will be similar to the existing environment and the Activity is unlikely to affect species' movement or 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,

- **TEC:** The Activity would have a minor contraction of the subject TEC (0.01 ha) in the form of PCT 3428 within the site. This portion PCT 3428 is disturbed and featured impacts from edge effects. Better quality habitat occurs outside of the site and would remain in situ.
- **Threatened Fauna:** A minor reduction in potential foraging habitat or temporary restriction to foraging available habitat during works for all threated fauna species. The habitat to be removed is subject to past disturbance and occurs adjacent to Casino-Coraki Road. Any threated fauna species in the locality are likely conditioned to noise and vibration. Both bridges provide low quality roosting habitat for Southern Myotis.

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*)			✓
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)			✓

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 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			✓

The Activity is characteristic of three KTPs:

- Anthropogenic climate change - the production of emissions from plant and equipment during bridge repair works and removal of native vegetation.
- Clearing of native vegetation - removal of up to 0.39 ha of PCT 3428 and PCT 4070 adjacent to a previously cleared road corridor.
- Invasion, establishment and spread of Lantana (*Lantana camara*) - the potential to spread Lantana from the site into surrounding areas if not appropriately managed.

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.

EPBC Act Significance Assessment

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment, 2013). These significance assessments have been prepared for the following community and threatened species:

- Vulnerable species:
  - South-eastern Glossy Black-Cockatoo
  - Grey-headed Flying-fox
- Endangered species:
  - Koala

EPBC Act Listed Vulnerable Species

South-eastern Glossy Black-Cockatoo (SEGBC) and Grey-headed Flying-fox (GHFF) are listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the *Matters of National Environmental Significance, Significant Impact Guidelines 1.1*. Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/ or
- at or near the limit of the species range.

Is this part of an important population:

South-eastern Glossy Black-Cockatoo

SEGBC Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She Oak occur. *Allocasuarina* and *Casuarina* tree species are important foods. River Oak (*Casuarina cunninghamiana*) and Swamp Oak (*Casuarina glauca*) occur at the site.

Occurrences of this species within the site are not at the limits of the species' distribution, and as such the habitat within the site can only be considered to represent a part of the foraging range of widely occurring individuals. No breeding resources (hollow-bearing trees) were recorded within the survey area.

Overall, the Activity is not expected to result in a significant reduction of occupancy for any important SEGBC populations.

Grey-headed Flying-fox

Grey-headed Flying-fox (GHFF) occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. GHFF can migrate up to 75 km north during the winter and during this time young flying-foxes establish camps.

With reference to National Flying-fox monitoring viewer, there are no recorded Flying-fox camps within the site (DCCEEW, 2024).

Occurrences of this species within the site are not at the limits of the species' distribution, nor are any maternity camps present in the site, and as such the habitat within the site can only be considered to represent a part of the foraging range of widely occurring individuals.

Overall, the Activity is not expected to result in a significant reduction of occupancy for any important GHFF populations.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

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

South-eastern Glossy Black-Cockatoo

The population subject to the Activity is not considered an important population (refer above).

Grey-headed Flying-fox

The population subject to the Activity is not considered an important population (refer above).

- **Reduce the area of occupancy of an important population.**

South-eastern Glossy Black-Cockatoo

The population subject to the Activity is not considered an important population (refer above).

Grey-headed Flying-fox

The population subject to the Activity is not considered an important population (refer above).

- **Fragment an existing important population into two or more populations.**

South-eastern Glossy Black-Cockatoo

The population subject to the Activity is not considered an important population (refer above).

Grey-headed Flying-fox

The population subject to the Activity is not considered an important population (refer above).

- **Adversely affect habitat critical to the survival of a species.**

South-eastern Glossy Black-Cockatoo

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for the SEGBC. However, the removal of 0.39 ha of native vegetation would result in minimal impacts. Furthermore, no hollow-bearing trees would be removed as part of the Activity.

On the basis the Activity would not adversely affect habitat critical to the survival of the species.

Grey-headed Flying-fox

The foraging habitat within the site meets the criteria for habitat critical for the survival of GHFF due to its proximity to existing camps (within 50 km) (DAWE, 2021).

However, the removal of 0.39 ha of native vegetation would result in minimal impacts to foraging habitat for the GHFF and the Activity would not impact on roosting sites for the species. On the basis the Activity would not adversely affect habitat critical to the survival of the species.

- **Disrupt the breeding cycle of an important population.**

South-eastern Glossy Black-Cockatoo

The population subject to the Activity is not considered an important population (refer above).

Grey-headed Flying-fox

The population subject to the Activity is not considered an important population (refer above).

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

South-eastern Glossy Black-Cockatoo

No, the scope of the Activity would not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Grey-headed Flying-fox

No, the scope of the Activity would not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

South-eastern Glossy Black-Cockatoo

No, the Activity would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Grey-headed Flying-fox

No, the Activity would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

- **Introduce disease that may cause the species to decline.**

South-eastern Glossy Black-Cockatoo

No, the Activity would not result in disease that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Grey-headed Flying-fox

No, the Activity would not result in disease that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

- **Interfere substantially with the recovery of the species.**

South-eastern Glossy Black-Cockatoo

No, due to the scope of the works and the level of disturbance, the Activity would not interfere substantially with the recovery of the species.

Grey-headed Flying-fox

No, due to the scope of the works and the level of disturbance, the Activity would not interfere substantially with the recovery of the species.

Conclusion

Overall due to the relatively low extent and magnitude of impacts associated with the Activity, it is unlikely that the Activity would result in a significant impact to the subject vulnerable species.

EPBC Act Listed Endangered Species

The Koala is listed as Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1. Under the Act, populations are:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it would result in one or more of the following:

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

Koala

The National Recovery Plan for the Koala (DAWE 2022) defines a population as '…*a set of individuals that live in the same habitat patch and interact with one another, commonly forming a breeding unit within which the exchange of genetic material is more or less unrestricted*…'.

For the purpose of this assessment, the Koala population has been defined as the Lismore Koala population meaning all Koalas within the Richmond Valley Local Government Area (LGA).

The EPBC PMST report identified the Koala as 'known to occur' in the survey area (within a 10km buffer of the site). A search of the BioNet Wildlife Atlas returned a total of 2,391 records of Koala within the Richmond Valley LGA and 148 records of Koala within a 10 km x 10 km grid centred on the site.

Three regrowth Koala feed trees (Forest Red Gum) would be removed as part of the Activity. The Activity may cause minor indirect impacts to Koala from noise, human activity, machine operations during construction. It is not expected that the existing impacts from the new bridges, including noise and human activity would be significantly exacerbated by the Activity.

On this basis, the Activity would not lead to a long-term decrease in the size of the local Koala population.

- **Reduce the area of occupancy of the species.**

Koala

The Activity involves a minor reduction of potential foraging and dispersal habitat (up to 0.39 ha). Indirect impacts would have minor short-term disturbance only during construction.

On this basis the Activity would not reduce the area of occupancy of the species.

- **Fragment an existing population into two or more populations.**

Koala

Habitat within the site is already fragmented at a local scale by historic clearing, farming, and road works. Landscape scale fragmentation would not occur from the Activity as the scope of work involve minor vegetation removal and utilised cleared areas where suitable. No further habitat fragmentation on a landscape scale would occur as a result of the Activity.

On this basis, the Activity would not result in the fragmentation of an existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species.**

Koala

The Activity involves a minor reduction of potential foraging and dispersal habitat (up to 0.39 ha). Indirect impacts would have minor short-term disturbance only during construction.

On this basis, the Activity would not result in significant impacts that would adversely affect habitat critical to the survival of the Koala.

- **Disrupt the breeding cycle of a population.**

Koala

Due to the Activity occurring within disturbed and modified area, it is considered unlikely that local population of Koala would be restricted to the site. Habitat within the site is already fragmented at a local scale by the historic clearing road works and neighbouring properties. The Activity is unlikely to exacerbate movement or significantly reduce area of occupancy of breeding individuals for the population. It is unlikely the Activity would significantly disrupt the breeding cycle of the population of Koalas.

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

Koala

The Activity involves a minor reduction of potential foraging and dispersal habitat (up to 0.39 ha). Indirect impacts would have minor short-term disturbance only during construction.

On this basis the Activity would not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the Koala is likely to decline.

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

Koala

It is unlikely that invasive species (such as introduced predators) that are harmful to the Koala would become further established as a result of the Activity.

- **Introduce disease that may cause the species to decline.**

Koala

It is unlikely that the Activity would significantly fragment a Koala population to the point where dispersal is limited and therefore disease transmission between individuals is increased. As *Chlamydia* bacteria in Koalas and Koala Retrovirus is primarily transmitted between Koala individuals it is unlikely that the Activity would introduce disease that may cause the species to decline.

- **Interfere substantially with the recovery of the species.**

Koala

No, due to the scope of the works and the level of disturbance, the Activity would not interfere substantially with the recovery of the species.

Conclusion

Overall due to the relatively low extent and magnitude of impacts associated with the Activity and with mitigations put in place where required, it is unlikely that the Activity would result in a significant impact to Koalas.

Appendix F

Aboriginal Cultural Heritage Assessment

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TATHAM BRIDGE, (CASINO-CORAKI ROAD) TATHAM, NSW

DESKTOP HERITAGE ASSESSMENT

September 2024

Richmond Valley Council

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ABBREVIATIONS

AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
Code of Practice	*Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010A).
CoPAI	*Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010B)
DCP	Development Control Plans
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
EPA	Environmental Planning and Assessment
HSA	Heritage Significance Assessment
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
NPW	National Parks and Wildlife
PAD	Potential Archaeological Deposit
Project	Replacement of bridges across Deep Creek and Spring Creek on the Casino Coraki Road, Tatham NSW.
OEH	Office of Environment and Heritage (now Heritage NSW)
RVC	Richmond Valley Council
SEPP	*State Environmental Planning Policy (Transport and Infrastructure)* (2021)
Subject Site	Parts of the Casino Coraki Road including bridges across Deep Creek and Spring Creek and ancillary work areas.

1. INTRODUCTION

1.1 Project Background

Heritage Management & Planning Pty Ltd has been commissioned by Richmond Valley Council (RVC) to undertake a desktop Heritage assessment to support the proposed replacement of bridges on the Casino-Coraki Road (the Project) at Deep Creek and Spring Creek, Tatham NSW (**Figure 1**-**Figure 2**) (the Subject Site). The scope of works includes the bridge demolition and replacement, upgrades to Casino-Coraki Road and temporary stockpile/ work areas including a site office.

The desktop assessment is required to consider the potential impacts of the bridge replacement works on Aboriginal objects and items of historic (non-Aboriginal) heritage significance. The Project is being assessed under Part 5 of the *Environmental Planning and Assessment Act* (1979) (EP&A Act) by a Review of Environmental Factors (REF). A desktop heritage assessment meets the investigation and reporting requirements of the *National Parks and Wildlife Act* (NSW) (1974) and *Heritage Act* (1977) (NSW) for public infrastructure upgrade works.

1.2 Project Brief & Methodology

The methods employed in this assessment include:

- a description of the Project including a summary of civil works with the potential to impact Aboriginal and non-Aboriginal archaeological sites
- a search of the Aboriginal Heritage Information Management System (AHIMS)
- a search of the NSW Heritage Inventory/ Richmond Valley Local Environmental Plan (2012)
- a desktop review of environmental information relevant to the assessment
- a review of historical land use and disturbance as it may affect the distribution of Aboriginal sites, and
- documenting the outcomes of the desktop assessment including:
    i. a summary of known and potential Aboriginal and non-Aboriginal heritage sites in the vicinity of the Project
    ii. statements on the requirement for additional consultation with the Aboriginal community or archaeological excavation based on the likelihood of harm to Aboriginal objects, and
    iii. management recommendations to mitigate impacts to Aboriginal and non- Aboriginal heritage values to avoid impacts to the cultural landscape, including an unexpected find procedure.

1.3 Report Authorship

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

Figure 1: Tatham Bridge Replacement- General location

1.5 Legislative and Planning Context

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

The *National Parks and Wildlife Act* 1974 (NSW) (NP&W Act) is the primary legislation concerning the identification and protection of Aboriginal cultural heritage in New South Wales. Three key definitions in the NP&W 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 NP&W 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 NP&W 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 NP&W 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" (NP&W Act Section 87(2))

- 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).

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

The desktop heritage assessment has been undertaken to determine whether the Project can be undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010A) (Code of Practice). 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 harmed during an activity (DECCW 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 (DECCW 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 if the assessment concludes that harm to Aboriginal objects is "likely" the proponent has an obligation to avoid the impacts by redesigning the activity or undertake additional archaeological investigation, including Aboriginal community consultation, in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010B) (CoPAI) (see below) to determine the requirement for an AHIP. 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 of "likely" is:

> "Having a high probability of occurring or being true: very probable" (www.merriam-webster.com/dictionary).

Where the Due Diligence assessment concludes that there might be a residual possibility that the activity might impact on Aboriginal objects and measures are put in place to avoid or reduce the likelihood of Harm then documentation of the assessment process would still provide a defense against prosecution for the activity under the Due Diligence approval pathway (NP&W Act section 87(2)).

The Due Diligence Code of Practice makes an additional statement which removes the requirement to undertake additional investigation where there has been significant ground disturbance that would reasonable reduce the potential that Aboriginal objects would be subject to additional harm. The Due Diligence Code of Practice includes the following definition of 'disturbed land' (DECCW 2010A: 12, 18).

> "Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable".

The application of the previous disturbance provisions of the NP&W Act/ Due Diligence Code of Practice must be considered on a case-by-case basis. However, the general application of the previous disturbance defence outlined in the Due Diligence Code of Practice is that the ground disturbance must have removed the portion of the soil profile likely to contain Aboriginal objects from the local area or be of a nature whereby the ground disturbance would significantly reduce the likelihood of finding Aboriginal objects as part of a archaeological investigation. This is primarily because the procedures set out by the Due Diligence Code of Practice assume that the likelihood an activity will impact Aboriginal objects can be determined using standard archaeological investigation methods. Archaeological investigation involves a sample survey to determine and/or infer the likelihood that Aboriginal objects are present - the confidence in results from archaeological investigations is significantly reduced where the land has been subject to ground disturbance.

1.5.3 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* (DECCW 2010B) 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." (DECCW 2010B:2).

The CoPAI replaces the former Standards and Guidelines Kit and outlines the minimum requirements for archaeological investigation and reporting by archaeologists. The purpose of the CoPAI is to (DECCW 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.

In the event that the CoPAI assessment concludes that the activity is not likely to impact on Aboriginal objects (i.e. the investigation concludes that harm to Aboriginal objects is not likely and that an AHIP is not required) a report that complies with the CoPAI is considered to be compliant with the Due Diligence approval pathway (NP&W Act Section 87 (2)). Where the CoPAI investigation determines an AHIP is required then the works can only be authorised by an AHIP (i.e. works cannot proceed under the Due Diligence approval pathway).

1.5.4 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. Where they are not on a heritage register, significant historic heritage items are afforded little protection, other than at the discretion of local councils. The three main registers of heritage sites include:

- the NSW Heritage Register which provides protection under the Heritage Act for sites which meet the criteria of state heritage significance and are additionally listed on the register by the relevant Minister
- heritage items managed by NSW government agencies and are additionally listed on the register (Section 170 heritage register) by the relevant department responsible for the site, and
- heritage items that meet the criteria of local heritage significance and are additionally listed on a Local Environmental Plan (LEP).

Of note are the provisions allowing for interim heritage orders (Part 3), which grant 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.

The *Heritage Act* 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. 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 s140) unless there is an applicable exception (pursuant to s139(4)). Section 146 of the Heritage Act requires any person who is aware or believes that they have discovered or located a relic to notify the Heritage Council of NSW providing details of the location and other information required.

1.5.5 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 ACH assessments:

> Part 3- Planning instruments which include Local Environmental 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 agencies, or determining authorities, for infrastructure and environmental proposals, and for the approval of State Significant Infrastructure by the Planning Minister.

The bridge replacement works are being assessed by Richmond Valley Council under Part 5 of the EPA Act.

1.5.6 Richmond Valley Local Environmental Plan 2012

The Richmond Valley LEP (2012) provides a framework to determine activities which require development consent and outlines considerations for the determination process. This includes the following general classes of heritage:

- Items on the NSW State heritage Register
- Items of local heritage significance listed on Schedule 5 of the Richmond Valley LEP, and
- Aboriginal objects and Places as defined by the NPW Act.

Section 5.10(2) of the Richmond Valley LEP (2012) stipulates activities which require development consent:

(2) Requirement for consent 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)—

(i) a heritage item,

(ii) an Aboriginal object,

(iii) 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—

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

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,

The Richmond Valley LEP (2012) sets out provisions to control activities at “Aboriginal Places of heritage significance”, which include places which do not meet the definition of an Aboriginal object or Aboriginal Place under the NPW Act but are listed under the LEP. Part 5.10.8 of the Richmond Valley LEP (2012) requires that Richmond Valley Council:

"… must, before granting consent under this clause to the carrying out of development in an Aboriginal place of heritage significance—

(a) consider the effect of the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place by means of an adequate investigation and assessment (which may involve consideration of a heritage impact statement), and

(b) notify the local Aboriginal communities, in writing or in such other manner as may be appropriate, about the application and take into consideration any response received within 28 days after the notice is sent.

Based on the requirement of the LEP, activities or land uses that may not otherwise require consent, such as some agricultural activities, trigger the requirement for development consent if they are in close proximity to Aboriginal objects, Aboriginal Places and Aboriginal Places of heritage significance.

1.5.7 State Environmental Planning Policy (Transport and Infrastructure) 2021

The purpose of this Policy is to enable the effective delivery of infrastructure in NSW through identification of particular types of infrastructure that either require consent, can be undertaken without consent or are exempt development. 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 this proposal includes repairs of a public road by Richmond Valley Council, it can be assessed under the Part 5 of the EP&A Act.

Section 3.2.1 of the Transport and Infrastructure SEPP provides 'General conditions of complying development certificates' and includes the following general condition relating to Aboriginal objects and historic relics:

(9) If any object having interest due to its age or association with the past is uncovered during the course of the work—

(a) all work must stop immediately in that area, and

(b) an appropriate Public Service employee designated by the Minister for Energy and Environment must be advised of the discovery.

Note—

Depending on the significance of the object uncovered, an archaeological assessment and excavation permit under the Heritage Act 1977 may be required before further the work can continue.

(10) If any Aboriginal object (including evidence of habitation or remains) is discovered during the course of the work—

(a) all excavation or disturbance of the area must stop immediately in that area, and

(b) the Secretary of the Department of Planning and Environment must be advised of the discovery in accordance with section 89A of the National Parks and Wildlife Act 1974.

2. HERITAGE ASSESSMENT

2.1 Description of the Project/ Scope of Works

The project involves construction of 2 x new bridges parallel to the 2 x existing bridges on the Casino-Coraki Road. Construction of new approaches and amending the existing road alignment to match in with the new replacement bridges. The 2 x existing bridges will be demolished, and area rehabilitated once the new bridges are in place.

The existing bridges are constructed of concrete Doolan decks which are now in poor condition and only have a 5t load limit and one way traffic to cross at a time. This is causing heavy vehicles to detour away from using the existing bridges. The replacement bridges are to be a four-span bridge over Deep Creek & a two span bridge over Spring Gully Creek both consisting of a concrete plank & deck structure.

The road construction of this project will consist of repositioning the roadway to line up with the 2 x new bridges and will also involve raising the road levels which will involve some substantial earthworks. The new roadway will tie into the exiting side roads; Perkins Bridge Road, Tomki- Tatham Road & Tatham-Ellangowan Road. The new roadway will also tie back into the existing Casino-Coraki Road at opposite ends of the project.

Key Features of the works include:

- Construction of ancillaries
- Tree and vegetation clearing
- Utility Relocation
- Construction of temporary piling pads
- Piling
- Construction of temporary crane pads for girder install
- Installation of a 4 span 91m long bridge over Shannon Brook
- Installation of a 2 span 43m long bridge over Spring Gully Creek
- Approximately 700 linear meters of road/pavement construction
- Exiting Bridge demolition.
- Stabilisation of disturbed areas including ancillary sites
- Demobilisation

Bridge Construction activities proposed:

- Install temporary environmental controls
- Establish access, compound and laydown ancillaries.
- Relocate overhead power lines
- Relocate Telstra cables (If needed)
- Tree & Vegetation clearing for bridge & roadworks.
- Install temporary Piling platforms
- Install Piles (Driven)

- Construct in-situ concrete pile caps
- Construct in-situ concrete piers
- Construct in-situ concrete abutments
- Construct in-situ concrete headstocks
- Install bridge bearings
- Backfill behind abutments
- Install temporary crane pad
- Crane mobilisation
- Install precast girders
- Pour concrete deck & approach slabs
- Earthworks & road pavement for realigned road & tie ins
- Installation of new safety barriers and road furniture
- Spray seal new road alignment
- Stabilisation, landscaping and finishing works
- Remove site compound and re-establish areas to original state, ensuring any disturbed areas are stabilised.

Demolition of existing bridges would be undertaken once the completion of the new bridges are completed and trafficable. The same ancillaries will be utilised for bridge construction and the demolition works.

- Crane set up on existing road behind the old bridge abutments.
- Dismantle exiting Doolan deck bridge in sections starting with the barriers and working our way down.
- Lift out each section with crane, using lifting straps, chains etc
- Load onto truck and cart off site, to be recycled or repurposed
- Cut the piers and pile caps and also remove them by crane.
- Use of 20t excavator to dig out the existing abutments to ground level and any concrete
- would be removed. Shape up disturbed area using excavator to match existing, stabilise and plant/landscape as required to design, and
- Remove short term erosion sediment controls once disturbed areas are stabilised.

Figure 2: Casino Coraki Road- Extent of works

2.2 Aboriginal Heritage Information Management System (AHIMS)

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 will likely be located within and around the Study Area. A search of AHIMS was undertaken on 11 September 2024 (#929446) for the Subject Site which returned no previously recorded Aboriginal site, being the Tatham Camp (Figure 3).

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : TH222 Tatham Bridges
Client Service ID : 929446

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

Date: 11 September 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Search using shape-file TathamBridge_ExtentOfWorks_Poly with a buffer of 0 meters. Additional Info : Due Diligence, conducted by Tim Hill on 11 September 2024.

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

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

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

Figure 3: Woodburn Coraki Road- AHIIMS search results (#9929446)

2.3 NSW Heritage Inventory/ Richmond Valley Local Environmental Plan

A search was undertaken of the NSW Heritage Inventory and Richmond Valley LEP (2012) on 11 September 2024 to identify items of local heritage/ environmental significance in the vicinity of the Study Area. Part of the Subject Site, being Lot 202 DP815264, comprises the northern portion of the "Tatham Church, Former" local heritage site (**Figure 4** and **Figure 5**). The ancillary work area is located on the paddock immediately opposite the church. The following site description is provided in the NSW Heritage Inventory:

> Weatherboard church in the gothic style with porch to the front and gabled iron roof. Rose window above the porch and decorative timber work under both the gable of the main roof and the porch roof. The building has been raised, and there is no access to the porch doors. No historically significant garden but some mature trees may have significance. The RRH 28/3/1924 p2 provides a full description of the Church of the second church which was replicated in the 1932 church.

The following Statement of Significance is provided in the NSW Heritage Inventory:

> The church is historically significant providing the last physical evidence of a strong Catholic community in Tatham. A community which at one stage supported a convent and church school. It is associated with the family of Thomas Marsh who settled in Tatham in the 1870s and gave land for both the convent and church. It is representative of the modest weatherboard carpenter built churches commonly found on the north coast.

Based on the site description the existing Spring Creek bridge would be considered as an 'intrusive' heritage element/ fabric- no additional impact assessment is required. Additionally, the curtilage of the site, being the open paddock and views over the creek/ river above the floodplain, retains the landscape setting of the church.

Figure 4: Tatham Church, Former (NSW Heritage Inventory)

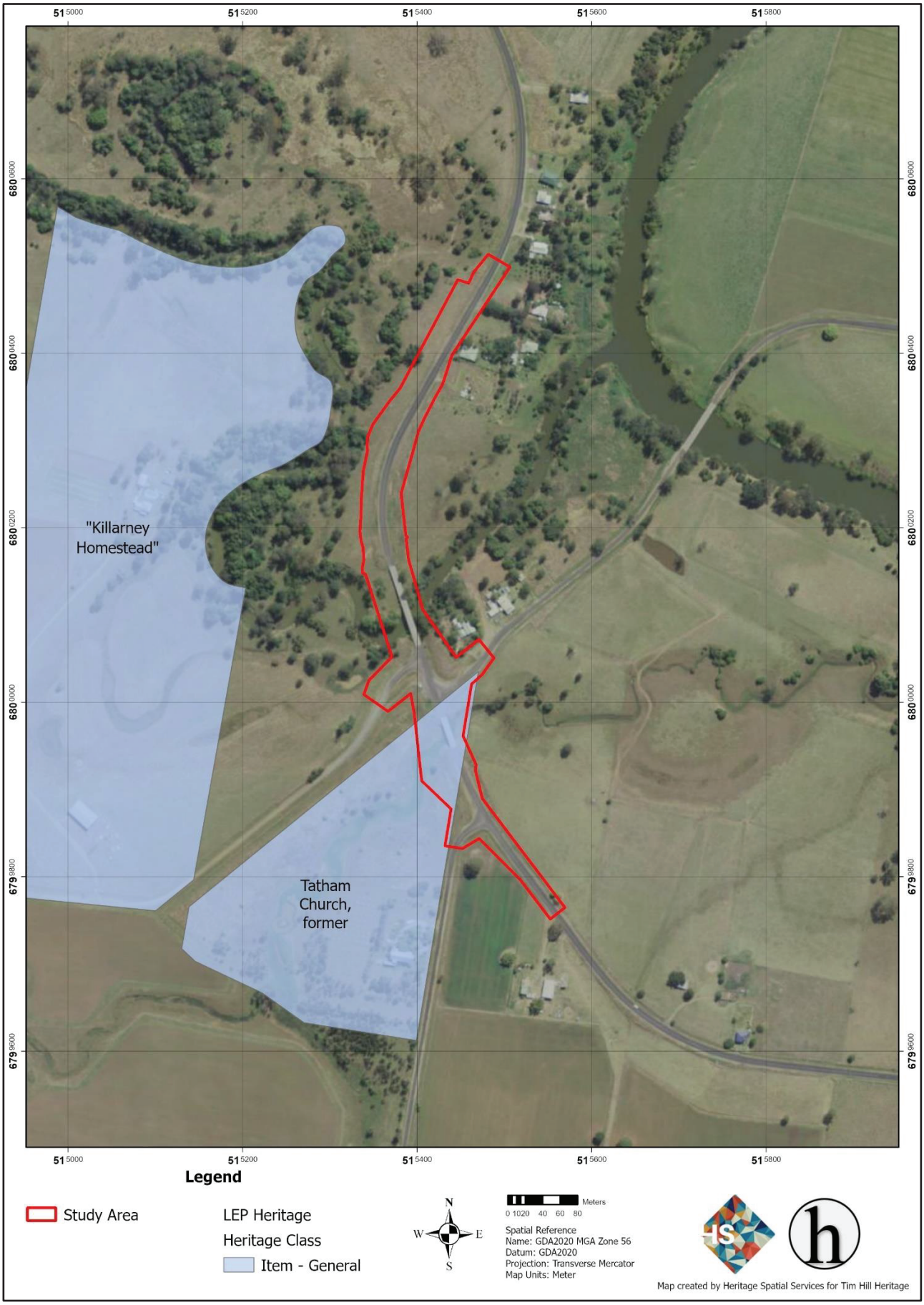


Figure 5: NSW Heritage Inventory- Search results

2.4 Landform Assessment

2.4.1 Topography and Stream Order

The Due Diligence Code of Practice (Step 2b) identifies some landforms as having an increased potential to contain Aboriginal objects (**Table 1**).

> Aboriginal objects are often associated with particular landscape features as a result of Aboriginal people's use of those features in their everyday lives and for traditional cultural activities. Examples of such landscape features are rock shelters, sand dunes, waterways, waterholes and wetlands. Therefore it is essential to determine whether the site contains landscape features that indicate the likely existence of Aboriginal objects (DEECW 2010A:12).

The Subject Site is located on the broader Richmond River floodplain (**Table 1** and **Figure 6**)- as such additional investigation is required to comply with the Due Diligence Code of Practice.

Table 1: Landform summary (Due Diligence Code of Practice Step 2b)

Landform	Comment in relation to the Study Area
Within 200m of waters	Yes. The Study Area is within the immediate vicinity of Deep Creek And Spring Creek.
Located within a sand dune system	No
Located on a ridge top, ridge line or headland	No.
Located within 200m below or above a cliff face	No
Within 20m of or in a cave, rock shelter, or a cave mouth	No

2.4.2 Soil Landscape Models and Geology

The Subject Site is mapped as part of the Tatham soil landscape which comprises "level to gently inclined extensive alluvial plain of the Richmond River" (espade.nsw.gov.au) (**Table 2** and **Figure 7**). The geological model for the Subject Site is "Alluvial floodplain deposits" (**Figure 8**).

Table 2: Summary of soil landscape model

Soil landscape	Landscape summary	Vegetation model
Tatham	**Topography-** Extensive alluvial plain, up to 5 km wide. Generally level with gently inclined slopes (up to 5%) with localised steeper (10–15%) areas within scours and ox-bows. The floodplain has a very gentle up-valley slope of 1%. Relief is extremely low to low (generally <5 m but can be up to 20 m over a distance of 5 km). **Soils-** deep (>200 cm), poorly to moderately well-drained Brown and Grey Clays (Ug5.34, Gn2.41) on alluvial plain. Deep (>200 cm), poorly drained Weisenboden (Ug5, Gn2) in ox-bows. Deep (>300 cm), well-drained Black Earths (Ug5.17) and Brown Clays (Ug5.34) on levees. Deep (>200 cm), well-drained Earthy Sands (Uc5.21, Uc1.43) line major stream channels.	Extensively cleared tall woodland. Areas of closed-forest (rainforest) may have occurred in places. Forest red gum (*Eucalyptus tereticornis*), cabbage gum (*Eucalyptus amplifolia*) and rough-barked apple (*Angophora floribunda*) occur as isolated trees. Less common are isolated trees of native teak (*Flindersia australis*) and figs (*Ficus spp.*). Broad leaved paperbark (*Melaleuca quinquenervia*) occupies sites of poor drainage, such as ox-bows. River oak (*Casuarina cunninghamiana*) lines drainage areas

Soil landscape	Landscape summary	Vegetation model
	Geology- Deep Quaternary alluvial sediments—alluvium, clay, sand. Fine-grained basaltic sediments predominate. Manson and Harte (1978) note that the depth of alluvium is >35 m in places.	
Leycester	**Topography-** Level to gently undulating broad to extensive (500–1 500 m) alluvial plains and back plains of extremely low relief. Slope ranges from 0–2%, with local steeper areas on channel scours, ox-bows and terrace faces (<25%). Narrow (<50 m) inset terraces are common **Soils—**deep (>200 cm), poorly to moderately well drained alluvial Black Earths (Ug5.15, Ug5.17) and Structured Clays (Uf6.42) occur throughout the floodplains. Wetter areas, such as ox-bow floors, have deep (>200 cm), poorly drained Weisenboden (Ug5.15, Ug5.17). Deep (>200 cm), well-drained Earthy Sands (Uc5.21) line channels. **Geology-** Quaternary alluvial valley in-fill sediments—dominantly alluvial clay with minor sand and river gravels. Fine grained sediments of the less intensely weathered basalt areas predominate.	Extensively cleared open-forest (wet sclerophyll). Current vegetation consists of a closed sod grassland ground cover with isolated trees. Main grasses are kikuyu (*Pennisetum clandestinum*), paspalum (*Paspalum dilatatum*) and setaria (*Setaria sphacelata*). Juncus spp. occurs in wetter areas. Forest red gum (*Eucalyptus teriticornis*), cabbage gum (*Eucalyptus amplifolia*) and broad-leaved apple (*Angophora subvelutina*) occur as isolated trees throughout the landscape. Stands of open-forest line channels and are dominated by river oak (*Casuarina cunninghamiana*), silky oak (*Grevillea robusta*) and less commonly hoop pine (*Araucaria cunninghamii*).

2.4.3 Disturbance History

The impact of previous ground disturbance is an important consideration in the Due Diligence assessment, particularly where ground disturbance removes Aboriginal objects from the soil profile or disturbs the objects to a degree that the interpretation of the archaeological survey results is significantly compromised. The Due Diligence Code of Practice provides the following advice on the application of the definition of 'disturbed lands'.

> Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks (DECCW 2010A:18).

The impacts of previous ground disturbance is an important consideration in the Due Diligence assessment (Step 2C), particularly where ground disturbance removes Aboriginal objects from the soil profile or disturbs the objects to a degree that the interpretation of the archaeological survey results is significantly compromised.

The following comments summarise historical aerials for the Subject Site:

1881 the Crown Plan show that the Casino Coraki Road was original east of the current road alignment- (**Figure 9**)

1890 the Crown Plan shows the road reserve to the east- the main bridge crossing is across Deep Creek (Figure 10)

1957- the aerial photo shows the road alignment / bridge crossings to the east of the current Casino-Coraki Road- the road surface is gravel and the bridges appear to be single lane (Figure 11).

1970- the aerial photo shows the road alignment / bridge crossings to the east of the current Casino-Coraki Road- the road surface is bitumen and the bridges appear to be single lane (Figure 12).

1990- the aerial photo shows the road alignment / bridge crossings to the east of the current Casino-Coraki Road- the road surface is bitumen and the bridges appear to have been upgraded to concrete (Figure 13).

Based on the Crown Plans and historic aerial photos it is possible to proceed with the assessment on the basis that the current road and bridges have been constructed within the past 30 years. This construction will have resulted in soil/ ground disturbance which is clear and observable- including cut and fill earthworks by civil machinery.

2.5 Outcomes of the Desktop Assessment

2.5.1 Historic (non- Aboriginal) Heritage

The following statements summarise the outcomes of the desktop assessment relating to historic (non-Aboriginal) heritage:

- the Subject Site comprises the eastern portion of the 'Tatham Church, Former' local heritage site- the curtilage includes a portion of the road reserve which includes Spring Creek bridge which would be assessed as being of low/ intrusive heritage significance
- the church building and gardens are located back from the road reserve and are partially obscured by ornamental tree rows- the replacement of the bridge will not have a significant impact on the agricultural landscape/ setting of the church
- the physical remains of the two original (pre 1990's) bridges are located to the east of the Subject Site- the current alignment portion of the Coraki Casino Road post-dates the 1990s and the existing bridges have no heritage significance.

2.5.2 Aboriginal Heritage

The following statements summarise the outcomes of the desktop assessment relating to Aboriginal heritage:

- the Subject Site is located across two tributaries of the Richmond River- the most likely location for Aboriginal archaeological sites are on elevated ridges and crests terminating near the floodplain but above approximately 10 metres above sea level
- Aboriginal archaeological sites associated with floodplain environments are typically restricted to isolated stone artefacts and low-density stone artefact scatters- these types of sites are not easily identified using standard archaeological excavation methods
- As the broad landscape has been cleared for forestry and agriculture there is no potential for scarred/ modified trees- it is not likely that Aboriginal objects associated with ceremonial/ spiritual or burial

places will be located within the Subject Site as this area has been subject to significant ground disturbance since the 1990's

- the bridge replacement works will be consistent with the historic ground disturbance- the cut and fill earthworks post 1990 and are 'clear and observable' within a floodplain environment, and
- floodplain environments have been exposed to significant accretion and erosion of soils which have the effect of reducing the spatial integrity of Aboriginal archaeological sites- the impact of geomorphological process on archaeological sites has increased significantly with heavy flooding.

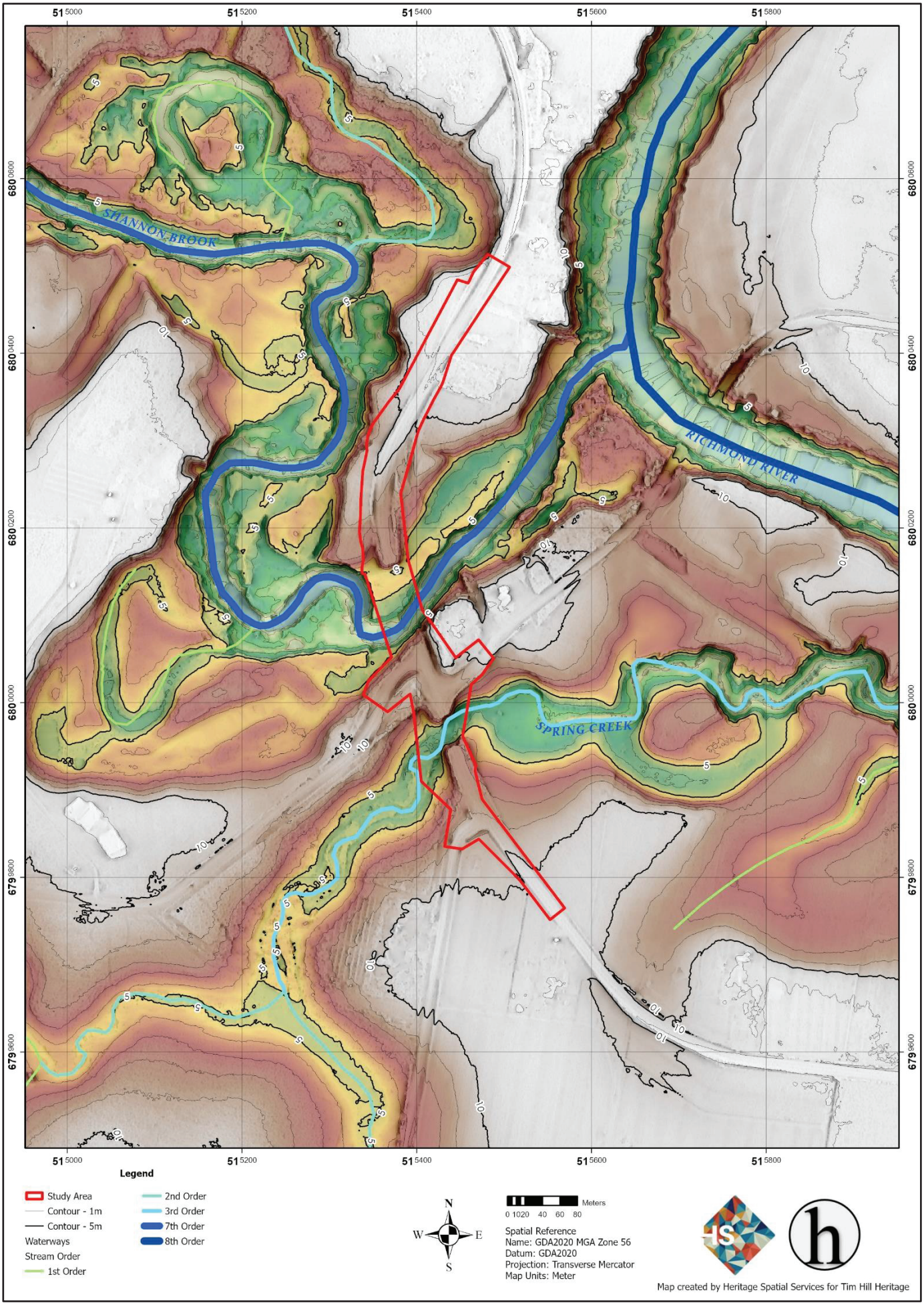


Figure 6: Tatham Bridges- Topography and stream order

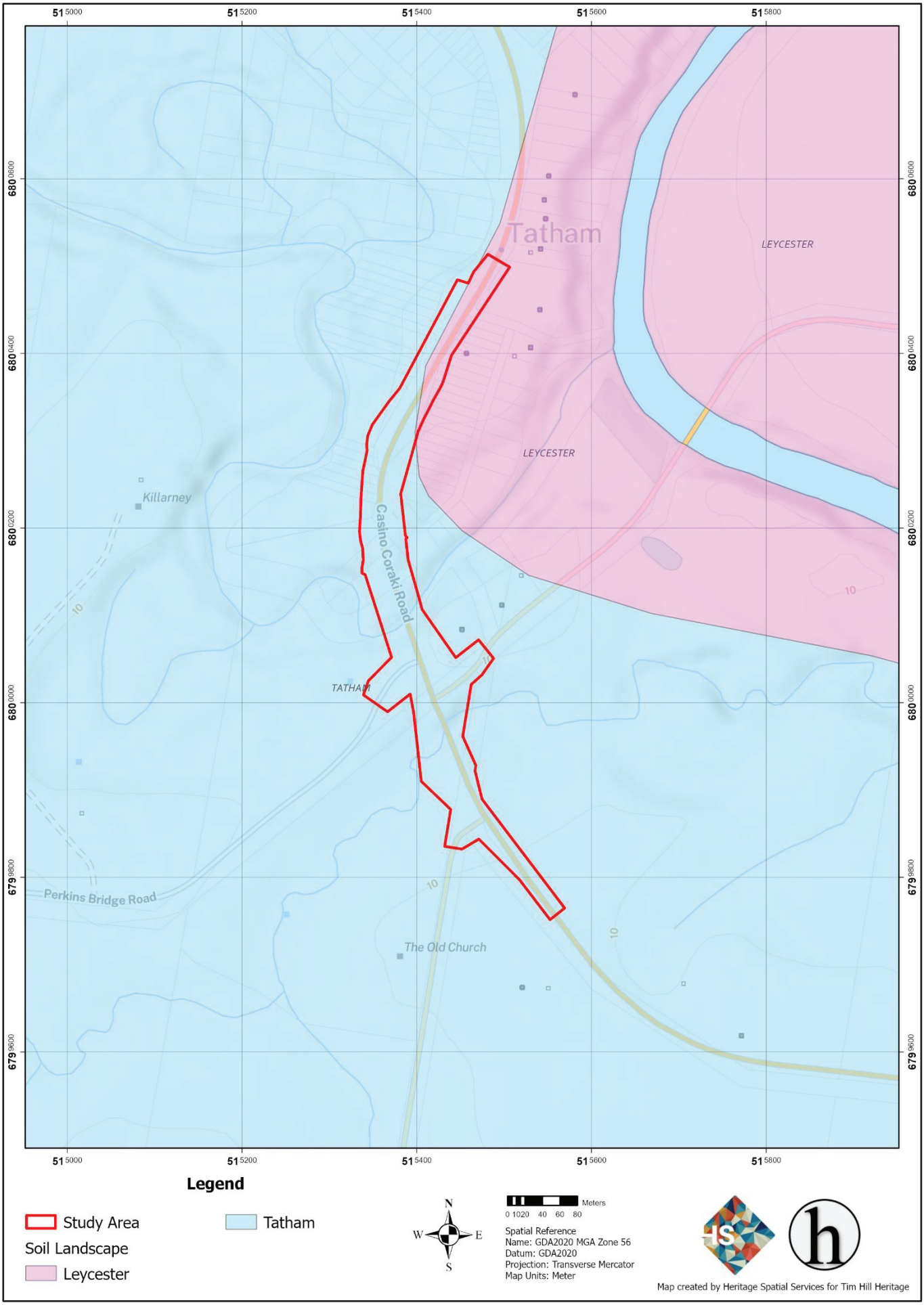
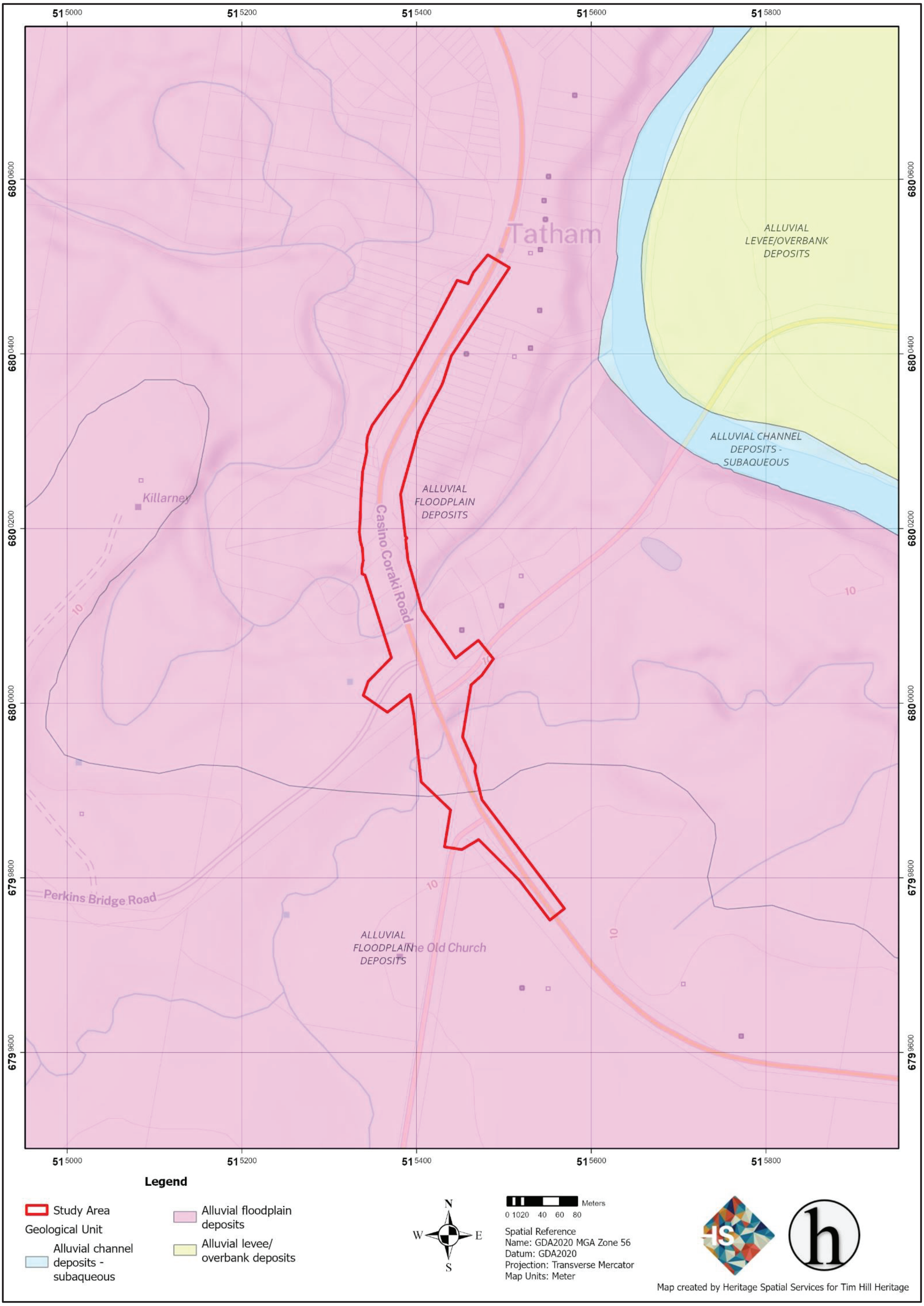


Figure 7: Tatham Bridges- Soil landscapes

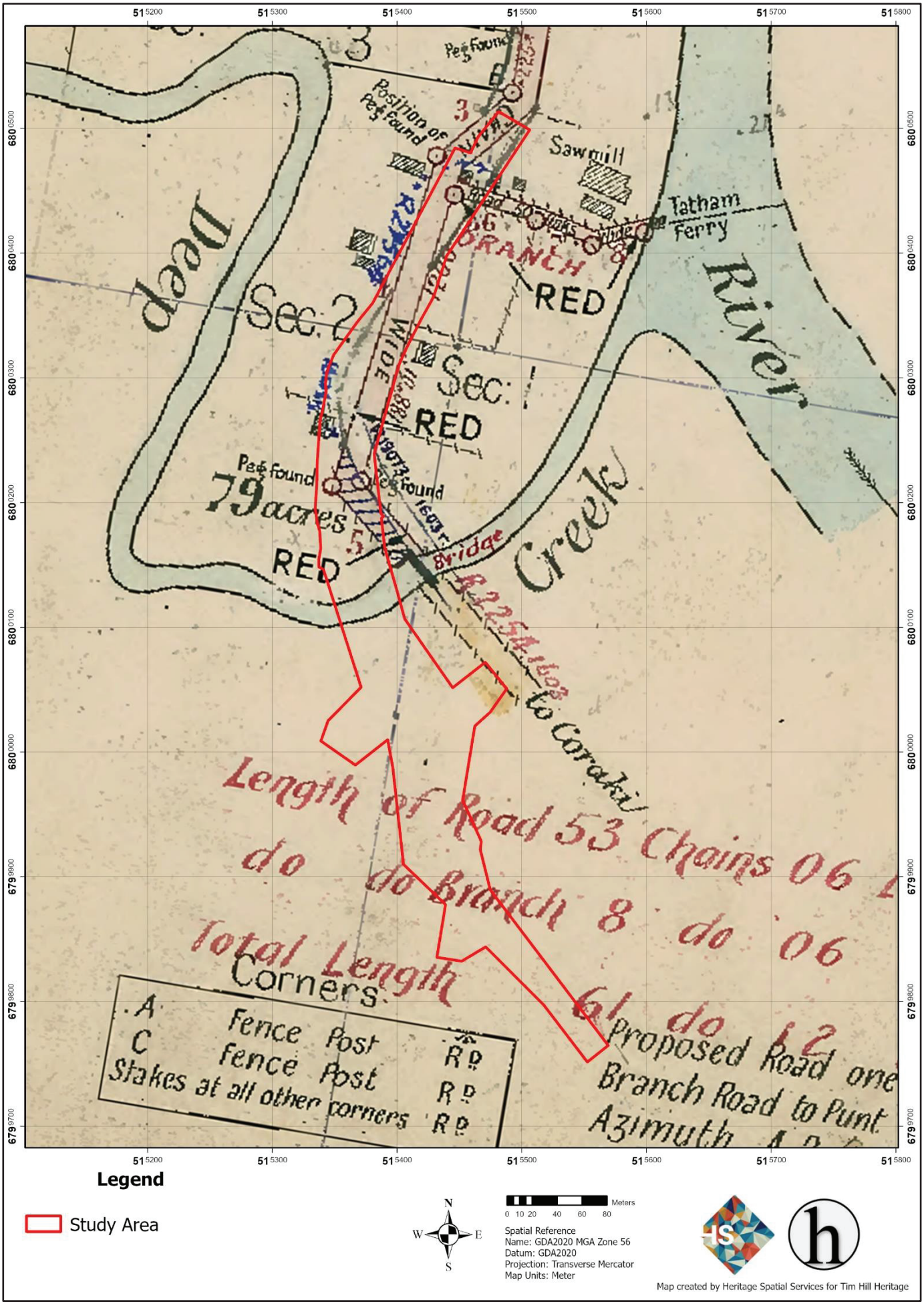


Tatham
ALLUVIAL LEVEE/OVERBANK DEPOSITS
ALLUVIAL CHANNEL DEPOSITS - SUBAQUEOUS
ALLUVIAL FLOODPLAIN DEPOSITS
Killarney
Casino Coraki Road
Perkins Bridge Road
The Old Church
Legend
Study Area
Geological Unit
Alluvial channel deposits - subaqueous
Alluvial floodplain deposits
Alluvial levee/ overbank deposits
Meters
Spatial Reference
Name: GDA2020 MGA Zone 56
Datum: GDA2020
Projection: Transverse Mercator
Map Units: Meter
Map created by Heritage Spatial Services for Tim Hill Heritage

Figure 8: Tatham Bridges- Geology


51 5200
51 5300
51 5400
51 5500
51 5600
51 5700
51 5800
680 0500
680 0400
680 0300
680 0200
680 0100
680 0000
679 9900
679 9800
679 9700
WHARF
RED
31
30
49
Closed
Gaz. 8. 12. 33
Rds. 32·678
R19073/603
Proposed to be confirmed
A not to be confirmed
T. Marsh
(occ)
now
A.M.P. Assn
Commerce Bank
(now)
Legend
Study Area
N
S
E
W
0 10 20 40 60 80
Meters
Spatial Reference
Name: GDA2020 MGA Zone 56
Datum: GDA2020
Projection: Transverse Mercator
Map Units: Meter
Map created by Heritage Spatial Services for Tim Hill Heritage

Figure 9: Tatham Bridges- 1881 Crown Plan


Dead
River
Creek
Sec. 2
Sec. 1
RED
RED
RED
Sawmill
Tatham Ferry
BRANCH
Bridge
79 acres
Peg found
Position of Peg found
to Coraki
Length of Road 53 Chains 06 L
do do Branch 8 do 06
Total Length 61 do 12
Proposed Road one
Branch Road to Punt
Azimuth
Corners
A Fence Post R D
C Fence Post R D
Stakes at all other corners R D
51 5200
51 5300
51 5400
51 5500
51 5600
51 5700
51 5800
680 0500
680 0400
680 0300
680 0200
680 0100
680 0000
679 9900
679 9800
679 9700
Legend
Study Area
N
W
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S
Meters
0 10 20 40 60 80
Spatial Reference
Name: GDA2020 MGA Zone 56
Datum: GDA2020
Projection: Transverse Mercator
Map Units: Meter
Map created by Heritage Spatial Services for Tim Hill Heritage

Figure 10: Tatham Bridge- 1890 Crown Plan

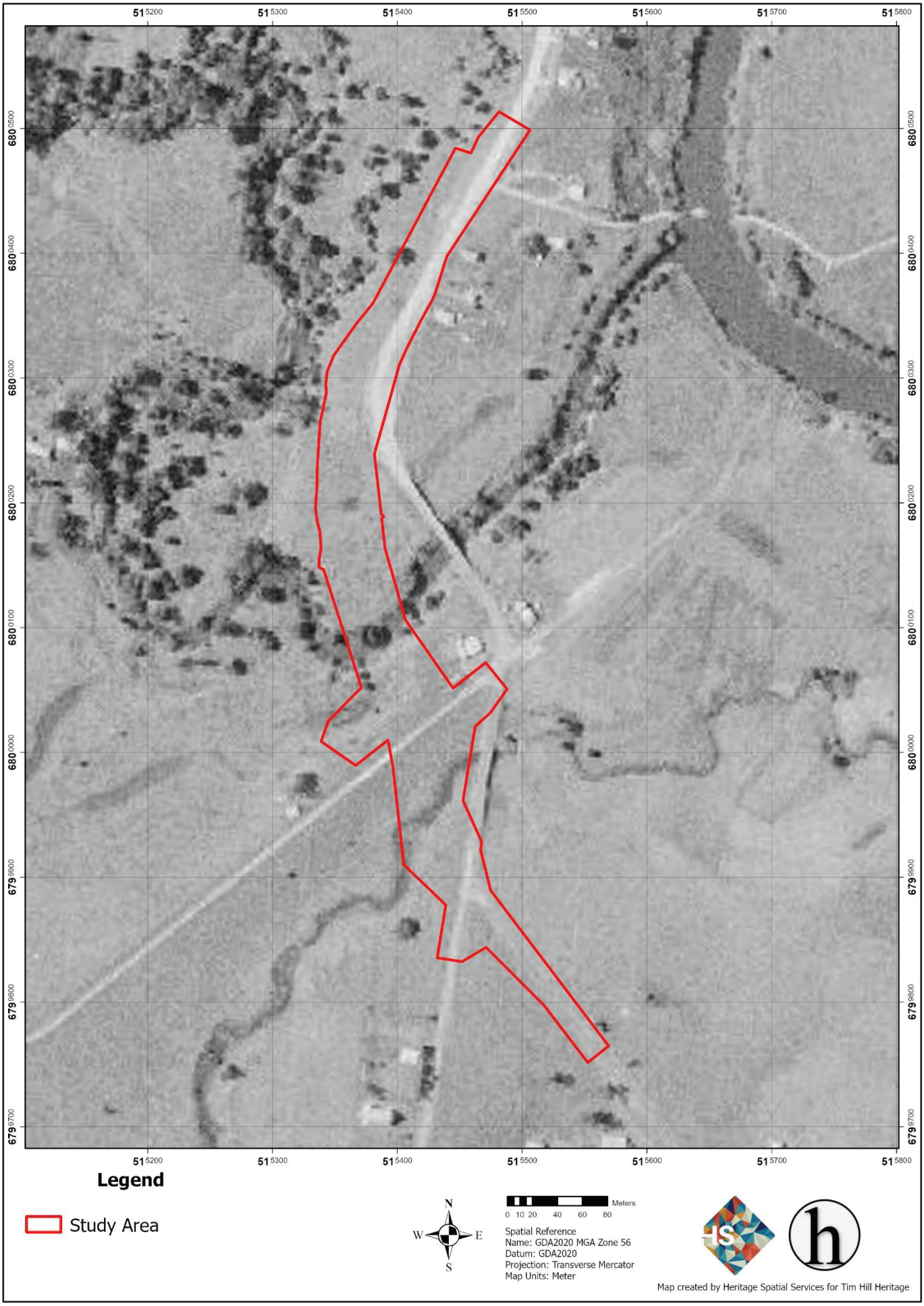

Figure 11: Tatham Bridges- 1957 aerial photo


515200
515300
515400
515500
515600
515700
515800
6800500
6800400
6800300
6800200
6800100
6800000
6799900
6799800
6799700
Legend
Study Area
N
W
E
S
0 10 20 40 60 80
Meters
Spatial Reference
Name: GDA2020 MGA Zone 56
Datum: GDA2020
Projection: Transverse Mercator
Map Units: Meter
Map created by Heritage Spatial Services for Tim Hill Heritage

Figure 12: Tatham Bridges- 1970 aerial photo

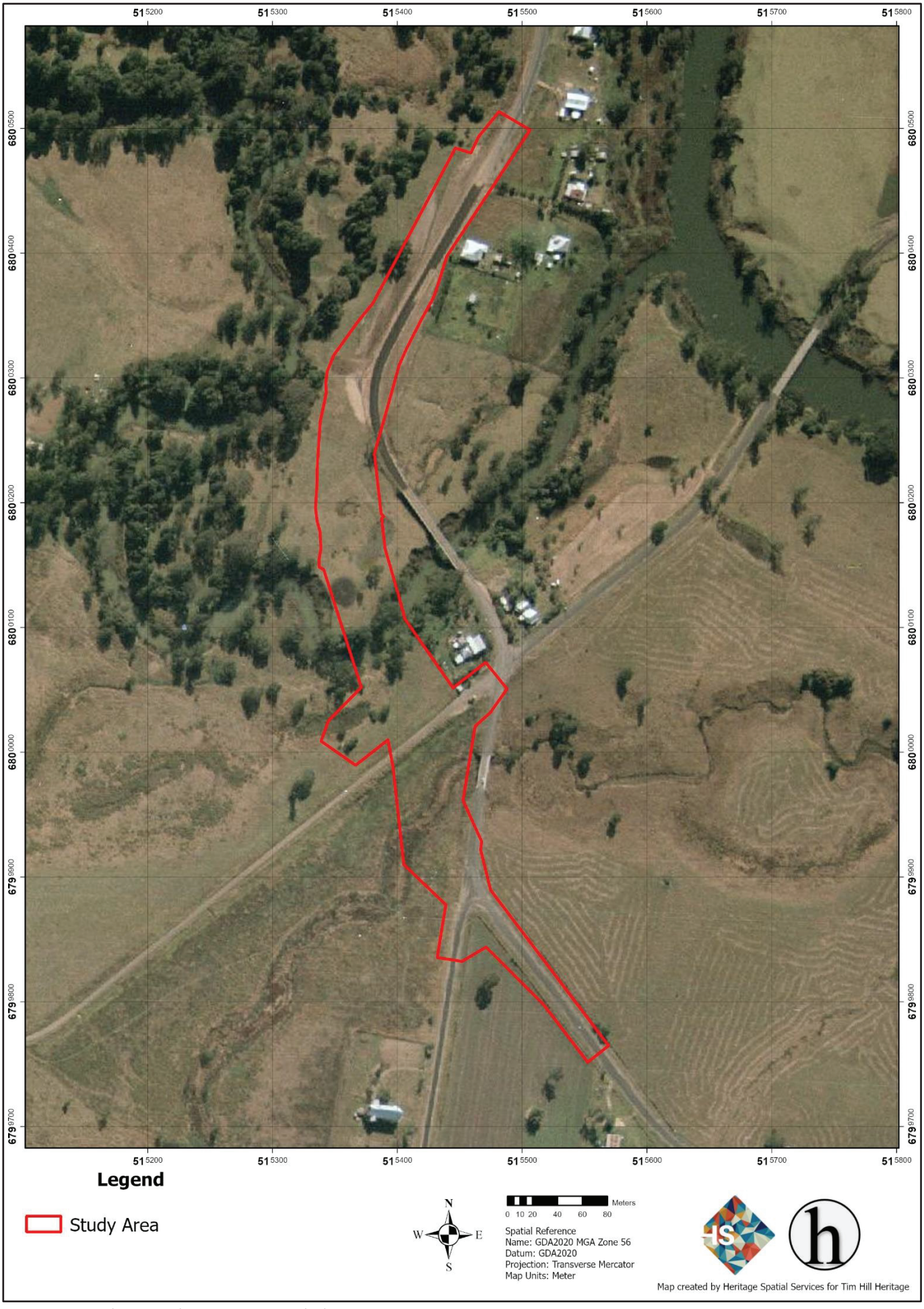

Figure 13: Tatham Bridges- 1990 aerial photo

2.6 Requirement for archaeological test excavation

Section 3.1 of the CoPAI (DEECW 2010B:24) makes the following comment on the requirement archaeological test-excavations as part of the ACH assessment:

> Archaeological test excavation will be necessary when (regardless of whether or not there are objects present on the ground surface) it can be demonstrated through Requirements 1, 2, 3, 4, and 5 that sub-surface Aboriginal objects with potential conservation value have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity.

The following comments are provided to address the requirements for archaeological excavation for future ground disturbance that would reasonably arise from the future subdivision of the Study Area.

2.6.1 Probability that artefacts will occur within the Study Area

The results of the desktop assessment are within the range of 'normal' for archaeological investigations on the NSW north coast where the ability to identify sites closely correlates with landforms, the amount of grass cover and the extent of historic disturbance to topsoils from forestry and farming. Archaeological test excavation of floodplains/ rainforests on the NSW North Coast area have demonstrated that topsoils do contain Aboriginal artefacts which are consistent with the manufacture and maintenance of hunting tools. However, the nature of the Subject Site, being actively accreting/ eroding floodplain and the history of ground disturbance associated with post 1990's road and bridge works means that there is not a 'high probability' that the Study Area will contain stone artefact scatters. Stone artefact scatters, if they occurred, would typically be classified as 'isolated artefacts' and result from the discard of tools and waste material during hunting activities in an ad hoc manner. It is not likely that this type of occupation, or archaeological discard pattern, would be identified by standard archaeological excavation methods as the sampling strategies outlined in the CoPAI do not provide sufficient coverage for isolated artefacts/ low density scatters typical of forest/ floodplain environments.

2.6.2 Potential conservation value

In northern NSW, sites which are considered to have 'conservation value' include, for example, bora/ stone arrangement sites, modified trees, rock art, historic sites associated with former Aboriginal reserves and missions and Aboriginal burials. Stone artefact scatters are relatively common and would not be considered to be of high conservation value. As such, the Subject Site does not meet the criteria or threshold for archaeological excavation on the grounds of conservation value.

2.6.3 Substantial avoidance

In the unlikely event that a isolated artefact or a low density stone artefact scatter is identified during the civil works the alignment of the crossing within the road reserve will provide sufficient space for the management of topsoils with archaeological values, including the following design and engineering options:

- redesign to utilise the existing road formation
- relocation of topsoils which contain Aboriginal stone artefacts and stockpiling of the topsoils within managed open space along the creekbanks, and

- deposition of fill material around/ in front of the archaeological site to provide a physical buffer to the artefacts for flood remediation allowing them to be retained insitu.

2.7 Mitigation measures/ recommendations

2.7.1 Recommendation 1: Aboriginal Objects Find Procedure

It is recommended that if it is suspected that Aboriginal objects have been uncovered as a result of bridge replacement works within the Subject Site:

a) work in the surrounding area is to stop immediately and records are made of the finds via project incident reporting procedures
b) 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
c) an appropriately qualified archaeological consultant and a representative of the Bandjalang People #2 / NTS Corp are to be 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
d) if the material is found to be of Aboriginal origin, the find must be reported on the AHIMS database
e) 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
f) 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.

2.7.2 Recommendation 2: Aboriginal Human Remains

Although it is unlikely that Human Remains will be located within the Study Area, should this event arise it is required 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 Local Area Command (Woolgoolga), Bandjalang People #2 / NTS Corp 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.

3. REFERENCES

Department of Environment, Climate Change and Water (DECCW)

2010A *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*

2010B *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales*

2010C *Aboriginal Cultural Heritage Consultation Requirement for Proponents.*

Espade.nsw.gov.au

Leycester soil landscape
<https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/9540le.pdf>
Tatham soil landscape
<https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/9540ta.pdf>

NSW Heritage Inventory

Tatham Church, Former
<https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2850053>

NSW Spatial Collaboration Portal

1957 *Aerial photo*
<https://portal.spatial.nsw.gov.au/download/historic/328/328_07_046.jp2.jpeg >

1970 *Aerial photo*
<https://portal.spatial.nsw.gov.au/download/historic/1966/1966_05_021.jp2.jpeg >

1990 *Aerial photo*
<https://portal.spatial.nsw.gov.au/download/historic/4021/4021_12_076.jp2.jpeg>

APPENDIX A: AHIMS SEARCH RESULTS.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : TH222 Tatham Bridges
Client Service ID : 918144

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
04-4-0125	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			

Contact Mr.Lauire Wlison **Recorders** Claude McDermott,Damien Hofmeyer **Permits**

** Site Status
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 08/08/2024 for Tim Hill for the following area at Lat, Long From : -28.9352, 153.1436 - Lat, Long To : -28.9165, 153.1745. Number of Aboriginal sites and Aboriginal objects found is 1

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 1

Appendix G

Flood Impact Assessment

BMT Commercial Australia Pty Ltd
Level 5, 348 Edward Street,
Brisbane, Qld, 4000
Australia

ABN: 54 010 830 421

Our ref: L.A12234.001_Tatham_Bridges_FIA.docx

11 October 2022

Richmond Valley Council
Locked Bag 10
Casino NSW 2470

Attention: Graeme Robertson

Dear Graeme

RE: TATHAM BRIDGES FLOOD IMPACT ASSESSMENT

Introduction

BMT was commissioned by Richmond Valley Council (Council) to prepare a flood impact assessment for the upgrade of two road bridges at Tatham, approximately 13km south-east of Casino in the Richmond Valley. The bridges are both on Casino-Coraki Road and are approximately 100m apart. The northern bridge crosses Shannon Brook (also referred to as Deep Creek) and the southern bridge crosses the smaller Spring Creek. Both Shannon Brook and Spring Creek are tributaries of the Richmond River and respectively join the Richmond River 400m and 800m downstream from the bridges.

The bridge upgrades seek to widen and raise the bridge decks. Each upgrade will result in the removal of the existing bridge and the replacement of that bridge with a new one immediately upstream. The new bridges have greater span lengths and so require less piers within the waterway area.

Figure 1.1 shows the location of the existing and proposed bridges along with the local watercourses.

Model Used

The hydraulic model used for the assessment was the draft Richmond Valley Flood Study TUFLOW model. This model is at a draft stage of development and as such, the design flood levels will be subject to revision. However, it was agreed with Council that the use of the draft model is considered suitable for an impact assessment where the focus is on comparing a base case with a developed case rather than requiring absolute flood levels.

LEGEND

- Proposed Bridges
- Existing Bridges
- Hydrolines
- Cadastral Boundaries

Title:

Existing and Proposed Bridges

Figure: 1-1

Rev: A

N

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Existing Case

The draft Richmond Flood Study model uses TUFLOW's Quadtree feature. This allows for the model resolution to be varied, for example to increase the model resolution in areas of interest. The model developed for Council has areas of higher resolution in urban areas with the finest resolution being 5m and the majority of the modelled floodplain using either a 20m or 40m grid.

The study area is located within part of the floodplain which utilised a 20m model grid. To allow for an improved model representation of the bridges being assessed, the cell size was refined to 5m in the vicinity of the bridge with a 10m domain beyond that before transitioning back to the 20m domain.

Ground survey was supplied for an approximate 750m length of Casino-Coraki Road. This survey captures the existing road geometry and embankments. The survey data has been included in the model and takes precedence over the LiDAR data used to form the base topography in the model. Checks showed that the LiDAR data showed good agreement with the ground survey data.

The TUFLOW model represents bridges using TUFLOW's layered flow constriction feature. This requires specification of the bridge soffit and deck elevations along with the heights of any guard rails. Substructure energy losses (due to bridge piers) are represented in the model using a form loss coefficient. The form loss coefficients are derived using the methods contained in Austroads (2019)[1] and are dependent on the ratio of the waterway area to the area obstructed by bridge piers. Allowances are made for the type of pier (for example circular or blade piers) along with adjustments for skew and eccentricity. For the base case model, the form loss coefficient values used were those determined for the flood study model.

The representation of the two existing bridges (which are being replaced) was checked against supplied bridge drawings. This led to a minor adjustment to one of the existing bridge decks. Ground survey in the vicinity of the study area was also supplied and this was read into the model taking precedence over the ground elevations derived from LiDAR data.

Basic details of the two existing bridges are contained within Table 1.1.

Table 1.1 Existing Bridge Details

Bridge Detail	Shannon Brook Bridge	Spring Creek Bridge
Bridge length (m)	96	36
Bridge deck elevation (mAHD)	8.20 to 8.75	8.36 to 8.69
No. Piers	7	2

Developed Case

A single developed case model was prepared in which the two existing bridges were removed and the two new bridges were represented in the model. Details of the proposed bridge designs were supplied to BMT from Bridge Knowledge Pty Ltd[2] and key bridge details are summarised in Table 1.2.

[1] Austroads (2019) Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures June 2019.
[2] Pages from 220926-1024-BKP225-B001-DRG-COMBINED_100%_CHK.pdf; Pages from 220926-1024-BKP225-B002-DRG-COMBINED_100%_CHK.pdf

The proposed Shannon Brook bridge contains 2 piers and so required a substructure form loss coefficient. This was calculated in accordance with Austroads (2019).

A 3D TIN file was provided to represent the bridge approach embankments. As the proposed bridges are higher and slightly upstream of the existing bridges, the bridge embankments are new features and they have been included in the model.

Table 1.2 Proposed Bridge Details

Bridge Detail	Shannon Brook Bridge	Spring Creek Bridge
Bridge length (m)	96	38
Bridge deck elevation (mAHD)	10	10
No. Piers	2	0

Model Results

The existing and design case models were simulated for the 5% AEP and the 1% AEP regional flood events as defined in the Richmond Valley draft flood study. It is possible that the impacts may be greater for events dominated by catchment runoff from Shannon Brook and Spring Creek i.e with minimal flow on the Richmond River (not assessed in this study). However, the peak flood levels would be significantly lower than those assessed in the current assessment and would not be expected to impact above floor levels at nearby properties.

Changes in peak flood level and peak flood velocity have been mapped (design case minus existing case) and are shown in Figure 1.2 to Figure 1.5. Any peak level change above a threshold of 10mm is shown as a mapped colour.

Figure 1.2 and Figure 1.4 also include the changes in flood level at nearby properties along with a property reference ID.

The peak flood levels in the 5% AEP and 1% AEP events are approximately 11.5mAHD and 12.0mAHD respectively[3]. As such the proposed bridge decks are overtopped in both events. As the bridge and approach embankments are significantly overtopped (by a depth of 2m or more in the 1% AEP event) the bridge is having minimal impact on flood behaviour.

Peak flood level impacts outside of the +/- 10mm threshold are limited to the immediate vicinity of the bridge and embankments. The southern approach embankment to the southern bridge shows minor decreases in peak flood levels in both the 1% and 5% AEP events. This is due to a slight increase in velocity over the raised embankment which consequently decreases the peak level.

There are localised changes in peak velocity near the embankment between the two bridges. This is associated with the updated approach road connections to Perkins Bridge Road and Tomki-Tatham Road. These impacts are mostly contained within the road corridor.

In the 5% AEP event there are small areas where the flood extent has increased. These areas are highly localised and the depth of flooding in these areas is very shallow (less than 10mm).

[3] For historic context, the modelled historic flood levels at the bridges are as follows: January 2008 11.7mAHD, May 2009 11.4mAHD, March/April 2017 10.9mAHD, February/March 2022 12.6mAHD.

The impacts (changes in peak flood level) at surrounding properties along with the flood levels and property floor levels are shown in Table 1.3 and Table 1.4 for the 1% and 5% AEP events respectively. The property ID corresponds to that used in the peak flood level impact figures. It can be seen that the impacts at all properties are minor (no more than 3mm). The floor levels for all properties shown are above the 5% AEP flood level. Only four properties have 1% AEP flood levels above the property floor level.

Table 1.3 1% AEP Flood Levels and Impacts at Properties

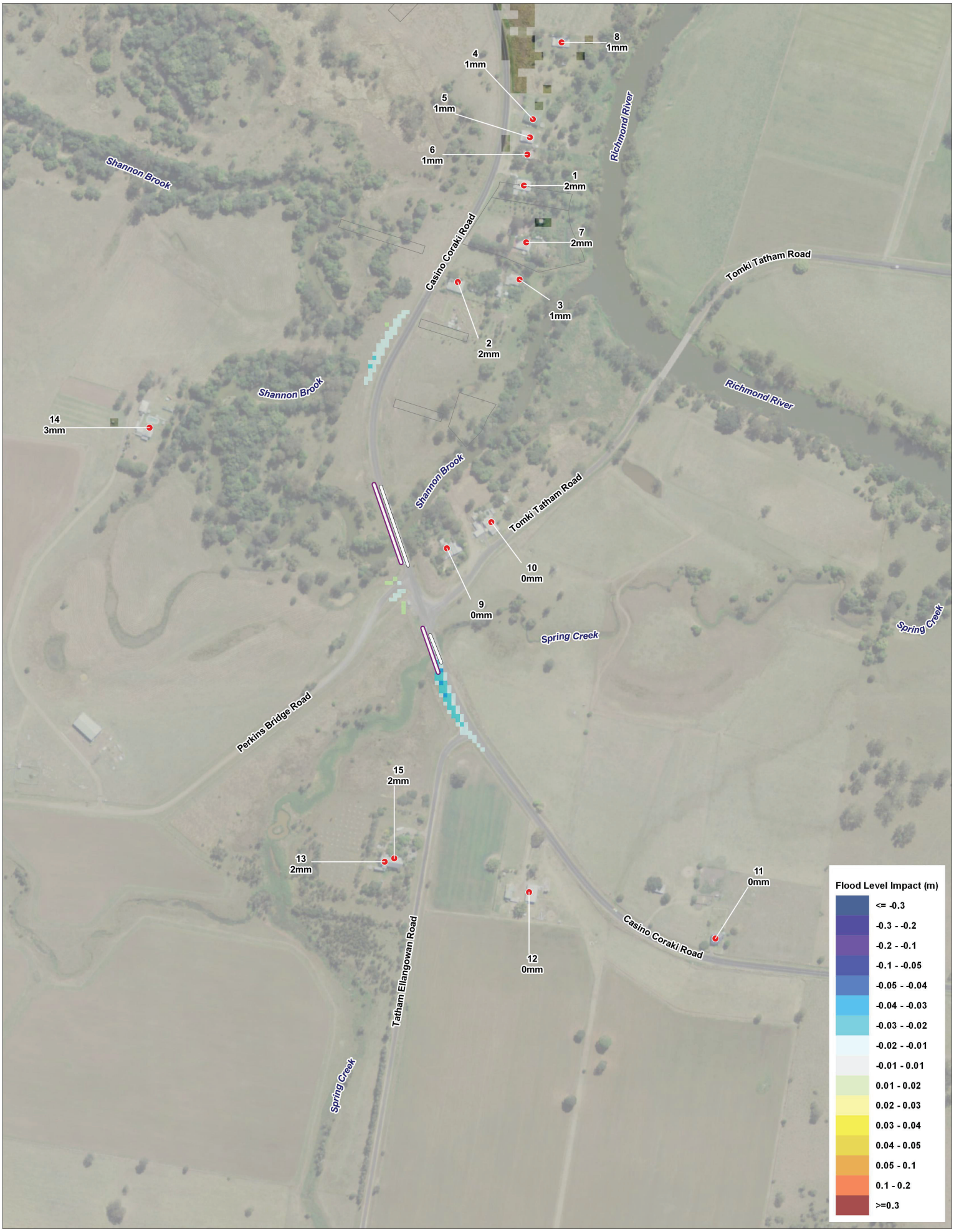
Property ID	Floor Level (mAHD)	1% AEP Existing Case Flood Level (mAHD)	1% AEP Design Case Flood Level (mAHD)	Impact (mm)
1	13.35	12.049	12.051	2
2	12.39	12.045	12.047	2
3	11.64	12.028	12.029	1
4	15.03	12.046	12.047	1
5	12.5	12.047	12.048	1
6	12.81	12.046	12.047	1
7	12.2	12.038	12.039	2
8	12.43	12.054	12.054	1
9	11.48	12.014	12.013	0
10	11.5	12.009	12.008	0
11	12.95	11.999	11.998	0
12	13.31	12.010	12.011	0
13	12.7	12.030	12.032	2
14	11.65	12.046	12.049	3
15	12.7	12.029	12.032	2

Properties and floor levels from Council's database. Note that the peak flood levels may change as the model is finalised.

Table 1.4 5% AEP Flood Levels and Impacts at Properties

Property ID	Floor Level (mAHD)	5% AEP Existing Case Flood Level (mAHD)	5% AEP Design Case Flood Level (mAHD)	Impact (mm)
1	13.35	-	-	-
2	12.39	11.507	11.510	3
3	11.64	11.489	11.491	2
4	15.03	-	-	-
5	12.5	11.529	11.531	1
6	12.81	11.523	11.524	2
7	12.2	-	-	-
8	12.43	-	-	-
9	11.48	11.477	11.477	0
10	11.5	11.482	11.482	0
11	12.95	11.453	11.451	0
12	13.31	11.471	11.471	0
13	12.7	11.487	11.489	2
14	11.65	11.504	11.507	3
15	12.7	11.487	11.489	2

Properties and floor levels from Council's database



LEGEND

- Properties
- Proposed Bridges
- Existing Bridges
- Cadastral Boundaries

Title:

1% AEP Peak Flood Level Impacts

Figure: 1-2

Rev: A

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LEGEND

- Properties
- Proposed Bridges
- Existing Bridges
- Cadastral Boundaries

Title:

1% AEP Peak Flood Velocity Impacts

Figure: 1-3

Rev: A

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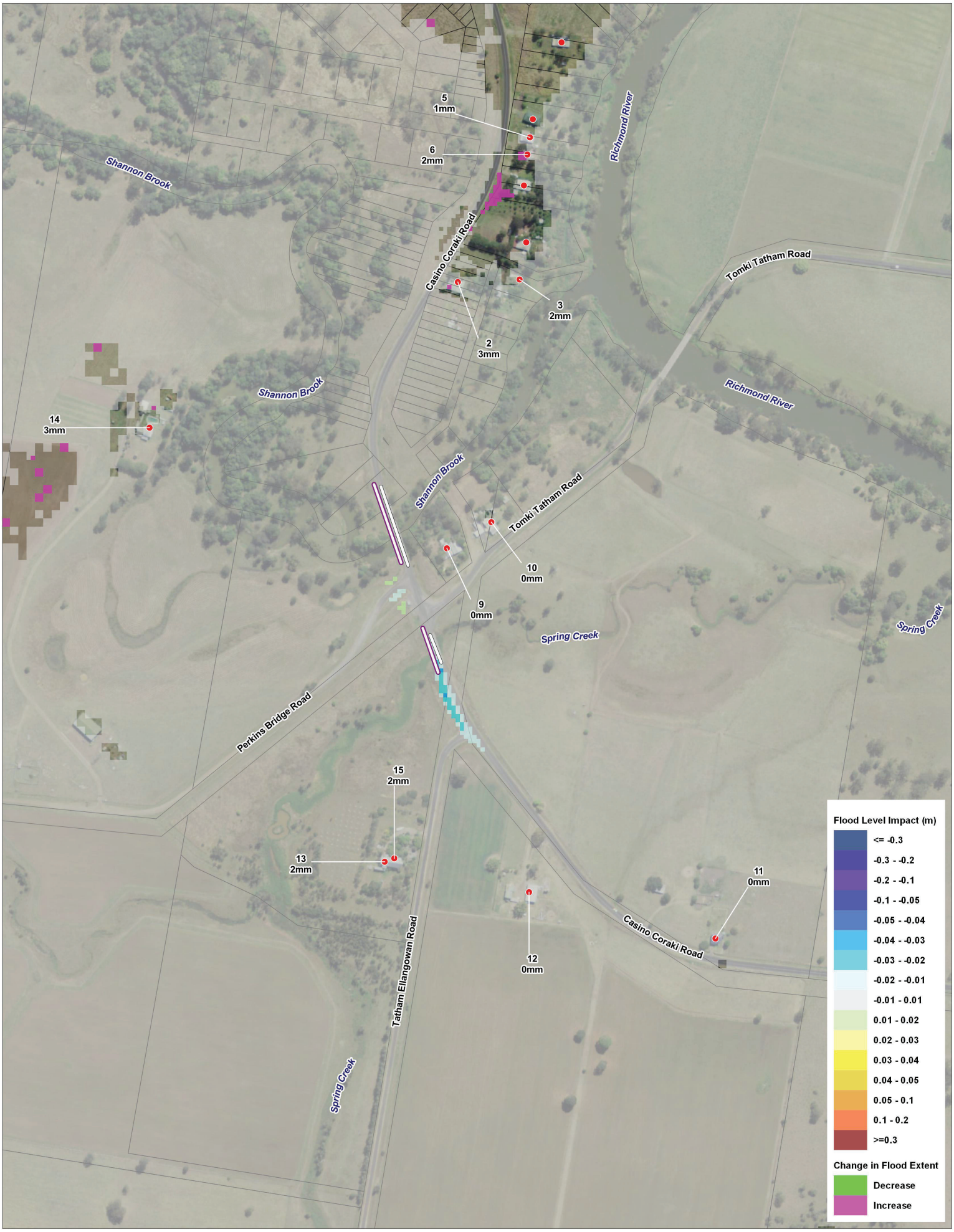

LEGEND

- Properties
- Proposed Bridges
- Existing Bridges
- Cadastral Boundaries

Title:

5% AEP Peak Flood Level Impacts

Figure: 1-4

Rev: A

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LEGEND

- Properties
- Proposed Bridges
- Existing Bridges
- Cadastral Boundaries

Title:

5% AEP Peak Flood Velocity Impacts

Figure: 1-5

Rev: A

N

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www.bmt.org

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Conclusions

The proposed upgrade of two bridges at Tatham along Casino-Coraki Road has been simulated in a modified version of Richmond Valley Council's draft flood study model and the flood impacts have been assessed for the 5% and 1% AEP flood events.

The bridge locations are in close proximity to the Richmond River and so the Richmond River has a significant influence on the flood levels at the bridges.

For both the 5% and 1% AEP events the proposed bridges and approach embankments are overtopped and the resulting flood impacts are shown to be minimal (a maximum impact of 3mm at nearby buildings for the two events assessed).

It is possible that the impacts may be greater for events dominated by catchment runoff from Shannon Brook and Spring Creek i.e with minimal flow on the Richmond River (not assessed in this study). However, the peak flood levels would be significantly lower than those assessed in the current assessment and would not be expected to impact above floor levels at nearby properties.

Impacts may also be greater than those mapped during bridge construction, particularly when the new bridges are near completion and the old bridges have not yet been removed. This should be assessed as the design of the bridges progress.

Yours Sincerely,

BMT

Barry Rodgers
Principal (Flooding)

Appendix H

Contaminated Land Search

Animals & livestock

Beef cattle

Health and disease

Feeding and nutrition

Breeding, selection and genetics

Yards and equipment

Husbandry

Appraisal

Welfare

Business management and market information

Cattle dip site locator

This search retrieved 5 dip sites.

For more information about each dip site, click on the name below.

Dip name	Road	Town/Locality	Council
COWANS	CORAKI ROAD	TATHAM	RICHMOND VALLEY
MCAULIFFES	TATHAM-ELLANGOWAN RD	TATHAM	RICHMOND VALLEY
SEGAERTS	TATHAM GREENRIDGE RD	TATHAM VIA CASINO	RICHMOND VALLEY
TATHAM	TATHAM TOMKI ROAD	TATHAM	RICHMOND VALLEY
TRANTERS	MCMAHONS ROAD	TATHAM VIA CASINO	RICHMOND VALLEY

Search results

Your search for:LGA: RICHMOND VALLEY COUNCIL

Matched 4 notices relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
CASINO	86 Johnston STREET	Casino Roadhouse	4 former

Page 1 of 1

15 August 2024

Search results

Your search for:Suburb: TATHAM

Search Again
Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

15 August 2024

Appendix I

Construction Noise Estimator Results

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3225 Casino Coraki Rd (Receptor 1)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	80

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	80	63

Total SPL $L_{Aeq(15minute)}$ (dBA)	***63***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***23***							
	Day (OOHW)	***23***							
	OOHW Period 1	***28***							
	OOHW Period 2	***33***							
Level above NML (dB(A))	**Standard hours**	***13***	**8**		**8**		**3**		
	Day (OOHW)	***18***	**8**		**8**		**3**		
	OOHW Period 1	***23***			**8**		**3**		
	OOHW Period 2	***28***			**8**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	10 Tatham Ellangowan Rd (Receptor 2)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	135

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	135	57

Total SPL $L_{Aeq(15minute)}$ (dBA)	***57***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***17***							
	Day (OOHW)	***17***							
	OOHW Period 1	***22***							
	OOHW Period 2	***27***							
Level above NML (dB(A))	**Standard hours**	***7***	**2**		**2**				
	Day (OOHW)	***12***	**2**		**2**				
	OOHW Period 1	***17***			**2**				
	OOHW Period 2	***22***			**2**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3265 Casino Coraki Rd (Receptor 4)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	25

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	25	71

Total SPL $L_{Aeq(15minute)}$ (dBA)	***71***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***31***							
	Day (OOHW)	***31***							
	OOHW Period 1	***36***							
	OOHW Period 2	***41***							
Level above NML (dB(A))	**Standard hours**	***21***	**16**	**6**	**16**	**6**	**11**		**1**
	Day (OOHW)	***26***	**16**	**6**	**16**	**6**	**11**		**1**
	OOHW Period 1	***31***		**6**	**16**	**6**	**11**		**1**
	OOHW Period 2	***36***		**6**	**16**				**1**
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**N, V**	**-**	**-**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**-**	**N**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
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10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	920 Tomki Tatham Road (Receptor 5)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	170

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	170	54

Total SPL $L_{Aeq(15minute)}$ (dBA)	***54***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***14***							
	Day (OOHW)	***14***							
	OOHW Period 1	***19***							
	OOHW Period 2	***24***							
Level above NML (dB(A))	**Standard hours**	***4***							
	Day (OOHW)	***9***							
	OOHW Period 1	***14***							
	OOHW Period 2	***19***							
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**-**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
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   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
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   (e) sleep disturbance affected distance for night works.
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   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3300 Casino Coraki Rd (Receptor 7)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	10

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	10	79

Total SPL $L_{Aeq(15minute)}$ (dBA)	***79***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***39***							
	Day (OOHW)	***39***							
	OOHW Period 1	***44***							
	OOHW Period 2	***49***							
Level above NML (dB(A))	**Standard hours**	***29***	**24**	**14**	**24**	**14**	**19**	**4**	**9**
	Day (OOHW)	***34***	**24**	**14**	**24**	**14**	**19**	**4**	**9**
	OOHW Period 1	***39***		**14**	**24**	**14**	**19**	**4**	**9**
	OOHW Period 2	***44***		**14**	**24**			**4**	**9**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**N**	**V, N, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3330 Casino Coraki Rd (Receptor 11)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	50

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	50	66

Total SPL $L_{Aeq(15minute)}$ (dBA)	***66***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***26***							
	Day (OOHW)	***26***							
	OOHW Period 1	***31***							
	OOHW Period 2	***36***							
Level above NML (dB(A))	**Standard hours**	***16***	**11**	**1**	**11**	**1**	**6**		
	Day (OOHW)	***21***	**11**	**1**	**11**	**1**	**6**		
	OOHW Period 1	***26***		**1**	**11**	**1**	**6**		
	OOHW Period 2	***31***		**1**	**11**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3340 Casino Coraki Rd (Receptor 13)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	100

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	100	61

Total SPL $L_{Aeq(15minute)}$ (dBA)	***61***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***21***							
	Day (OOHW)	***21***							
	OOHW Period 1	***26***							
	OOHW Period 2	***31***							
Level above NML (dB(A))	**Standard hours**	***11***	**6**		**6**		**1**		
	Day (OOHW)	***16***	**6**		**6**		**1**		
	OOHW Period 1	***21***			**6**		**1**		
	OOHW Period 2	***26***			**6**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3350 Casino Coraki Rd (Receptor 14)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	125

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	125	58

Total SPL $L_{Aeq(15minute)}$ (dBA)	***58***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***18***							
	Day (OOHW)	***18***							
	OOHW Period 1	***23***							
	OOHW Period 2	***28***							
Level above NML (dB(A))	**Standard hours**	***8***	**3**		**3**				
	Day (OOHW)	***13***	**3**		**3**				
	OOHW Period 1	***18***			**3**				
	OOHW Period 2	***23***			**3**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	50 Perkins Bridge Rd (Receptor 18)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	225

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Paving / asphalting	113	Yes	0	225	51

Total SPL $L_{Aeq(15minute)}$ (dBA)	***51***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***11***							
	Day (OOHW)	***11***							
	OOHW Period 1	***16***							
	OOHW Period 2	***21***							
Level above NML (dB(A))	**Standard hours**	***1***							
	Day (OOHW)	***6***							
	OOHW Period 1	***11***							
	OOHW Period 2	***16***							
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**-**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3225 Casino Coraki Rd (Receptor 1)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	270

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	270	55

Total SPL $L_{Aeq(15minute)}$ (dBA)	***55***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***15***							
	Day (OOHW)	***15***							
	OOHW Period 1	***20***							
	OOHW Period 2	***25***							
Level above NML (dB(A))	**Standard hours**	***5***	**0**		**0**				
	Day (OOHW)	***10***	**0**		**0**				
	OOHW Period 1	***15***			**0**				
	OOHW Period 2	***20***			**0**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**-**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	10 Tatham Ellangowan Rd (Receptor 2)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	220

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	220	58

Total SPL $L_{Aeq(15minute)}$ (dBA)	***58***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***18***							
	Day (OOHW)	***18***							
	OOHW Period 1	***23***							
	OOHW Period 2	***28***							
Level above NML (dB(A))	**Standard hours**	***8***	**3**		**3**				
	Day (OOHW)	***13***	**3**		**3**				
	OOHW Period 1	***18***			**3**				
	OOHW Period 2	***23***			**3**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	930 Tomki Tatham Rd (Receptor 3)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	85

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	85	69

Total SPL $L_{Aeq(15minute)}$ (dBA)	***69***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***29***							
	Day (OOHW)	***29***							
	OOHW Period 1	***34***							
	OOHW Period 2	***39***							
Level above NML (dB(A))	**Standard hours**	***19***	**14**	**4**	**14**	**4**	**9**		
	Day (OOHW)	***24***	**14**	**4**	**14**	**4**	**9**		
	OOHW Period 1	***29***		**4**	**14**	**4**	**9**		
	OOHW Period 2	***34***		**4**	**14**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3265 Casino Coraki Rd (Receptor 4)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	30

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	30	76

Total SPL $L_{Aeq(15minute)}$ (dBA)	***76***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***36***							
	Day (OOHW)	***36***							
	OOHW Period 1	***41***							
	OOHW Period 2	***46***							
Level above NML (dB(A))	**Standard hours**	***26***	**21**	**11**	**21**	**11**	**16**	**1**	**6**
	Day (OOHW)	***31***	**21**	**11**	**21**	**11**	**16**	**1**	**6**
	OOHW Period 1	***36***		**11**	**21**	**11**	**16**	**1**	**6**
	OOHW Period 2	***41***		**11**	**21**			**1**	**6**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**N**	**V, N, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	920 Tomki Tatham Rd (Receptor 5)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	160

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	160	62

Total SPL $L_{Aeq(15minute)}$ (dBA)	***62***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***22***							
	Day (OOHW)	***22***							
	OOHW Period 1	***27***							
	OOHW Period 2	***32***							
Level above NML (dB(A))	**Standard hours**	***12***	**7**		**7**		**2**		
	Day (OOHW)	***17***	**7**		**7**		**2**		
	OOHW Period 1	***22***			**7**		**2**		
	OOHW Period 2	***27***			**7**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
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10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
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   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3290 Casino Coraki Road (Receptor 6)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	205

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	205	59

Total SPL $L_{Aeq(15minute)}$ (dBA)	***59***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***19***							
	Day (OOHW)	***19***							
	OOHW Period 1	***24***							
	OOHW Period 2	***29***							
Level above NML (dB(A))	**Standard hours**	***9***	**4**		**4**				
	Day (OOHW)	***14***	**4**		**4**				
	OOHW Period 1	***19***			**4**				
	OOHW Period 2	***24***			**4**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	50 Perkins Bridge Rd (Receptor 18)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	270

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Bridge works	120	Yes	0	270	55

Total SPL $L_{Aeq(15minute)}$ (dBA)	***55***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***15***							
	Day (OOHW)	***15***							
	OOHW Period 1	***20***							
	OOHW Period 2	***25***							
Level above NML (dB(A))	**Standard hours**	***5***	**0**		**0**				
	Day (OOHW)	***10***	**0**		**0**				
	OOHW Period 1	***15***			**0**				
	OOHW Period 2	***20***			**0**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**-**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3225 Casino Coraki Rd (Receptor 1)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	80

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	80	71

Total SPL $L_{Aeq(15minute)}$ (dBA)	***71***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***31***							
	Day (OOHW)	***31***							
	OOHW Period 1	***36***							
	OOHW Period 2	***41***							
Level above NML (dB(A))	**Standard hours**	***21***	**16**	**6**	**16**	**6**	**11**		**1**
	Day (OOHW)	***26***	**16**	**6**	**16**	**6**	**11**		**1**
	OOHW Period 1	***31***		**6**	**16**	**6**	**11**		**1**
	OOHW Period 2	***36***		**6**	**16**				**1**
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**N, V**	**-**	**-**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**-**	**N**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

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Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	10 Tatham Ellangowan Rd (Receptor 2)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	135

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	135	65

Total SPL $L_{Aeq(15minute)}$ (dBA)	***65***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***25***							
	Day (OOHW)	***25***							
	OOHW Period 1	***30***							
	OOHW Period 2	***35***							
Level above NML (dB(A))	**Standard hours**	***15***	**10**	**0**	**10**	**0**	**5**		
	Day (OOHW)	***20***	**10**	**0**	**10**	**0**	**5**		
	OOHW Period 1	***25***		**0**	**10**	**0**	**5**		
	OOHW Period 2	***30***		**0**	**10**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

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Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3265 Casino Coraki Rd (Receptor 4)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	25

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	25	79

Total SPL $L_{Aeq(15minute)}$ (dBA)	***79***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***39***							
	Day (OOHW)	***39***							
	OOHW Period 1	***44***							
	OOHW Period 2	***49***							
Level above NML (dB(A))	**Standard hours**	***29***	**24**	**14**	**24**	**14**	**19**	**4**	**9**
	Day (OOHW)	***34***	**24**	**14**	**24**	**14**	**19**	**4**	**9**
	OOHW Period 1	***39***		**14**	**24**	**14**	**19**	**4**	**9**
	OOHW Period 2	***44***		**14**	**24**			**4**	**9**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**N**	**V, N, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	920 Tomki Tatham Road (Receptor 5)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	170

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	170	62

Total SPL $L_{Aeq(15minute)}$ (dBA)	***62***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***22***							
	Day (OOHW)	***22***							
	OOHW Period 1	***27***							
	OOHW Period 2	***32***							
Level above NML (dB(A))	**Standard hours**	***12***	**7**		**7**		**2**		
	Day (OOHW)	***17***	**7**		**7**		**2**		
	OOHW Period 1	***22***			**7**		**2**		
	OOHW Period 2	***27***			**7**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3300 Casino Coraki Rd (Receptor 7)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	10

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	10	87

Total SPL $L_{Aeq(15minute)}$ (dBA)	***87***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***47***							
	Day (OOHW)	***47***							
	OOHW Period 1	***52***							
	OOHW Period 2	***57***							
Level above NML (dB(A))	**Standard hours**	***37***	**32**	**22**	**32**	**22**	**27**	**12**	**17**
	Day (OOHW)	***42***	**32**	**22**	**32**	**22**	**27**	**12**	**17**
	OOHW Period 1	***47***		**22**	**32**	**22**	**27**	**12**	**17**
	OOHW Period 2	***52***		**22**	**32**			**12**	**17**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**N, R1, DR**	**V,N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**N, R1, DR**	**V,N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, IB, N, PC, SN, R2, DR**	**AA, V, IB, N, PC, SN, R2, DR**			**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3330 Casino Coraki Rd (Receptor 11)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	50

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	50	74

Total SPL $L_{Aeq(15minute)}$ (dBA)	***74***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***34***							
	Day (OOHW)	***34***							
	OOHW Period 1	***39***							
	OOHW Period 2	***44***							
Level above NML (dB(A))	**Standard hours**	***24***	**19**	**9**	**19**	**9**	**14**		**4**
	Day (OOHW)	***29***	**19**	**9**	**19**	**9**	**14**		**4**
	OOHW Period 1	***34***		**9**	**19**	**9**	**14**		**4**
	OOHW Period 2	***39***		**9**	**19**				**4**
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**N, V**	**-**	**-**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**-**	**N**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3340 Casino Coraki Rd (Receptor 13)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	100

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	100	69

Total SPL $L_{Aeq(15minute)}$ (dBA)	***69***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***29***							
	Day (OOHW)	***29***							
	OOHW Period 1	***34***							
	OOHW Period 2	***39***							
Level above NML (dB(A))	**Standard hours**	***19***	**14**	**4**	**14**	**4**	**9**		
	Day (OOHW)	***24***	**14**	**4**	**14**	**4**	**9**		
	OOHW Period 1	***29***		**4**	**14**	**4**	**9**		
	OOHW Period 2	***34***		**4**	**14**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3350 Casino Coraki Rd (Receptor 14)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	125

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	125	66

Total SPL $L_{Aeq(15minute)}$ (dBA)	***66***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***26***							
	Day (OOHW)	***26***							
	OOHW Period 1	***31***							
	OOHW Period 2	***36***							
Level above NML (dB(A))	**Standard hours**	***16***	**11**	**1**	**11**	**1**	**6**		
	Day (OOHW)	***21***	**11**	**1**	**11**	**1**	**6**		
	OOHW Period 1	***26***		**1**	**11**	**1**	**6**		
	OOHW Period 2	***31***		**1**	**11**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	50 Perkins Bridge Rd (Receptor 18)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	225

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Corridor clearing	121	Yes	0	225	59

Total SPL $L_{Aeq(15minute)}$ (dBA)	***59***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***19***							
	Day (OOHW)	***19***							
	OOHW Period 1	***24***							
	OOHW Period 2	***29***							
Level above NML (dB(A))	**Standard hours**	***9***	**4**		**4**				
	Day (OOHW)	***14***	**4**		**4**				
	OOHW Period 1	***19***			**4**				
	OOHW Period 2	***24***			**4**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3225 Casino Coraki Rd (Receptor 1)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	50

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Compound operation	114	Yes	0	50	67

Total SPL $L_{Aeq(15minute)}$ (dBA)	***67***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***27***							
	Day (OOHW)	***27***							
	OOHW Period 1	***32***							
	OOHW Period 2	***37***							
Level above NML (dB(A))	**Standard hours**	***17***	**12**	**2**	**12**	**2**	**7**		
	Day (OOHW)	***22***	**12**	**2**	**12**	**2**	**7**		
	OOHW Period 1	***27***		**2**	**12**	**2**	**7**		
	OOHW Period 2	***32***		**2**	**12**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	10 Tatham Ellangowan Rd (Receptor 2)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	150

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Compound operation	114	Yes	0	150	57

Total SPL $L_{Aeq(15minute)}$ (dBA)	***57***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***17***							
	Day (OOHW)	***17***							
	OOHW Period 1	***22***							
	OOHW Period 2	***27***							
Level above NML (dB(A))	**Standard hours**	***7***	**2**		**2**				
	Day (OOHW)	***12***	**2**		**2**				
	OOHW Period 1	***17***			**2**				
	OOHW Period 2	***22***			**2**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3225 Casino Coraki Rd (Receptor 1)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	80

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	80	70

Total SPL $L_{Aeq(15minute)}$ (dBA)	***70***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***30***							
	Day (OOHW)	***30***							
	OOHW Period 1	***35***							
	OOHW Period 2	***40***							
Level above NML (dB(A))	**Standard hours**	***20***	**15**	**5**	**15**	**5**	**10**		**0**
	Day (OOHW)	***25***	**15**	**5**	**15**	**5**	**10**		**0**
	OOHW Period 1	***30***		**5**	**15**	**5**	**10**		**0**
	OOHW Period 2	***35***		**5**	**15**				**0**
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**N, V**	**-**	**-**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
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   (c) noise management levels .
   (d) predicted noise levels for each time period.
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(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	10 Tatham Ellangowan Rd (Receptor 2)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	135

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	135	64

Total SPL $L_{Aeq(15minute)}$ (dBA)	***64***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***24***							
	Day (OOHW)	***24***							
	OOHW Period 1	***29***							
	OOHW Period 2	***34***							
Level above NML (dB(A))	**Standard hours**	***14***	**9**		**9**		**4**		
	Day (OOHW)	***19***	**9**		**9**		**4**		
	OOHW Period 1	***24***			**9**		**4**		
	OOHW Period 2	***29***			**9**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3265 Casino Coraki Rd (Receptor 4)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	25

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	25	78

Total SPL $L_{Aeq(15minute)}$ (dBA)	***78***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***38***							
	Day (OOHW)	***38***							
	OOHW Period 1	***43***							
	OOHW Period 2	***48***							
Level above NML (dB(A))	**Standard hours**	***28***	**23**	**13**	**23**	**13**	**18**	**3**	**8**
	Day (OOHW)	***33***	**23**	**13**	**23**	**13**	**18**	**3**	**8**
	OOHW Period 1	***38***		**13**	**23**	**13**	**18**	**3**	**8**
	OOHW Period 2	***43***		**13**	**23**			**3**	**8**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**-**	**N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**N**	**V, N, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	920 Tomki Tatham Road (Receptor 5)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	170

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	170	61

Total SPL $L_{Aeq(15minute)}$ (dBA)	***61***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***21***							
	Day (OOHW)	***21***							
	OOHW Period 1	***26***							
	OOHW Period 2	***31***							
Level above NML (dB(A))	**Standard hours**	***11***	**6**		**6**		**1**		
	Day (OOHW)	***16***	**6**		**6**		**1**		
	OOHW Period 1	***21***			**6**		**1**		
	OOHW Period 2	***26***			**6**				
Additional mitigation measures	**Standard Hours**	***N, V***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**N, R1, DR**	**-**	**-**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3300 Casino Coraki Rd (Receptor 7)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	10

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	10	86

Total SPL $L_{Aeq(15minute)}$ (dBA)	***86***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***46***							
	Day (OOHW)	***46***							
	OOHW Period 1	***51***							
	OOHW Period 2	***56***							
Level above NML (dB(A))	**Standard hours**	***36***	**31**	**21**	**31**	**21**	**26**	**11**	**16**
	Day (OOHW)	***41***	**31**	**21**	**31**	**21**	**26**	**11**	**16**
	OOHW Period 1	***46***		**21**	**31**	**21**	**26**	**11**	**16**
	OOHW Period 2	***51***		**21**	**31**			**11**	**16**
Additional mitigation measures	**Standard Hours**	***N, V, PC, RO***	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**	**N, V, PC, RO**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**N, R1, DR**	**V,N, R1, DR**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**V,N, R1, DR**	**V, IB, N, R1, DR, PC, SN**	**N, R1, DR**	**V,N, R1, DR**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, IB, N, PC, SN, R2, DR**	**AA, V, IB, N, PC, SN, R2, DR**			**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

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Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3330 Casino Coraki Rd (Receptor 11)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	50

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	50	73

Total SPL $L_{Aeq(15minute)}$ (dBA)	***73***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***33***							
	Day (OOHW)	***33***							
	OOHW Period 1	***38***							
	OOHW Period 2	***43***							
Level above NML (dB(A))	**Standard hours**	***23***	**18**	**8**	**18**	**8**	**13**		**3**
	Day (OOHW)	***28***	**18**	**8**	**18**	**8**	**13**		**3**
	OOHW Period 1	***33***		**8**	**18**	**8**	**13**		**3**
	OOHW Period 2	***38***		**8**	**18**				**3**
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**N, V**	**-**	**-**
	Day (OOHW)	***V, IB, N, R1, DR, PC, SN***	**V,N, R1, DR**	**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**N, R1, DR**	**V,N, R1, DR**	**N, R1, DR**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**V, N, R2, DR**	**V, IB, N, PC, SN, R2, DR**			**-**	**N**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3340 Casino Coraki Rd (Receptor 13)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	100

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	100	68

Total SPL $L_{Aeq(15minute)}$ (dBA)	***68***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***28***							
	Day (OOHW)	***28***							
	OOHW Period 1	***33***							
	OOHW Period 2	***38***							
Level above NML (dB(A))	**Standard hours**	***18***	**13**	**3**	**13**	**3**	**8**		
	Day (OOHW)	***23***	**13**	**3**	**13**	**3**	**8**		
	OOHW Period 1	***28***		**3**	**13**	**3**	**8**		
	OOHW Period 2	***33***		**3**	**13**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**N**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
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   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	3350 Casino Coraki Rd (Receptor 14)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	125

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	125	65

Total SPL $L_{Aeq(15minute)}$ (dBA)	***65***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***25***							
	Day (OOHW)	***25***							
	OOHW Period 1	***30***							
	OOHW Period 2	***35***							
Level above NML (dB(A))	**Standard hours**	***15***	**10**	**0**	**10**	**0**	**5**		
	Day (OOHW)	***20***	**10**	**0**	**10**	**0**	**5**		
	OOHW Period 1	***25***		**0**	**10**	**0**	**5**		
	OOHW Period 2	***30***		**0**	**10**				
Additional mitigation measures	**Standard Hours**	***N, V***	**N, V**	**-**	**N, V**	**-**	**-**	**-**	**-**
	Day (OOHW)	***V, N, R1, DR***	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 1	***V, IB, N, R1, DR, PC, SN***		**-**	**N, R1, DR**	**-**	**N, R1, DR**	**-**	**-**
	OOHW Period 2	***AA, V, IB, N, PC, SN, R2, DR***		**-**	**V, N, R2, DR**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Transport for NSW

Noise Estimator (Scenario)

Steps:
1. Enter project name (cell C9).
2. Enter scenario name (cell C10).
3. Enter receiver address (cell C11).
4. Select area ground type (cell C12) - water, undeveloped green fields (e.g. rural areas with isolated dwellings) or developed settlements (e.g. urban and suburban areas)
5. Select type of background noise level input - Reprentative noise environment (to make assumptions) or user input (where noise monitoring data is available):
   (a) where representative noise environment is selected - select the appropriate noise area category (cell C16). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
   (b) where user input is selected - enter the measured background noise level for each time period (cells D17 to D19).
6. Enter the representative distance in cell C24.
7. Select scenario from the drop-down list in cells A27.
   (a) is there line of sight to receiver? Select from drop down list in cells F27. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
8. Identify the level above background and/or noise mangement level (see rows 36 to 41).
9. Identify and implement standard mitigation measures where feasible and reasonble. Include any shileiding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
10. Identify and implement feasible and reasonable additional mitigation measures (see rows 42 to 44).
11. Document a summary report detailing:
   (a) project description (including location, duration, hours of work, construction methodology, plant , potentially impacted receivers, etc.).
   (b) background noise levels.
   (c) noise management levels .
   (d) predicted noise levels for each time period.
   (e) sleep disturbance affected distance for night works.
   (f) mitigation measures.
   (g) team member responsible for implementing mitigation measures and managing noise and vibration.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project

Please input information into yellow cells
Please pick from drop-down list in orange cells

Project name	5060 Tathum Bridges
Scenario name	Bridge Construction
Receiver address	50 Perkins Bridge Rd (Receptor 18)
Select area ground type	Undeveloped green fields (rural areas with isolated dwellings)
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or L_{A90} Background level (dB(A))	**Day**	40	
	Evening	35	
	Night	30	
$L_{Aeq(15minute)}$ Noise mangement level (dB(A))	**Day**	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Representative distance (m)	225

Scenario	SWL L_{Aeq} (dB(A))	Is there line of sight to receiver?	Shielding correction (dB(A))	Distance used in calculation (m)	Contribution SPL (dB(A))
Local road works	120	Yes	0	225	58

Total SPL $L_{Aeq(15minute)}$ (dBA)	***58***

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	**Hospital wards and operating theatres**	**Place of worship**	**Active recreation**	**Passive recreation**	**Industrial premise**	**Offices, retail outlets**
Noise Management Level (dB(A))	**Standard hours**	***50***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	Day (OOHW)	***45***	**55**	**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 1	***40***		**65**	**55**	**65**	**60**	**75**	**70**
	OOHW Period 2	***35***		**65**	**55**			**75**	**70**
Level above background (dB(A))	**Standard hours**	***18***							
	Day (OOHW)	***18***							
	OOHW Period 1	***23***							
	OOHW Period 2	***28***							
Level above NML (dB(A))	**Standard hours**	***8***	**3**		**3**				
	Day (OOHW)	***13***	**3**		**3**				
	OOHW Period 1	***18***			**3**				
	OOHW Period 2	***23***			**3**				
Additional mitigation measures	**Standard Hours**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Day (OOHW)	***N, R1, DR***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 1	***V, N, R1, DR***		**-**	**-**	**-**	**-**	**-**	**-**
	OOHW Period 2	***V, IB, N, PC, SN, R2, DR***		**-**	**N**			**-**	**-**

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Appendix J

Design Report

Replacement of Deep Creek and Spring Gully Bridges

Design Report

October 2022

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ENGINEERING CONSULTING SERVICES

Bridge Knowledge Pty Ltd

Replacement of Deep Creek and Spring Gully Bridges

Design Report

10 October 2022

Revision	Document status	Date	Prepared by	Reviewed by
V1.0	Concept Design	20/05/2022	Amritpal Singh	Craig Riley
V1.1	Detail Design	10/10/2022	Amritpal Singh	Craig Riley

Prepared by Bridge Knowledge
Project: BKP225
Report Ref: BKP225-RVC-ST-RPT-01

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ENGINEERING CONSULTING SERVICES

Executive Summary

Deep Creek and Spring Gully bridges are located on Casino-Coraki Road, Tatham, and provide local access to the rural region. Council intends to replace the existing bridges due to their current condition.

The new structures are anticipated to be constructed offline to the existing bridges so they can be used as temporary crossings during construction. It is proposed that the new structures will comprise Super T girders (T5) with a width of 8.4 m between barriers to accommodate two traffic lanes. Deep Creek bridge is proposed to be three 38 spans totalling 114 m and Spring Gully bridge is proposed to be a single span of 38m. It should be noted that Deep Creek bridge will be replaced before Spring Gully bridge and a temporary alignment will be in place until Spring Gully bridge is replaced.

Based on the geotechnical investigation reports (RGS32900.1-AC and RGS32900.1-AB issued 31 January 2022) by Regional Geotechnical Solutions (RGS) the most suitable and cost-effective foundation option is driven steel tube piles with a reinforced concrete shaft. Bored concrete piles can also be used but the cost to socket into the very deep rock layer was deemed quite significant compared to driven steel tubes.

For simplicity in design and construction, both bridges have been designed and detailed to be nearly identical where possible. This is because both bridges are utilising the same Super T girders (both 38m spans) and the ground conditions are very similar (due to the proximity of the bridges to each other) so the piling solution is almost the same as well.

It should be noted that Council is undertaking their own hydraulic assessment of the bridge sites and it is not yet complete, so flood loads, and scour have not been assessed in this stage of the design. Therefore, this design is subject to change upon receipt of the hydraulic assessment.

Detailed drawings have been supplied with this report for Council review and feedback. Feedback provided by Council will be incorporated into the final submission of the project. This document outlines the basis of the design.

Contents

Appendices

1 Introduction

1.1 Background

Deep Creek and Spring Gully bridges on Casino-Coraki Road over Shannon Brook and Spring Creek respectively are currently Doolan Deck type bridges (timber girders composite with a concrete deck). Richmond Valley Council (Council) has engaged Bridge Knowledge to provide a detailed design for the replacement of these bridges due to concerns over the remaining serviceable life.

Deep Creek is 8 spans with an overall length of approximately 96 m and Spring Gully is 3 spans with an overall length of approximately 36 m. Both bridges have a width between barriers of approximately 7.2 m.

The bridges are in poor condition, the speed limit has been reduced to 60 km/hr from 100 km/hr and are scheduled for replacement with a complete concrete structure. More information on the condition and deterioration of the bridges can be found in report BKP158.R2.V1.2.

1.2 Location

Deep Creek and Spring Gully bridges are located on Casino-Coraki Road crossing Shannon Brook and Spring Gully respectively, approximately 15 km southeast of Casino (-28.926956, 153.157878) and 12 minutes by car. The location of the bridges is shown in Figure 1.

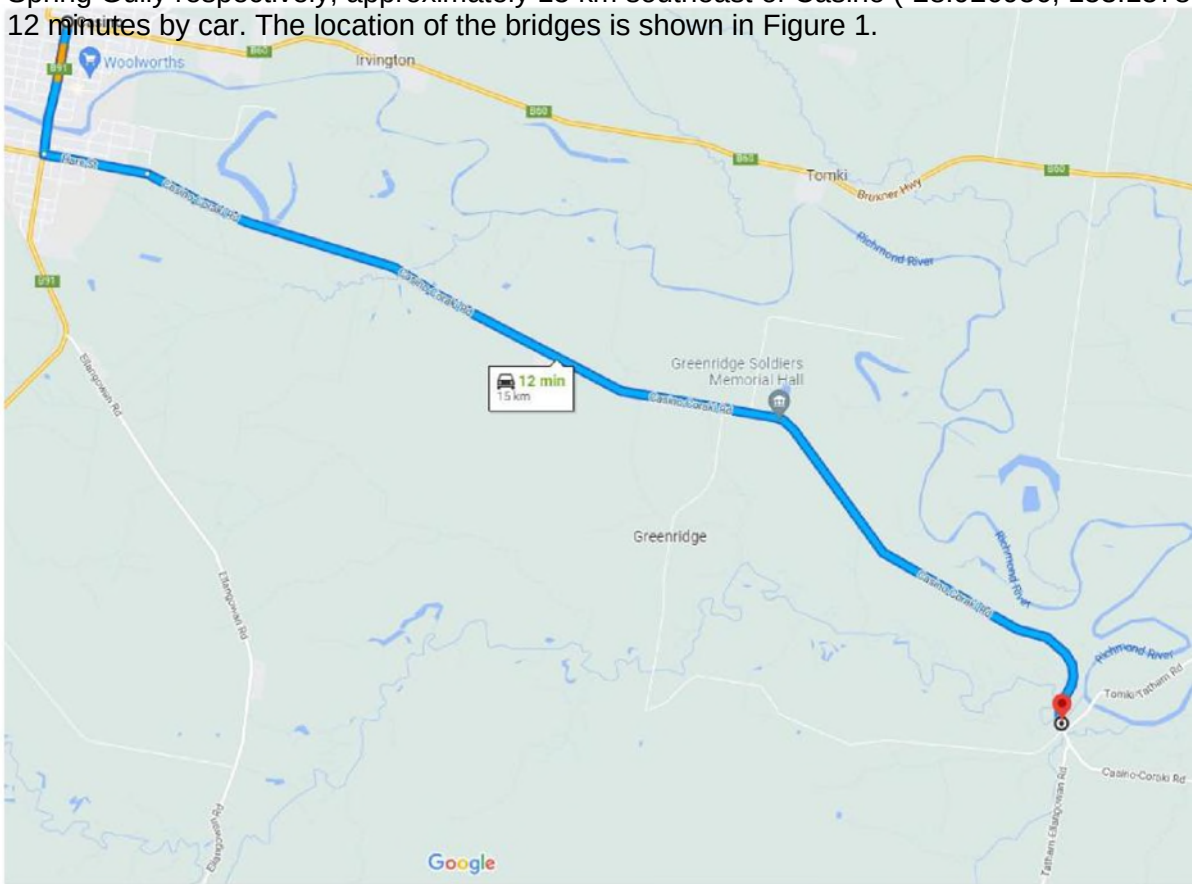


Figure 1: Location of bridges

2 Design Criteria and Constraints

2.1 Design Standards

The design has been based on the following standards and publications:

- AS5100:2017 – Bridge Design Suite
- AS1170 – Structural design actions
- AS2159:2009 – Piling Design and Installation
- Austroads Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures (2018)

2.2 Bridge Design Criteria

For design purposes, a design criterion was developed and is outlined in Table 1.

Table 1: Bridge design criteria

Element	Key Criteria	Reference
Design Life	100 Years	AS 5100.1:2017 Section 8.2
AADT	1343 (30% HV)	Council Data
Design Speed	100 km/hr	Council
Design vehicle loads	SM1600	AS 5100.2:2017 Section 7
Bridge width	8.4 m between barriers (3.2 m lane, 1 m shoulders)	AS 5100.1: 2017 Section 13
Vertical Alignment	Deck level 10.0 m for Deep Creek Bridge and 9.7 m for Spring Gully Bridge.	Maintains existing girder soffit level.
Horizontal Alignment	West of the existing bridge	Council
Longitudinal grade	Level	Minimum Drainage
Cross fall	3% one way	Road Design
Barrier Performance	Regular Performance Barrier	Refer to this report Section 2.4
Durability	Superstructure: B1 Substructure: Non-aggressive to steel elements	AS 5100.5:2017 AS 2159: 2009
Hydraulics	ULS = 1:2000 yr. SLS = 1:50 yr. Awaiting Council's hydraulic study	AS 5100.1:2017 Section 11
Wind	Region B Terrain Category: 2 V_{2000} = 63m/s V_{20}=38 m/s	AS1170.2
Earthquake	BEDC-1 (single span) BEDC-2 (multiple spans)	AS1170.4

Element	Key Criteria	Reference
	Soil class C_e Z = 0.08 k_p = 1.0	

2.3 Utilities

Dial Before You Dig (DBYD), and survey indicate that there are multiple utilities in the project footprint. These include overhead power lines, Telstra communication lines and minor culverts. These will likely need to be relocated during the construction of the two bridges. DBYD plans are provided in Appendix B.

2.4 Environmental

A Review of Environmental Factors (REF) may be required and will need to be arranged by Richmond Valley Council. The Department of Primary Industries will also need to be consulted and a fisheries permit issued.

2.5 Construction

At this 100% design stage there have been some key construction issues identified that will need to be considered as the design progresses:

- A 38 m span Super T weighs approximately 71 tonnes and will require a crane weighing approximately 450 tonnes. This is a substantial lifting operation that will require an engineered crane platform of around 12 m x 12 m. However, there does appear to be plenty of access and space available on the northern bank of Deep Creek bridge.
- The existing bridge is in relatively poor condition and deflects significantly under normal traffic loads. The use of the existing bridge during construction will be limited and the transport of girders and cranes will need to be carefully considered.
- There are overhead wires directly over the top of the proposed alignment. These will need to be relocated.
- The geotechnical profile contains very deep sands requiring lengthy piles which will have an impact on piling rig sizes and time on site.

3 Bridge Design

3.1 Introduction

This section provides design information relating to the bridge design. The design has utilised Super T girders as the superstructure. Based on the geotechnical properties at the site, driven steel piles are the preferred foundation system. In situ concrete abutments have been nominated to allow for easy integration into the driven piles.

3.2 Bridge description

The superstructure utilises 4 prestressed 1815 deep Super T girders, 3 spans long 2x38m and 1 span at 20m. A 180 mm thick insitu concrete deck will span between the girders. The bridge structure is permitted to rotate on elastomeric bearings, which are supported by concrete abutments on driven piles. To prevent the superstructure from dislodging laterally off the substructure during flood events, concrete lateral restraint blocks are proposed which will butt up against the girders. Steel brackets will also be installed to prevent movement vertically upwards. Wingwalls are required to contain the batter slope and provide scour protection to the road approach. A typical section of the abutments is shown in Figure 2.

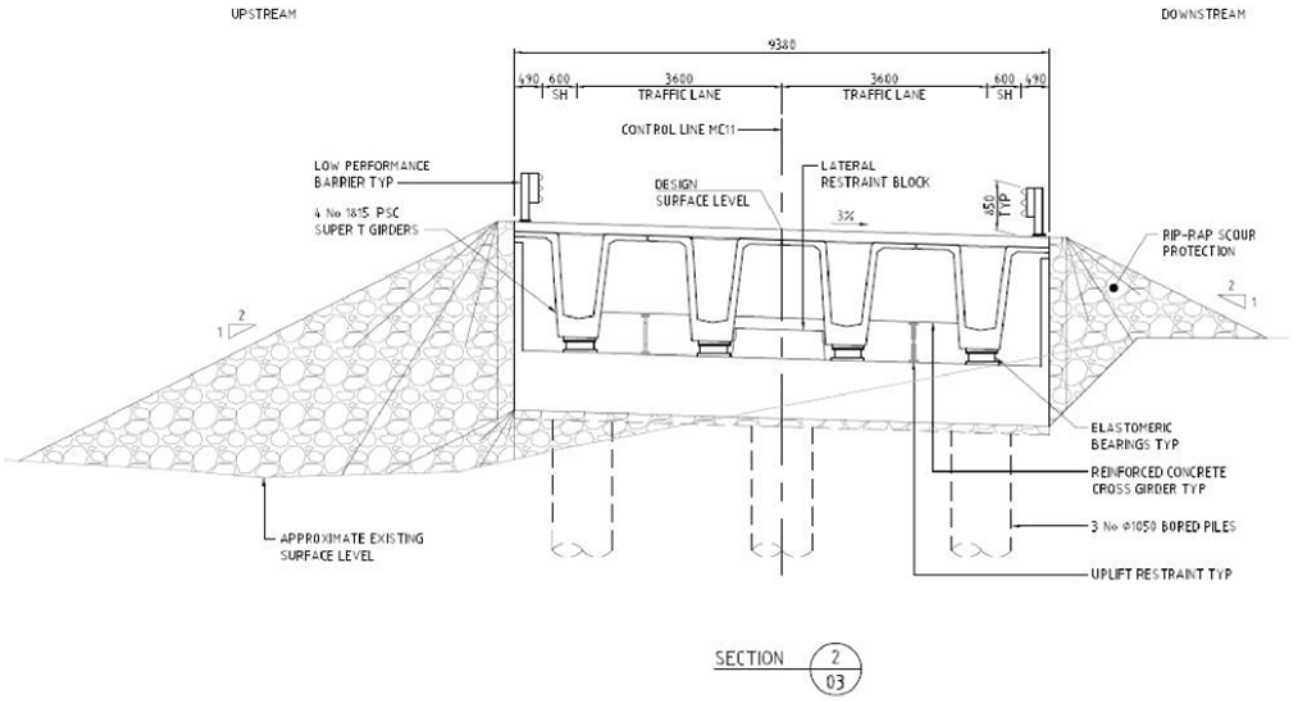


Figure 2: Typical cross-section at the abutment

3.2.1 Pier

Deep Creek bridge consists of 3 spans with two piers. The piles are arranged to be driven on the creek bank to avoid construction in the water. A pile/column extension is designed in this structure to provide ease of constructability when installing the piles.

3.2.2 Barriers

An assessment according to AS 5100.1 Section 14 would require regular performance (TL4) barriers due to the height of the bridges, medium occupancy land use and the expected traffic volumes.

3.3 Hydraulics and Scour

No hydraulic information at the bridge sites is currently available. Hydraulic loads and calculations are being calculated by others and will need to be confirmed once available.

3.4 Design Loads

3.4.1 Dead Load

Dead loads for the structure self-weight were based on dimensions and typical densities (25 kN/m^3 for reinforced concrete).

3.4.2 Traffic Load

Traffic loading for the structure included SM1600 loading. SM1600 loading is specified over a 3.2 m design lane. Traffic loading was determined using finite element analysis with design lanes positioned laterally to produce the worst effects for piers and abutments as per AS5100.2. The design actions from the design vehicles were determined by moving load analysis. The critical position of the M1600 load for the pier and abutment is shown in

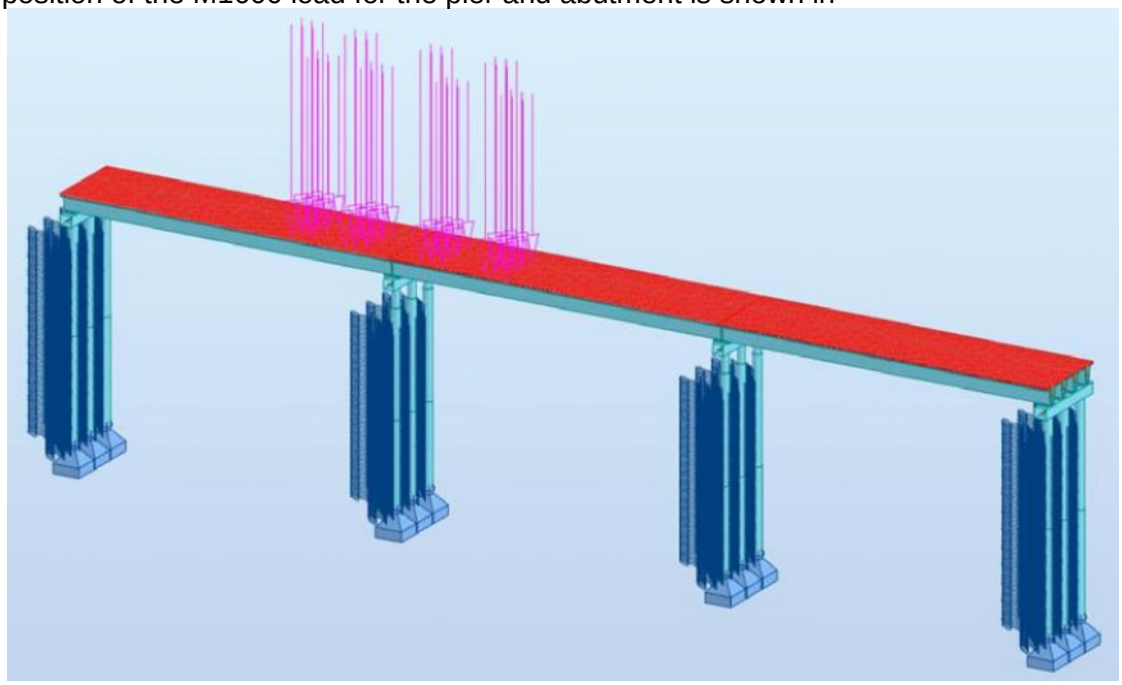


Figure *3* and Figure 4 respectively.

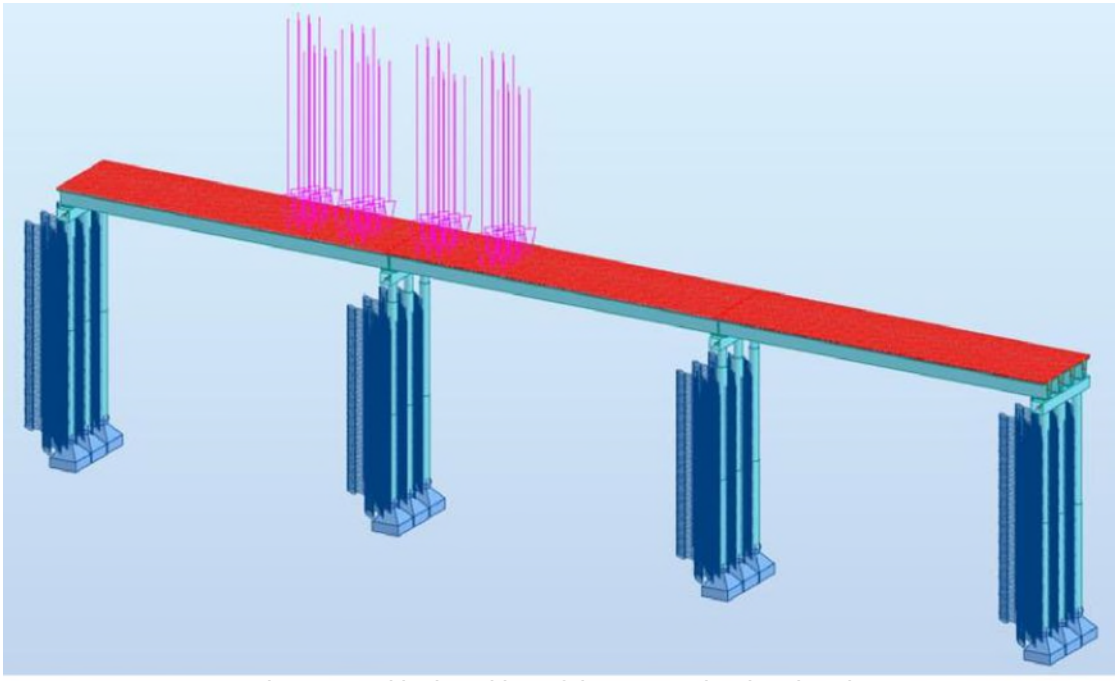


Figure 3: Critical position of the M1600 load at the pier

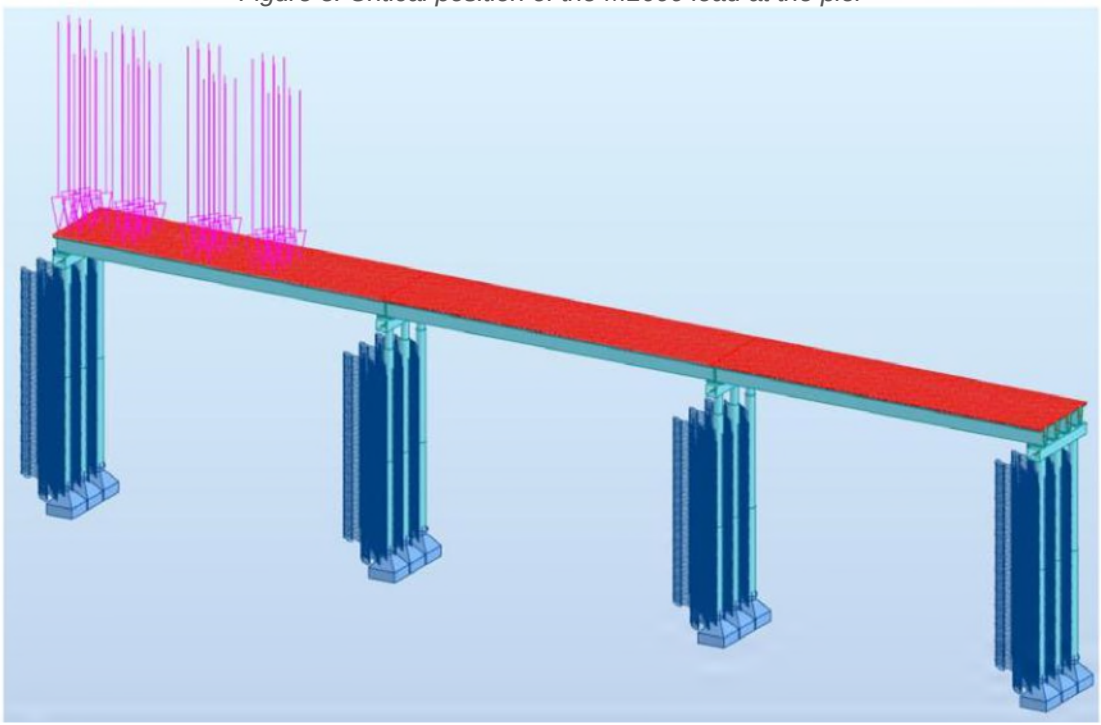


Figure 4: Critical position of the M1600 load at the abutments

3.4.3 Shrinkage and Creep Effects

Total shrinkage effects are considered stabilised at 30 years. The maximum unfactored deflection from shrinkage and creep is anticipated to be 3 mm and 8 mm respectively at each abutment/pier. It is assumed that the girders are landed on the bearings with an age of concrete of 28 days.

3.4.4 Thermal Expansion

Thermal expansion was determined from a thermal coefficient of 10 x 10^{-6} /°C and assuming a construction temperature of 20 degrees. In a temperate inland region less than 1000 m above sea level this results in a temperature range of +29°C to -17°C as per AS 5100.2 Section 18. This temperature range results in an unfactored displacement of +6 mm to -3 mm at each abutment/pier.

3.4.5 Wind Load

Wind loading was determined following AS5100.2 Section 23 and was applied in combination with the traffic load using a velocity of 35 m/s.

3.4.6 Earthquake Load

The bridge earthquake design criteria (BEDC) are defined in AS5100.2 Section 15. Spring Gully bridge is a single-span bridge and is classified as BEDC-1 and does not require to be assessed for earthquake loading. Deep Creek bridge however is a multiple-span minor bridge and is classified as BEDC-2. Bridge earthquake forces are calculated based on modal analysis which calculates the fundamental frequency of the structure. It was found that the earthquake loading was not the critical load case as the minimum lateral restraint load and braking load were greater.

3.4.7 Minimum Lateral Restraint

A minimum lateral restraint is required for bridges per AS5100.2 Section 10. The superstructure is required to be able to resist a minimum lateral load normal to the centre line of the bridge. This lateral load is unfactored and determined from the greater of 500 kN or 5 % of the dead load of the structure (308 kN).

3.4.8 Lateral Earth Pressures

Lateral earth pressures were applied to the abutments. Lateral earth pressure included the combined effects of rigid soil pressure, hydrostatic pressure, and compaction pressure. Surcharge pressure from the SM1600 load was applied separately.

Lateral earth pressures were applied to the abutments in combination with ultimate traffic loads and traffic serviceability loading. Soil and hydrostatic pressures were determined based on Rankine's 'rigid' earth pressure coefficient, estimated soil friction angle of 30 degrees for the backfill material, and soil density of 20 kN/m^3.

The lateral loading for the earth pressure was converted to a line load of 73.92 kN/m acting at 1294 mm from the base of the abutment for SLS conditions and 93.35 kN/m acting at 1350 mm from the base of the abutment for ULS conditions.

3.4.9 Flood Load

Flood loading has not been assessed due to no flood data currently being available. Once Council provides their hydraulic study the design will be checked and updated.

3.5 Structural Design

3.5.1 Introduction

Structural analysis was undertaken in Autodesk Robot Structural Analysis and Structural Bridge Design (SBD) software. The Robot model consisted of a combination of beam elements and plate elements as appropriate. Rigid links joined the superstructure to bearings and connected the two decks at the pier with releases allowing for rotation.

3.5.2 Durability

The design life of the bridge structure is to be 100 years. The geotechnical investigation analysed multiple soil samples with the results of the test summarised in Table 2.

Table 2: Summary of aggressivity results

Location and Material	Depth (m)	pH	Chlorides in Soil (ppm)	Sulphates in Soil (ppm)	Resistivity (ohm/cm)
BH2 Clay	29.5-29.95	8.65	35.4	89	11,111
BH3 Clay	1.0-1.45	8.52	145.5	371	18,315
BH4 Clay	8.5-8.95	7.33	561.6	10,307	2,715

BH4 Clay	20.5-20.95	6.63	90.6	1221	185,185

Using AS2159, these parameters would indicate the exposure class for steel piles to be non-aggressive. A corrosion allowance of 1 mm (0.01 mm/year) is required for the steel piles to satisfy the durability requirements of AS2159.

For above-ground concrete elements, the exposure class is B1 as per AS5100.5 for a near-coastal environment.

3.5.3 Pier Foundation

The pier consists of three driven steel tube piles with the upper 12 m of the pile shaft being reinforced concrete and then three 900-diameter insitu concrete columns extending into the headstock.

3.5.3.1 Steel Tube Piles

Three driven 1090 ID steel tube piles have been selected for the piers based on the results of the analysis. The design actions for the critical load cases are summarised in Table 3.

Table 3: Summary of maximum design action effects at the pier piles

Load Case	Design Actions			Utilisation
	N* (kN)	V* (kN)	M* (kNm)	
PE + Traffic + Wind + Thermal Expansion	5080	43	448	72%
PE + Traffic + Wind + Thermal Contraction	5061	48	455	72%

3.5.3.2 Reinforced Concrete Pile Shaft

The analysis determined that three 1050 mm reinforced concrete pile shafts with 16 N28 bars were required to provide suitable capacity. Assessment of the pile shafts was undertaken per AS5100.5 and based on the critical load cases, as shown in Figure 5 it was found that the shafts had suitable ULS structural capacity for the loading as the load case combinations were bounded by the load-moment interaction curve.

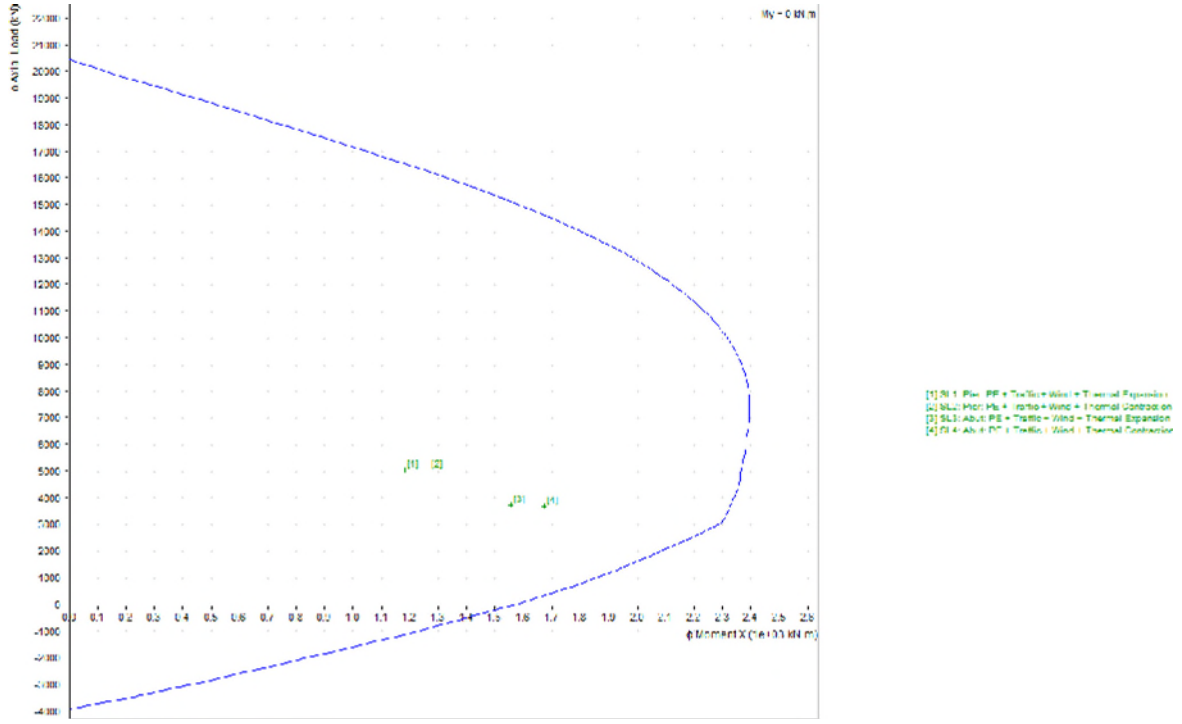


Figure 5: Reinforced concrete pile shaft capacity check

3.5.3.3 Columns

The analysis determined that three 900 mm reinforced concrete piles with 12 N28 bars were required to provide suitable capacity. Assessment of the columns was undertaken per AS5100.5 and based on the critical load cases, as shown in Figure 6 it was found that the columns had suitable ULS structural capacity for the loading as the load case combinations were bounded by the load-moment interaction curve.

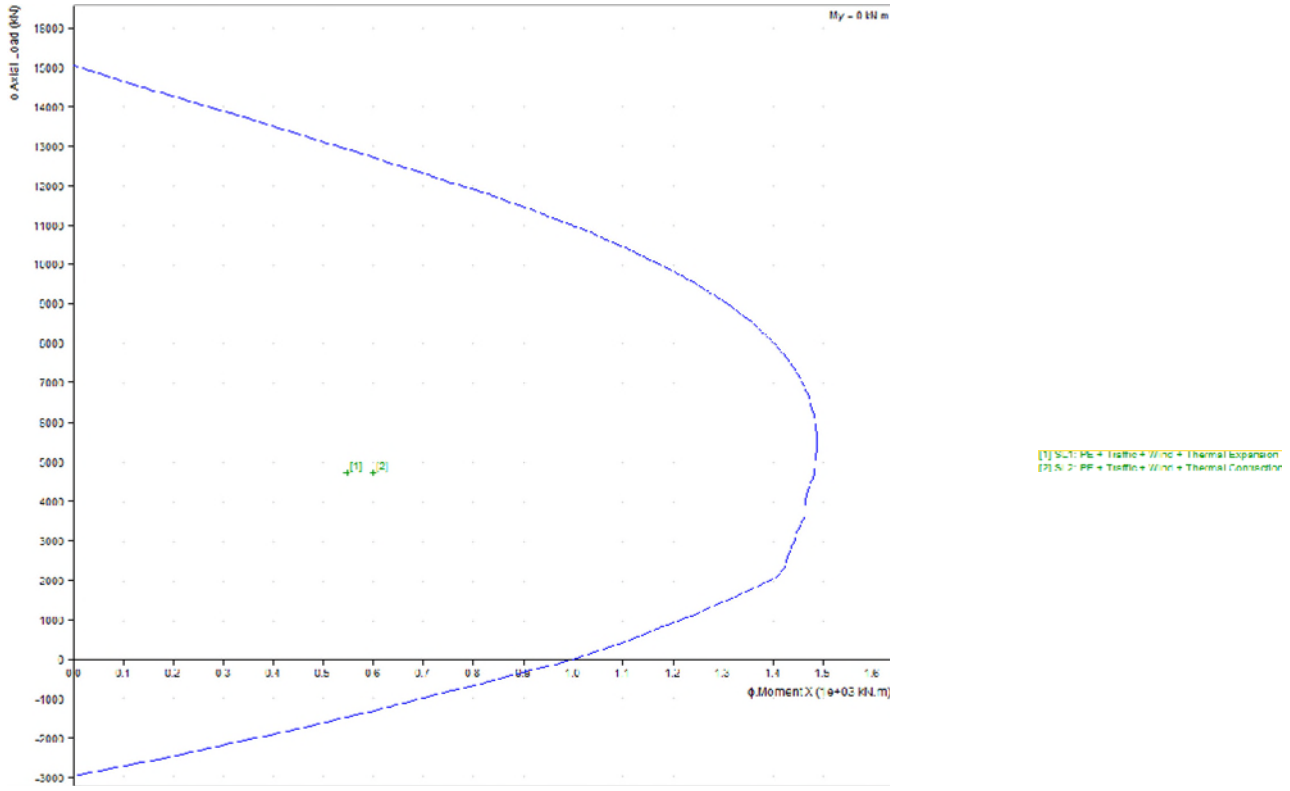


Figure 6: Column capacity check

3.5.3.4 Headstock

From the analysis, it was determined that a 1200 mm x 1200 mm headstock was required. Reinforcement in the headstock was selected to satisfy bending, shear, and torsion requirements. The design actions for the critical load cases are summarised in Table 4.

Table 4: Summary of maximum design action effects at the headstock

Symbol	Design Action	Capacity	Load Case
M* (kNm)	805	1896	PE + Traffic + Wind + Thermal Contraction
V* (kN)	761	2507	PE + Traffic + Wind + Thermal Contraction
T (kNm)	170	189	PE + Traffic + Wind + Thermal Contraction
M_{SLS} (kNm)	628	1189	PE + Traffic + Wind + Thermal Contraction

3.5.4 Abutment Foundation

The abutment foundation consists of three driven steel tube piles with the upper 12 m of the pile shaft being reinforced concrete which extends into the insitu abutment.

3.5.4.1 Steel Tube Piles

Three driven 1090 ID steel tube piles have been selected for the abutments based on the results of the analysis. The design actions for the critical load cases are summarised in Table 5.

Table 5: Summary of maximum design action effects at the abutment piles

Load Case	Design Actions			Utilisation
	N* (kN)	V* (kN)	M* (kNm)	
PE + Traffic + Wind + Thermal Expansion	3738	76	411	56%
PE + Traffic + Wind + Thermal Contraction	3726	83	422	56%

3.5.4.2 Reinforced Concrete Pile Shaft

The analysis determined that three 1050 mm reinforced concrete pile shafts with 16 N28 bars were required to provide suitable capacity. Assessment of the pile shafts was undertaken per AS5100.5 and based on the critical load cases, as shown in Figure 7 it was found that the shafts had suitable ULS structural capacity for the loading as the load case combinations were bounded by the load-moment interaction curve.

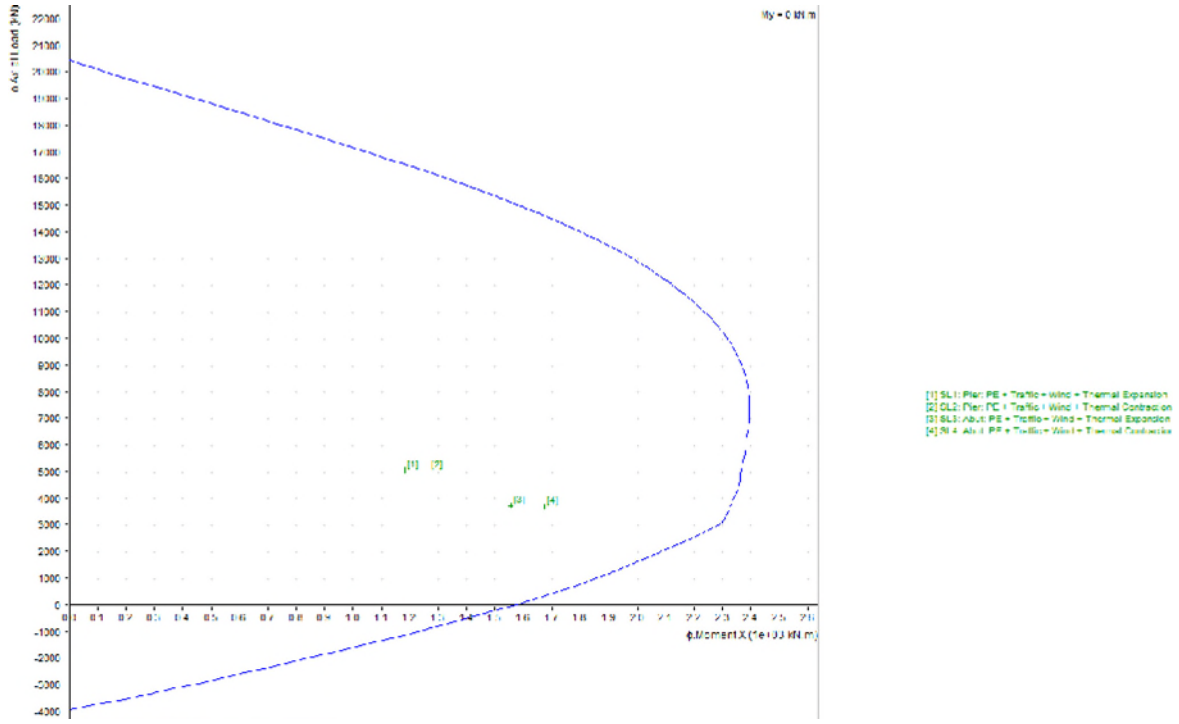


Figure 7: Reinforced concrete pile shaft capacity check

3.5.4.3 Abutment

From the analysis, it was determined that a 1400 mm x 1200 mm abutment was required. Reinforcement in the abutment was selected to satisfy bending, shear, and torsion requirements. The design actions for the critical load cases are summarised in Table 6.

Table 6: Summary of maximum design action effects at the abutment

Symbol	Design Action	Capacity	Load Case
M* (kNm)	1164	2168	PE + Traffic + Wind + Thermal Contraction
V* (kN)	1005	3112	PE + Traffic + Wind + Thermal Contraction
T (kNm)	162	221	PE + Traffic + Wind + Thermal Contraction
M_{SLS} (kNm)	1059	1344	PE + Traffic + Wind + Thermal Contraction

3.5.5 Prestress Plank Design

According to Council's requirement, 4 x 1815 mm deep Super T girders have been chosen as the superstructure. The cross-section of the planks with the tendon location is shown in Figure 8. The selected prestress strand properties are shown in Table 10. The initial prestress force is 70% of $f_{pb.}$

Table 10: Prestress strand properties

Material Type and Standard	Nominal Diameter mm	Area mm^2	Characteristic Minimum Breaking Load kN	Characteristic Minimum Breaking Strength(f_{pb}) (MPa)
7 wire ordinary, AS/NZS 4672.1	15.2	140	250	1790

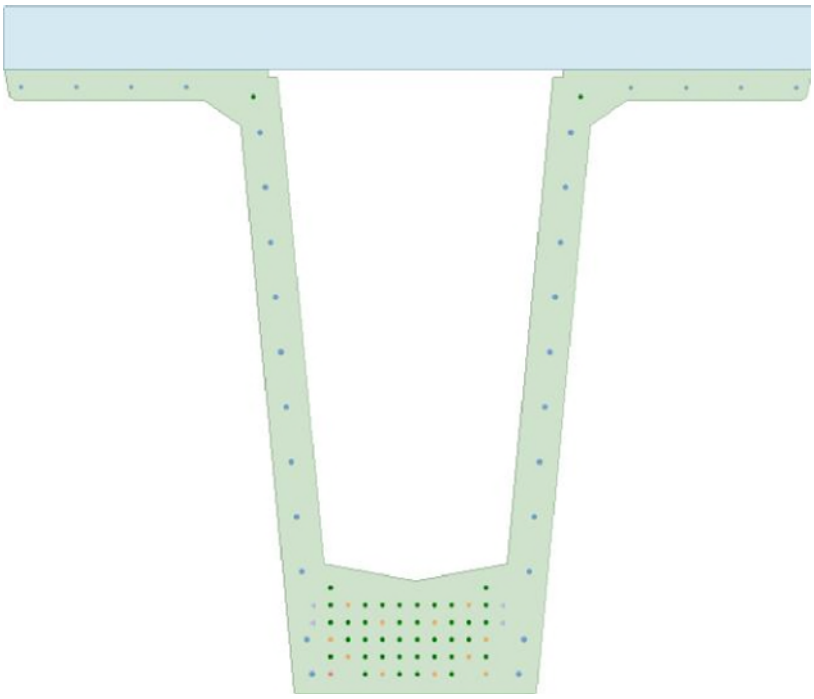


Figure 8: Cross-section of plank

SBD was used to analyse and design the superstructure.

Figure *9* illustrates the stresses in the beam at transfer, and Figure 10 illustrates the permissible stresses in the beam under live load. In all these charts blue denotes the capacity of the beam and

green denotes the design action in the beam. From these charts, the beam has enough capacity and is not overstressed during critical loading scenarios.

Figure 9: SLS Capacity of the beam at transfer

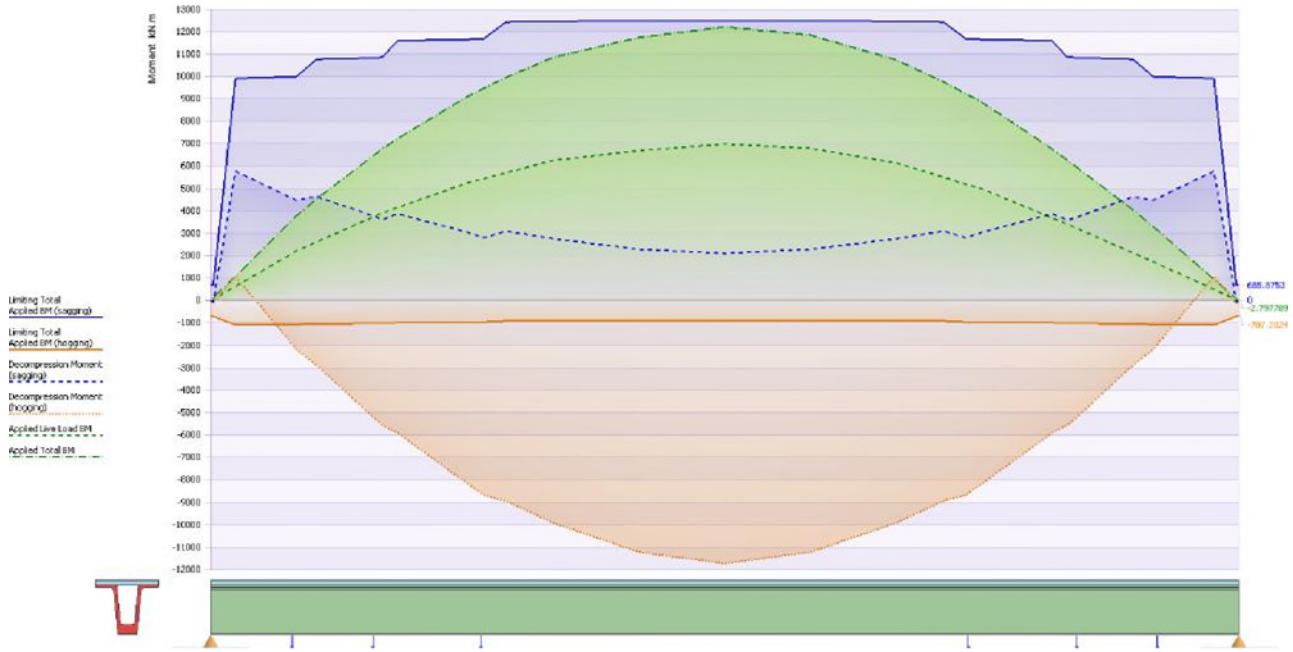


Figure 10: SLS Capacity of the beam under live load

The beam has been designed to be ‘class 3’ meaning the tensile strength of concrete is exceeded in service conditions and cracks are expected to develop in the beam. These cracks are controlled by limiting the stress in the beam to 200 MPa as per Table 8.6.2.1 in AS 5100.5.

3.5.6 Bearing

SBD was used to determine the rotations, displacements, axial forces, and shear forces at the bearing locations. These values were then used to design the bearings as per AS 5100.4. It was determined that bearing 060909R provided suitable capacities. The design actions and the capacities of this bearing are summarised in Table 7.

Table 7: Bearing design actions and capacities

041505R	Design Action	Capacity
Min. Load (kN)	491	214

Maximum Load (kN)	1590	1725
Deflection (mm)	0	46.5

3.5.7 Insitu Deck

A minimum deck thickness of 180 mm spanning a maximum of 800 mm in the trough of the Super T girders with N20 at 130 mm provides suitable capacity for the traffic loads. The design actions and capacities are summarised in Table 8.

Table 8: Insitu deck design actions and capacities

Symbol	Design Action	Capacity
M* (kNm)	229	231
M_{SLS} (kN)	133	186

3.6 Geotechnical Design

3.6.1 Parameters

RGS has completed geotechnical investigations at both bridge sites. Bridge Knowledge has relied on the information provided in the geotechnical report (RGS32900.1-AC and RGS32900.1-AB issued 31 January 2022) and engineering judgement to develop a representative geotechnical model of the foundations as described in Table 9.

A design geotechnical strength reduction factor of 0.80 was utilised for the design of the foundations for axial capacity assuming PDA testing will be carried out during the construction of the piles.

The geotechnical model has been used for the analysis of axial capacity and lateral capacity. For structural actions, the coefficient of lateral soil displacement/subgrade reaction modulus of the soil and rock layers was estimated from Glick (1948) for adopted pile width and discrete springs of 0.2 m spacings.

Borehole 1 was conducted on the northern abutment of Deep Creek bridge and was bored to a depth of 36.7 m. Borehole 2 was conducted on the northern creek bank of Deep Creek bridge and was bored to a depth of 33.0 m. Borehole 3 was conducted on the southern abutment of Deep Creek bridge and was bored to a depth of 41.0 m. Borehole 4 was conducted on the southern abutment of Spring Gully bridge and was bored to a depth of 39.2 m. It has been assumed that the material found on termination will continue. The estimated depths provided on the drawings are based on the design parameters provided in this report.

Table 9: Geotechnical model of foundations for analysis

Abutment /Pier	Layer	Depth	Ultimate Shaft Adhesion	Ultimate End Bearing	Lateral modulus (k)
		(m)	(kPa)	(MPa)	(kN/m)
Northern Deep Creek (BH1)	Alluvial clay 1	0.0 – 4.0	55	-	3067
	Alluvial sand 2	4.0 – 11.7	25	-	1534
	Alluvial clay 4	11.7 – 22.0	55	0.9	4498
	Alluvial sand 5	22.0 – 30.0	55	5.5	-
	Residual soil	30.0 – 32.5	-	-	-
	SW – Fr Basalt	>36.7	2000	40	-
Pier Deep Creek (BH2)	Fill	0.0 – 0.8	-	-	-
	Alluvial clay 1	0.8 – 1.8	55	-	3067
	Alluvial sand 2	1.8 – 10.0	25	-	1534
	Alluvial clay 3	10.0 – 16.2	50	-	1636
	Alluvial clay 4	16.2 – 23.5	55	0.9	4498
	Alluvial sand 5	23.5 – 29.5	55	5.5	-
	Residual soil	29.5 – 29.7	-	-	-
	SW – Fr Basalt	>33.0	2000	40	-
Southern Deep Creek (BH3)	Alluvial clay 1	0.0 – 7.5	55	-	3067
	Alluvial sand 2	7.5 – 11.0	25	-	1534
	Alluvial clay 3	11.0 – 23.0	50	-	1636
	Alluvial sand 5	23.0 – 34.5	55	5.5	-
	Residual soil	34.5 – 35.1	-	-	-
	EW – MW Basalt	35.1 – 36.5	250	4	-
	SW – Fr Basalt	>36.7	2000	40	-
Southern Spring Gully (BH4)	Fill	0.0 – 4.0	-	-	-
	Alluvial unit 1	4.0 – 32.2	25	-	1500
	Residual soil	32.2 – 35.5	35	-	-
	EW – MW Basalt	35.5 – 35.8	150	5	-
	SW – Fr Basalt	>39.2	500	30	-

3.6.2 Axial Resistance

3.6.2.1 Compression

Based on the provided geotechnical parameters, the axial capacity of the foundations for compression loads (based on ultimate design compression of 5080 kN at the pier and 3738 kN at the abutment) is estimated to be gained once the piles are driven to the alluvial sand 5 layer at Deep Creek bridge and the EW-MW basalt rock layer at Spring Gully bridge. The length to achieve resistance may be shorter or longer than this estimated length, and it is prudent that piling contractors make their own assessment for pile lengths required. Piles also are required to be driven to the ULS loads divided by the geotechnical factor.

3.6.2.2 Tension

No tension loads were observed due to flood loads not being analysed. When flooding information is received from Council, flood loads will be calculated and applied to the structural model to see if any tension loads are developed in the piles. If piles are driven to their founding material as stated above, they will approximately provide 1350 kN of tension capacity.

3.6.3 Lateral Resistance

The lateral capacity of the foundation has been determined from Broms method for pile foundations in soil. The analysis utilised an estimated undrained shear strength of 100 kPa (estimated) based on the stiff to very stiff clayey soils.

It was determined that the lateral capacity is adequate with a minimum pile embedment of 2.7 m from the termination of the reinforced concrete pile shaft.

4 Conclusion

Deep Creek and Spring Gully bridges are located on Casino-Coraki Road, Tatham, and provide local access to the rural region. Council intends to replace the existing bridges due to their current condition.

The new structures are anticipated to be constructed offline to the existing bridges so they can be used as temporary crossings during construction. It is proposed that the new structures will comprise Super T girders (T5) with a width of 8.4 m between barriers to accommodate two traffic lanes. Deep Creek bridge is proposed to be three spans at 38m, 38m and 20m and Spring Gully bridge is proposed to be a single span of 38m. It should be noted that Deep Creek bridge will be replaced before Spring Gully bridge and a temporary alignment will be in place until Spring Gully bridge is replaced.

Based on the geotechnical investigation reports (RGS32900.1-AC and RGS32900.1-AB issued 31 January 2022) by Regional Geotechnical Solutions (RGS) the most suitable and cost-effective foundation option is driven steel tube piles with a reinforced concrete shaft. Bored concrete piles can also be used but the cost to socket into the very deep rock layer was deemed quite significant compared to driven steel tubes.

For simplicity in design and construction, both bridges have been designed and detailed to be nearly identical where possible. This is because both bridges are utilising the same Super T girders (both 38m spans) and the ground conditions are very similar (due to the proximity of the bridges to each other) so the piling solution is almost the same as well.

It should be noted that Council is undertaking their own hydraulic assessment of the bridge sites and it is not yet complete, so flood loads, and scour have not been assessed in this stage of the design. Therefore, this design is subject to change upon receipt of the hydraulic assessment.

Detailed drawings have been supplied with this report for Council review and feedback. Feedback provided by Council will be incorporated into the final submission of the project. This document outlines the basis of the design.

Amritpal Singh
Structural Engineer
m: 0470 503 658
e: amrit@bridgeknowledge.com.au

Craig Riley
Senior Structural Engineer
m: 0434 929 838
e: craig@bridgeknowledge.com.au

Appendices

Appendix A – Safety in Design Register

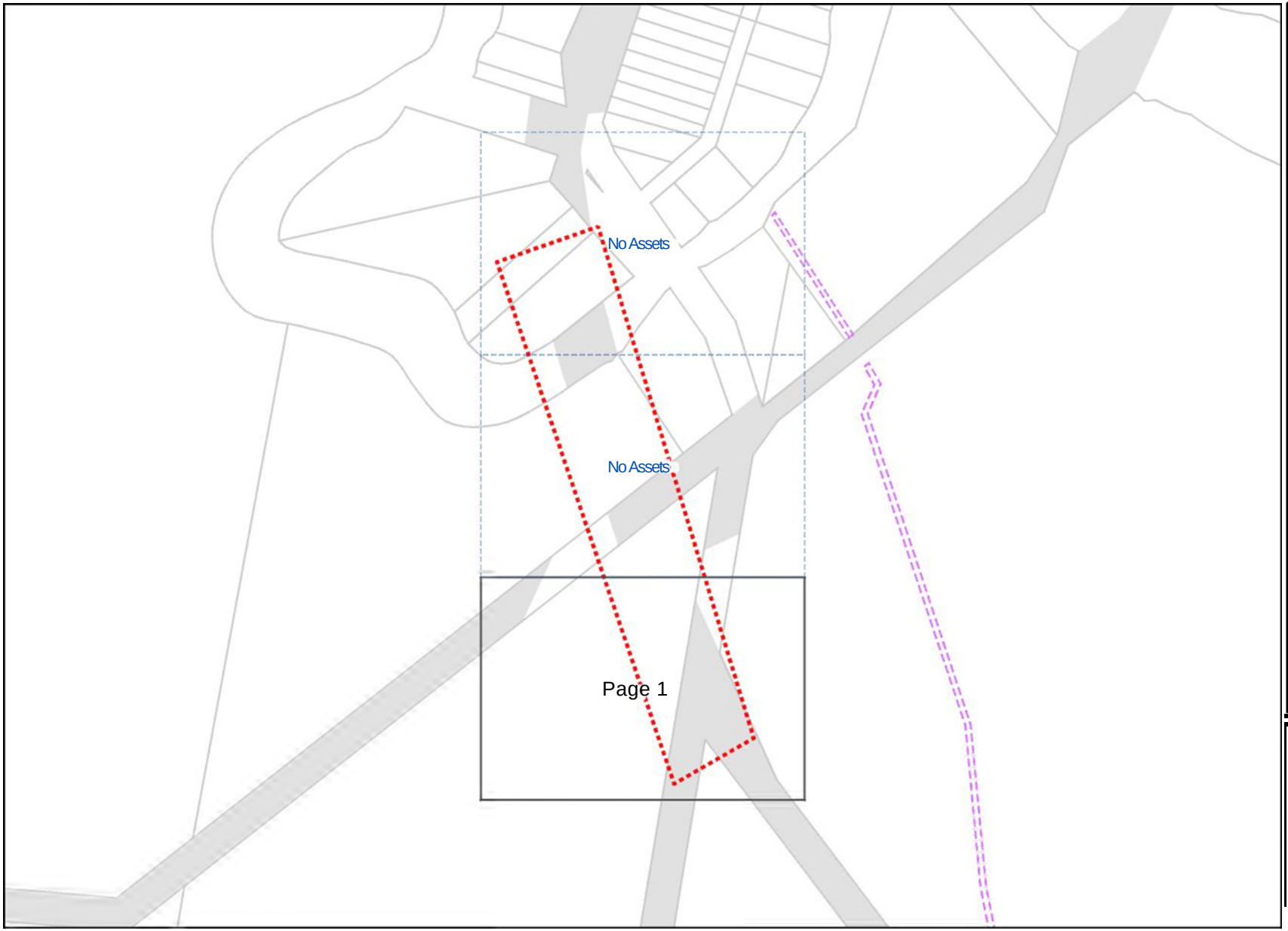
Appendix B – DBYD Search Results

Richmond Valley Council

Job # 31772018
Seq # 210352588

Provided by Richmond Valley Council

DIAL BEFORE YOU DIG www.1100.com.au



Legend

- DBYD Enquiry
- Detailed map page
- No dig site assets

In an emergency contact Richmond Valley Council on (02) 6660 0300

Index Sheet

0 37.5 75 150 m

Scale 1:3,500

Plans generated by SmarterWXTM Automate

data.

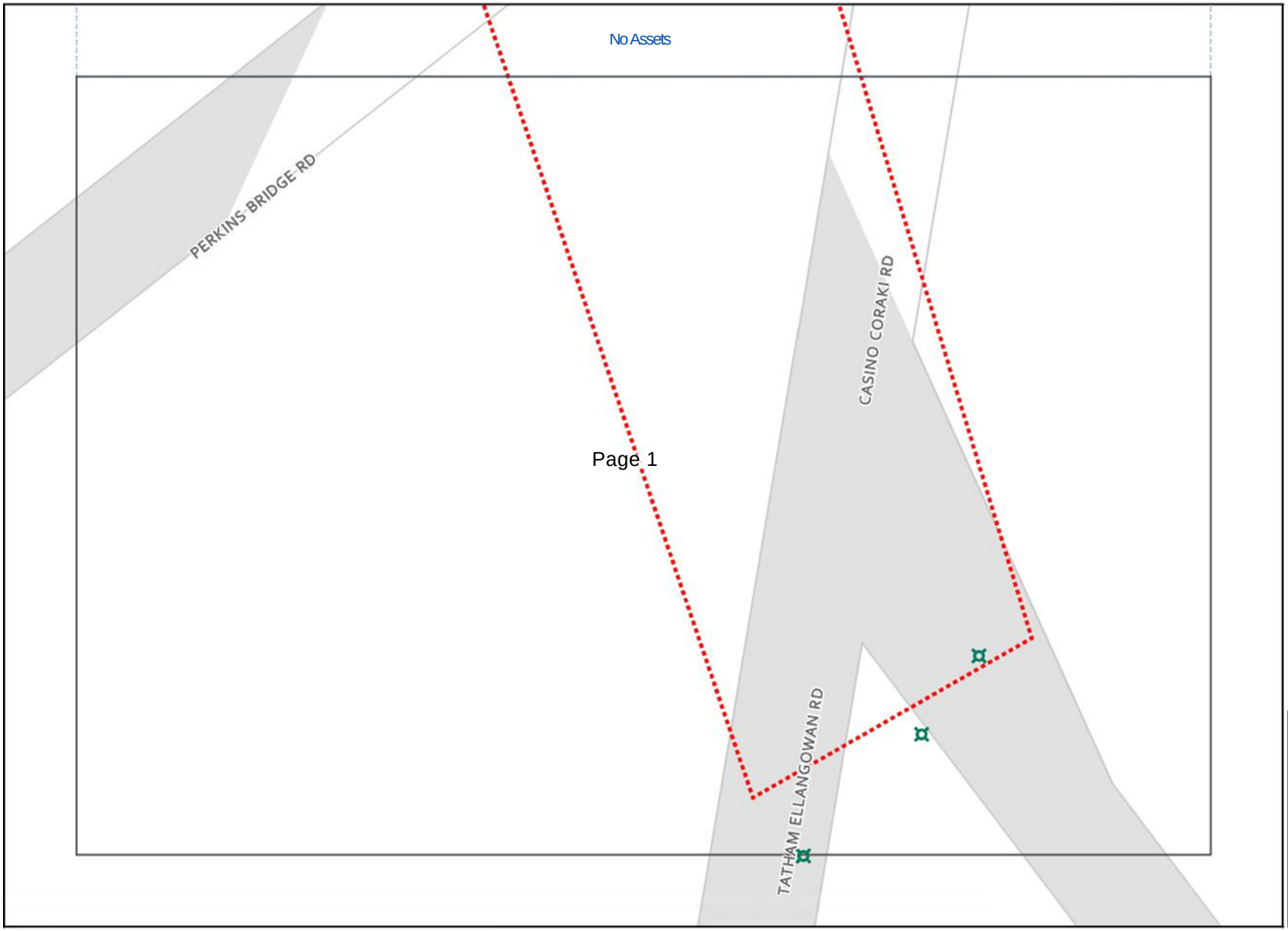
Richmond Valley Council

Job # 31772018

Seq # 210352588

Provided by Richmond Valley Council

DIAL BEFORE YOU DIG www.1100.com.au



Legend

DBYD Enquiry

Minor Culvert

Disclaimer: The Plan is provided in response to a Dial Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of Richmond Valley Council infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.

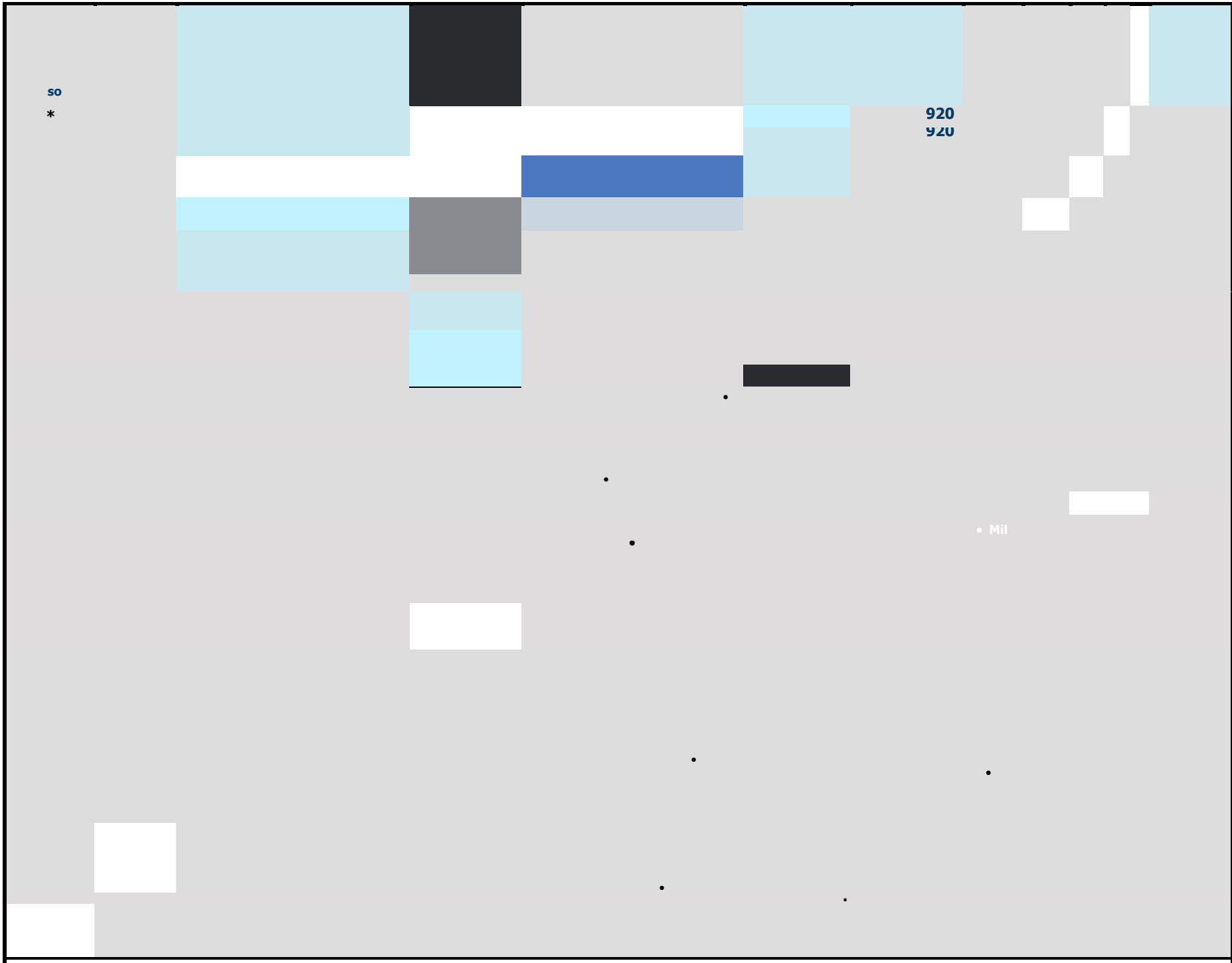
In an emergency contact Richmond Valley Council on (02) 6660 0300

14/04/22 (valid for 30 days)

0 10 20 40 m

Scale 1:1,000

Plans generated by SmarterWXTM Automate



Overhead wires not shown
LOOK UP & LIVE!

LEGEND

..... LV Underground Cable

- - - HV Underground Cable

Underground Pipe

Underground Earth or Wires

Ground Substation

• Pole

Cubicle

0 Pit

Area of Interest

Cities' Assets

Contact Essential Energy on 13 23 91

Zone Substation

Underground Cattle

Underground Fibre

Proposed Works

Area of proposed works

Proposed assets are shown as orange symbols

TI-IE INFORMATION ON THIS MAP MAY NOT BE ACCURATE. If details are Incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 14104/2022

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4I | SCALE:

Job Number 31772018 Sequence number: 210352590 Job location: 3265 Casino Corakl Road, Tatham

Map Centre: 153° 9' 29.2", -28' 55 39.8'

LEGEND

IT'S HOW WE CONNECT

For more info contact a Certified Locating Organisation or Telstra Plan Services 1800 653 935

Exchange
(Major Cable Present)

Footway Access Chamber
(can vary from 1-lid to 12-lid)

Pillar / Cabinet
(above ground / free standing)

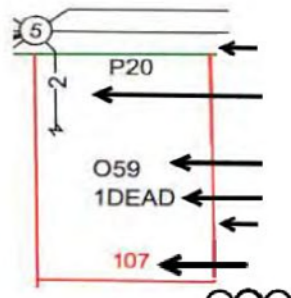
Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V Electricity

O C — Other Carrier Telecommunications Cable/Asset

Dist — Distribution cables in Main Cable ducts

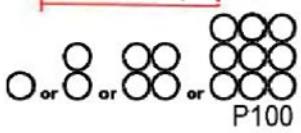
MC — Main Cable ducts on a Distribution plan

Blocked or damaged duct.



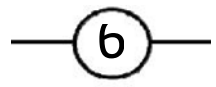
Roadside / Front Boundary
2 pair lead-in to property from pit in street 1

pair working (pair ID 059)
1 pair dead (i.e. spare, not connected) Side / Rear Property Boundary Property Number

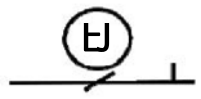


Single to multiple round conduit
Configurations 1,2,4,9 respectively
(attached text denotes conduit type and size)

Multiple square conduit
Configurations 2, 4, 6 respectively
(attached text denotes conduit type and size)



Cable Jointing Pit
(number indicating Pit Type)



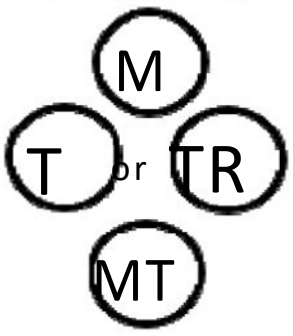
Elevated Joint
(above ground joint on buried cable)

Telstra Plant in shared Utility trench

Aerial Cable

Aerial Cable
(attached to joint Use Pole eg. Power)

Direct Buried Cable



Marker Post Installed

Buried Transponder

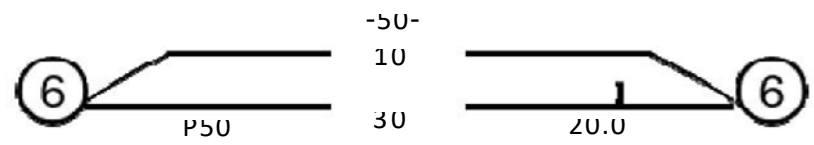
Marker Post, Transponder

Optical Fibre cable direct buried

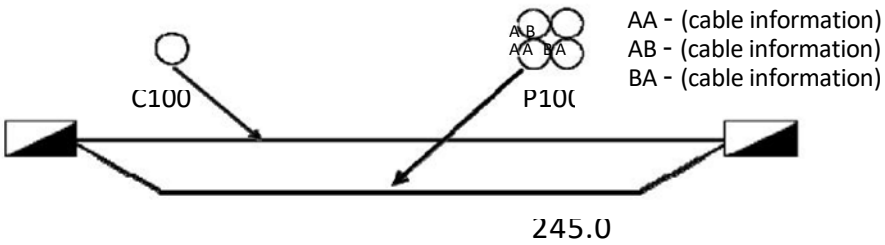
Some examples of conduit type and size:

A - Asbestos cement, P - PVC / Plastic, C - Concrete,
GI - Galanised iron, E - Earthenware
Conduit sizes *nominally* range from 20mm to 100mm
P50 50mm PVC conduit
P100 100mm PVC conduit
A100 100mm asbestos cement conduit

Some Examples of how to read Telstra Plans



One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits. approximately 20.0m apart, with a direct buried 30-pair cable along the same route



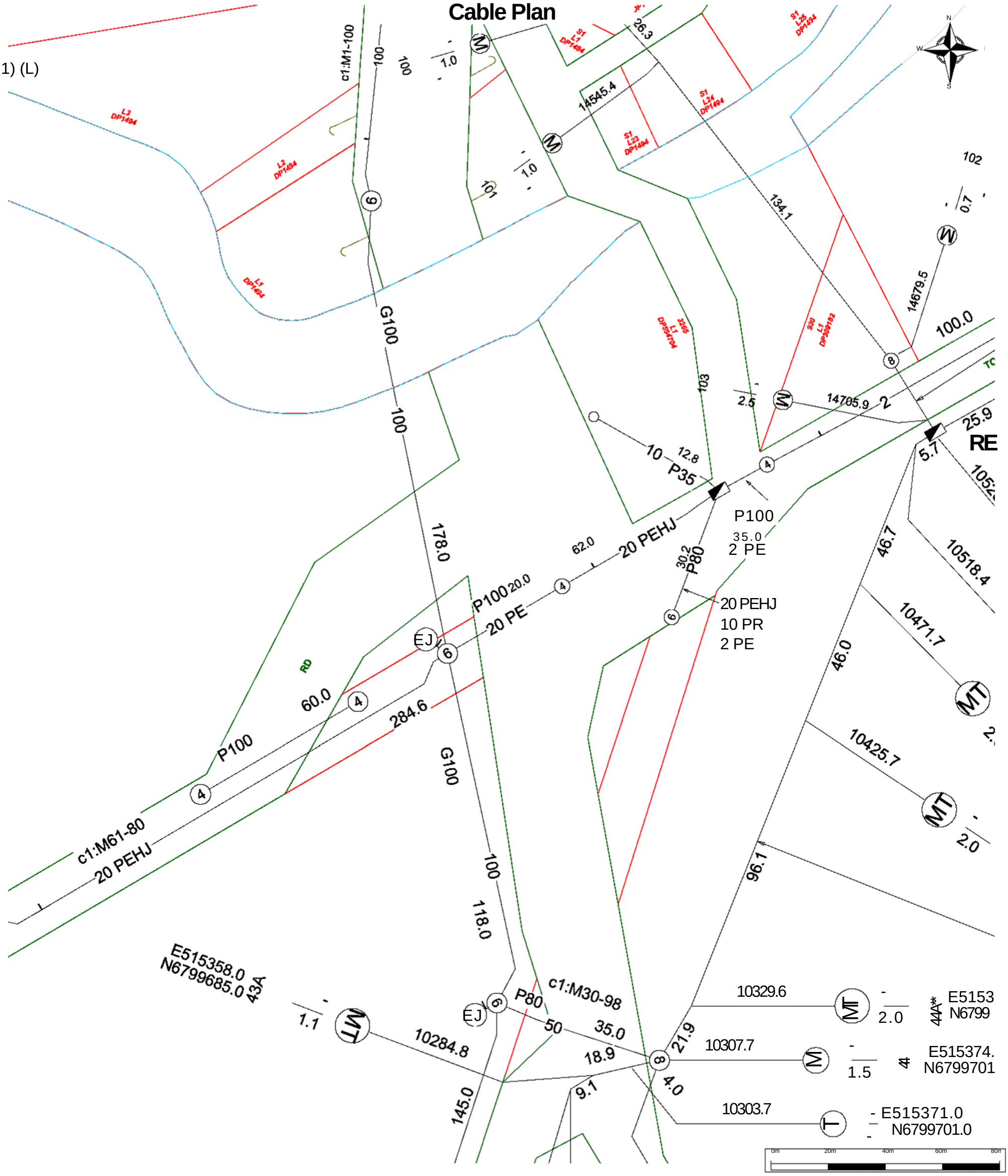
AA - (cable information)
AB - (cable information)
BA - (cable information)

Two separate conduit runs between two footway access chambers (manholes) approximately 245m apart A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along

WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the assets are protected during construction works. The exact position of Telstra assets can only be validated by physically exposing them. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

TELSTRA CORPORATION ACN 051 775 556

Cable Plan



Telstra	For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com For urgent onsite contact only - ph 1800 653 935 (bus hrs)
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	
Generated On 14/04/2022 10:53:01	Sequence Number: 210352589 CAUTION: Critical Network Route in plot area. DO NOT PROCEED with any excavation prior to seeking advice from Telstra Plan Services on : 1800 653 935

Appendix K

Geotechnical Report

Bridge Knowledge

Geotechnical Assessment

Tatham Bridges Replacement

Deep Creek Bridge

Report No. RGS32900.1-AB

31 January 2022

REGIONAL GEOTECHNICAL SOLUTIONS

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS32900.1-AB

31 January 2022

Bridge Knowledge
275 Nana Creek Road
NANA GLEN NSW 2450

Attention: Craig Riley

Dear Craig,

RE: Tatham Bridges Replacement – Deep Creek Bridge
Geotechnical Assessment

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment for the construction of a new bridge to replace the existing Deep Creek Bridge at Tatham. Deep Creek Bridge is the northern of two adjacent concrete bridges located on Casino-Coraki Road, Tatham.

The investigation included the drilling of three boreholes which encountered a deep alluvial soil profile overlying bedrock. Slightly weathered to fresh basalt was encountered between 32.98m and 36.50m beneath ground level.

Presented herein is a summary of the conditions encountered at the site along with comments and recommendations regarding foundation design and construction, and soil aggressivity.

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

Matt Rowbotham

Associate Engineering Geologist

Regional Geotechnical Solutions Pty Ltd
ABN 51141848820

Unit 14, 25-27 Hurley Drive
Coffs Harbour NSW 2450
Ph. (02) 6650 0010

Email joel.b@regionalgeotech.com.au
Web: www.regionalgeotech.com.au

Table of Contents

Figures

Appendices

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment for the replacement of Deep Creek Bridge.

The purpose of the assessment was to provide comments and recommendations on the following:

- Extent and full description of the site investigations and laboratory testing undertaken at the site;
- An interpretive geotechnical model;
- Possible foundation systems that should be considered and a recommendation on suitable foundation configuration (from a practicality/construction perspective);
- Design parameters for various pile types (as appropriate for the conditions encountered);
- Determination of the geotechnical strength reduction factor; and
- Soil aggressivity.

The assessment was undertaken in accordance with proposal RGS32900.1-AA, dated 9 September 2021.

2 METHODOLOGY

Field work for the assessment was undertaken by a Geotechnical Engineer from RGS in November 2021, and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- Drilling of three boreholes (one at each abutment and one for the midspan). The boreholes were drilled using auger and wash bore drilling techniques, and advanced with NMLC coring to recover rock core. Standard Penetration Tests (SPTs) were undertaken at regular intervals through the soil and upper weathered rock profiles; and
- Collection of soil samples for subsequent laboratory testing.

Engineering logs of the boreholes are presented in Appendix A. The borehole locations were measured from known points and are presented on Figure 1. Laboratory test result sheets are presented in Appendix B.

3 SITE CONDITIONS

3.1 Surface Conditions

A satellite photograph that illustrates the site location and site setting is reproduced below.

Satellite photograph that illustrates the site location and site setting obtained from Google Earth.

The site is situated within a region of alluvial floodplain associated with the Richmond River and Shannon Brook. The northern creek bank is terraced and the southern bank grades down towards the creek at about 20°. Alluvial silts and clays are exposed in the creek banks.

Surrounding the bridge are scattered rural properties with agricultural and grazing land.

The bridge comprises driven precast piles supporting timber girders with a cast in situ concrete deck.

Water was present within the creek during the period of the site investigation and was located 8.4m below the existing bridge deck at the Deep Creek Location. Site photographs are presented below.

Looking south along the existing bridge deck

Looking south from the lower alluvial terrace on the northern creek bank (adjacent to BH2)

3.2 Subsurface Conditions

The 1:250,000 Tweed Heads Geological Map indicates that the site is underlain by quaternary alluvial soils consisting of river gravels, alluvium, sand and clay. Lismore Basalt is mapped as being within 2km to the southwest of the existing bridge.

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 and is also reproduced in Section 4.

Table 1: Summary of Subsurface Conditions Encountered in Boreholes

Unit	Material Description	Depth to Base of Layer Below Ground Level (m)		
		BH1	BH2	BH3
Fill	COBBLES, up to 100mm with silty clay fines	--	0.8	--
Alluvial Clay 1	SILTY CLAY, stiff to very stiff, high plasticity, dark brown	4.0	1.8	7.5
Alluvial Sand 2	SAND, fine to medium grained, loose to medium dense, grey	11.7	10.0	11.0
Alluvial Clay 3	SILTY CLAY high plasticity, stiff, grey and yellow, trace shell fragments	--	16.2	23.0
Alluvial Clay 4	SILTY CLAY, high plasticity, very stiff to hard, grey mottled orange / brown,	22.0	23.5	--
Alluvial Sand 5	Silty SAND fine to medium grained, medium dense, with lenses of clayey sand, grey with orange / brown	30.0	29.5	34.5
Residual Soil	Silty CLAY, high plasticity, with fine to coarse grained gravel, grey to dark grey grading into Extremely Weathered BASALT	32.5	29.7	35.1
EW-MW Basalt	BASALT, extremely to moderately weathered, partially weathered to boulders and cobbles with clay infill, low strength	--	--	36.5
SW-Fr Basalt	BASALT, slightly weathered to fresh, high to very high strength, average defect spacing of approximately 100 to 500mm	≥36.72	≥32.98	≥41.00

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

The boreholes were progressed below 2.5m with wash bore drilling techniques and groundwater observations below this level were not possible. Water was measured within the creek 8.4m below the bridge deck during the period of the site investigation. Groundwater levels do fluctuate due to inclement 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

Due to the presence of deep alluvial soils with the potential for scour in the upper profile, shallow foundations are not feasible for the support of the new bridge, and it is recommended that the bridge be supported on piles. Pile types suitable for the site include bored piles (socketed into the basalt rock, or driven piles (designed as friction piles) founded in the alluvium above the bedrock. The use of bored piles will require steel liners to support the walls through the sand layers. Driven piles may include steel H-Sections, large diameter steel tubes with concrete infill plugs, or precast concrete piles.

It is understood that the proposed bridge will remain on approximately the same alignment as the existing bridge and therefore only minor changes to the embankments will be undertaken. Due to this, negative skin friction effects are not expected to impact the piles.

The ultimate design parameters for driven piles and bored piles are provided in tables 2 and 3 respectively.

Table 2: Pile Design Parameters for Driven Piles

Material Name	Ultimate End Bearing Pressure, fb	Ultimate Skin Friction (Compression), $f_{m,s}$	Effective Vertical Young's Modulus, E'_v	Effective Horizontal Young's Modulus, E'_v	Limiting Lateral Yield Pressure, p_y
Fill	--	55 kPa	20MPa	15 MPa	400 kPa
Alluvial 1 - Stiff to Very Stiff Clay					
Alluvial 2 - Loose Sand	--	25 kPa	10 MPa	7.5 MPa	100 kPa
Alluvial 3 - Stiff to Very Stiff Clay	--	50 kPa	12 MPa	8 MPa	500 kPa
Alluvial 4 - Very Stiff to Hard Clay	0.9 MPa	55 kPa	30 MPa	22 MPa	900 kPa
Alluvial 5 - Medium Dense Sand	5.5 MPa	55 kPa	50 MPa	40 MPa	800 kPa
Residual - Very Stiff Clay	--	--	40 MPa	30 MPa	--
EW-MW Basalt	--	--	--	--	--
SW-Fr Basalt	--	--	--	--	--

If driven piles are adopted, it is recommended that a pile drivability assessment be undertaken to determine the required hammer sizes for a different arrangement of piles. Driven tubular piles may require periodic drilling out to enable continued driving.

Table 3: Pile Design Parameters for Bored Piles Socketed in Rock

Material Name	Ultimate End Bearing Pressure, fb	Ultimate Skin Friction (Compression), $f_{m,s}$	Effective Vertical Young's Modulus, E'_v	Effective Horizontal Young's Modulus, E'_v	Limiting Lateral Yield Pressure, p_y
Fill	--	--	--	--	--
Alluvial 1 - Stiff to Very Stiff Clay					
Alluvial 2 - Loose Sand	--	--	--	--	--
Alluvial 3 - Stiff to Very Stiff Clay	--	--	--	--	--
Alluvial 4 - Very Stiff to Hard Clay	--	--	--	--	--
Alluvial 5 - Medium Dense Sand	--	--	--	--	--
Residual - Very Stiff Clay	--	--	--	--	--
EW-MW Basalt	4 MPa	250 kPa	100 MPa	160 MPa	1500 kPa
SW-Fr Basalt	40 MPa	2000 kPa	1000 MPa	750 MPa	10 000 kPa

Notes: For bored piles founded within the basalt, skin friction will be negligible throughout the soil profile and therefore has not been included in the parameters for design

Due to boreholes only being drilled at the abutments and the midpoint of the bridge, some variability in the depth to rock may be encountered during construction. Therefore, it would be prudent to allow for some flexibility in the design for construction purposes such as pile lengths, pile reinforcement and pile casing / liners.

4.2 Piling Platforms

Temporary or permanent granular working platforms must be constructed to support the piling rig. The platforms 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) and should also be designed to account for slope instability. To design the platforms 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.

4.3 Geotechnical Reduction Factor

In accordance with AS2159-2009, a geotechnical reduction factor (Φ_g) is to be applied to the ultimate values shown in Table 2 and Table 3 to derive ultimate geotechnical strengths for limit state design. This factor is dependent on assignment of an Average Risk Rating (ARR) which takes into

account the redundancy of the pile system and the quantity and type of pile testing. RGS has undertaken calculation of Average Risk Ratings and resultant geotechnical reduction factors, as summarised in Appendix C of this report. The calculations require the consideration of a number of factors which can only be estimated by a geotechnical consultant at the site investigation stage of a project, and therefore some of the factors assumed in the calculation may need revision as project details become further available.

Based on the current understanding of the project, the following values have been calculated:

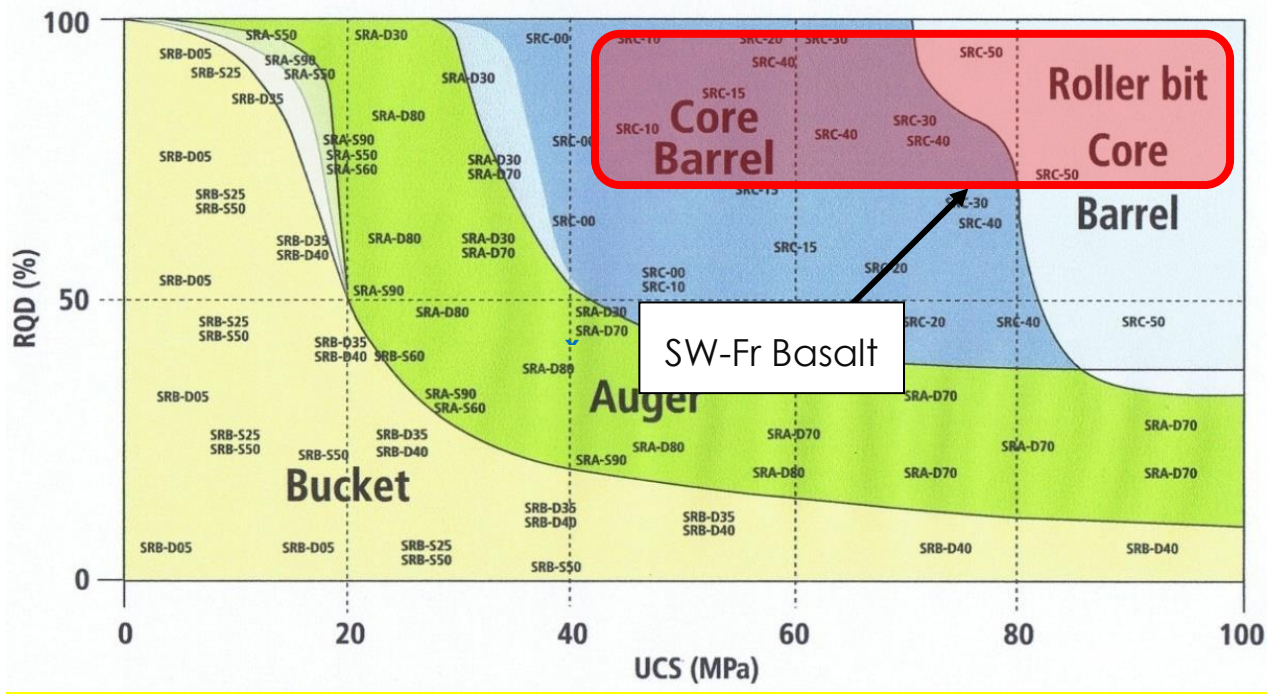
- Average Risk Rating 2.59
- Geotechnical strength reduction factor, Φ_g (no pile testing) 0.60
- Geotechnical strength reduction factor, Φ_g (Dynamic pile testing) 0.8

4.4 Excavation Conditions.

The excavation of open bored piles is not recommended due to the potential for groundwater inflows and collapse of the alluvial sand. Temporary or permanent casing that extends to socket within the residual clay or upper weathered rock profile is recommended.

Point load strength index testing was undertaken on the recovered core samples. The point load results have been converted to a Uniaxial Compressive Strength (UCS) based on a conversion factor of 25.

Soilmec provides a guideline for bored pile tool selection based on typical RQD and UCS, as shown below. The indicative UCS and RQD values indicate that excavation of the slightly weathered to fresh basalt will require a roller bit core barrel.



Guide to bored pile tool selection (Reproduced from Soilmec document 'Rock Drilling Tools' www.soilmec.com)

5 CHEMICAL AGGRESSIVITY

The results of the testing on samples of alluvial soil from both bridges are attached in Appendix B and are summarised below in Table 4.

Table 4: Summary of Aggressivity Results

Location and Material	Depth (m)	pH	Chlorides in Soil (mg/kg)	Sulfates in Soil (mg/kg)	Resistivity (ohm/cm)	Aggressivity Classification			
						Soil Condition A Sand and Gravel		Soil Condition B Silts and Clays	
						Steel	Concrete	Steel	Concrete
BH2 Clay	29.5 to 29.95	8.65	35.4	89	11,111	--	--	Non Aggressive	Non Aggressive
BH3 Clay	1.0 to 1.45	8.52	145.5	371	18,315	--	--	Non Aggressive	Non Aggressive
BH4 Clay	8.5 to 8.95	7.33	561.6	10,307	2,715	--	--	Non Aggressive	**Moderate**
BH4 Clay	20.5 to 20.95	6.63	90.6	1221	185,185	--	--	Non Aggressive	Non Aggressive

For piles installed in fresh water, the following classifications are recommended in accordance with AS2159-2009 '*Piling – Design and Installation*'.

- Concrete Piles in Submerged Fresh Water (Mild)
- Steel Piles in Fresh Water (**Moderate**)

Based on the above soil testing and the presence of running water at the site a **moderately aggressive** classification is recommended for **both concrete and steel elements** in accordance with AS2159-2009 '*Piling – Design and Installation*'.

6 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

Joel Babbage

Geotechnical Engineer

Reviewed by

Matt Rowbotham

Associate Engineering Geologist

Figures

REGIONAL GEOTECHNICAL SOLUTIONS

Client	Bridge Knowledge	Job No.	RGS32900.1
Project:	Proposed Bridge Replacement Deep Creek and Spring Gully Bridge, Tatham	Drawn By:	JB
		Date:	7-Jan-22
Title:	Borehole Location Plan	Drawing No.	**FIGURE 1**

Horizontal Scale (m)

South **North**

100m 50 0m

BH3 Bridge Deck (Approx 97m long) BH2 BH1

Vertical Scale (m below bridge deck)

0m 0

-10m -10m

-20m -20m

-30m -30m

-40m -40m

-50m -50m

Fill

Stiff to Very Stiff Alluvial Clay

Stiff to Very Stiff Alluvial Clay

Loose to Medium Dense Alluvial Sand

Stiff Alluvial Clay

Stiff to Very Stiff Alluvial Clay

Very Stiff to Hard Alluvial Clay

Medium Dense Alluvial Sand

Residual Clay

Extremely to Moderately Weathered Basalt

Slightly Weathered to Fresh Basalt

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No.	RGS32900.1
	Project:	Proposed Bridge Replacement	Drawn By:	JB
		Deep Creek Bridge, Tatham	Date:	7-Jan-22
	Title:	Interpreted Geotechnical Long Section	Drawing No.	**FIGURE 2**

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH1

CLIENT: Bridge Knowledge
PAGE: 1 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515366 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800147 m
DATUM: AHD

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		SPT 1.00m 3,3,4 N=7		1.0		CH	**Silty CLAY:** Medium to high plasticity, dark brown, top 100mm root affected	M > w_P	VSt	HP	300	ALLUVIAL
				2.0		SP	1.90m **SAND:** Fine to medium grained, brown	W				
WB	▶	SPT 2.50m 2,2,4 N=6				Cl	2.40m **Sandy CLAY:** Medium plasticity, brown, fine to medium grained sand	M > w_P	St			
				3.0								
		SPT 4.00m 4,6,5 N=11		4.0		SP	4.00m **SAND:** Fine to medium grained, orange-brown, with silt fines	W	D			
				5.0								
		SPT 5.50m 2,3,8 N=11				SP	5.30m **SAND:** Medium to coarse grained, grey					
				6.0								
		SPT 7.00m 3,5,5 N=10		7.0								
				8.0								
		SPT 8.50m 7,10,9 N=19										
				9.0								
		SPT 10.00m										

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	

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: BH1

CLIENT: Bridge Knowledge | **PAGE:** 2 of 5

PROJECT NAME: Proposed Bridge Replacements | **JOB NO:** RGS32900.1

SITE LOCATION: Tatham Bridges | **LOGGED BY:** JB

TEST LOCATION: Refer to Figure 1 | **DATE:** 4/11/21

DRILL TYPE: NCD Tracked Rig | **EASTING:** 515366 m | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** 6800147 m | **DATUM:** AHD

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		4,3,5 N=8				SP	**SAND:** Medium to coarse grained, grey *(continued)*	W	D			ALLUVIAL
				11.0								
		SPT 11.50m 5,7,7 N=14					11.70m					
				12.0		CL	**Silty CLAY:** Low plasticity, grey, with fine grained sand	M > w_P	VSt	HP	350	
		SPT 13.00m 4,5,7 N=12		13.0			13.00m					
						CL	**Silty CLAY:** Low plasticity, grey mottled orange-brown, with fine grained sand			HP	230	
				14.0								
		SPT 14.50m 4,5,7 N=12										
				15.0								
		SPT 16.00m 4,6,7 N=13		16.0						HP	350	
				17.0								
		SPT 17.50m 4,6,6 N=12								HP	320	
				18.0								
		SPT 19.00m 4,5,6 N=11		19.0			Grading into Sandy SILT, low plasticity, grey and orange-brown		VSt - H			

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS32900.1 BH1-5.GPJ <<DrawingFile>> 23/11/2021 14:59 10.03.00.09 Datgel Lab and In Situ Tool

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: BH1

CLIENT: Bridge Knowledge
PAGE: 3 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515366 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800147 m
DATUM: AHD

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 20.50m 3,6,8 N=14		21.0		CL	**Silty CLAY:** Low plasticity, grey mottled orange-brown, with fine grained sand *(continued)*	M > w_P	VSt - H	HP	220	ALLUVIAL
		SPT 22.00m 4,5,7 N=12		22.0		SM	**Silty SAND:** Fine to medium grained, brown 22.00m	W	MD - D			
		SPT 25.00m 7,9,9 N=18		23.0 24.0 25.0 26.0 27.0								
		SPT 28.00m 7,11,11 N=22		28.0 29.0			30.00m					

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	

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: BH1

CLIENT: Bridge Knowledge
PAGE: 4 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515366 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800147 m
DATUM: AHD

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 31.00m 7,9,9 N=18		31.0		CH	**Silty CLAY:** High plasticity, grey	M < w_P	VSt			ALLUVIAL
				32.0			32.50m					
				33.0			**BASALT:** Dark grey, slightly weathered, high strength					
		33.50m					33.50m					
							Continued as Cored Drill Hole					
				34.0								
				35.0								
				36.0								
				37.0								
				38.0								
				39.0								

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

ENGINEERING LOG - CORED BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH1

CLIENT: Bridge Knowledge
PAGE: Page 5 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515366 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800147 m
DATUM: AHD

Drilling and Sampling				Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}D/A$	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
			31.0								
			32.0								
			33.0		START CORING AT 33.50m						
NMLC	0% LOSS		34.0		**BASALT:** Dark grey, with some calcite inclusions	FR	H - VH		100		JT 70° IR RO CN JT 10° IR RO Calcite
			35.0						60		JT 60° IR RO CN BP 0° PL SO Clay VN JT 10° IR SO Clay VN JT 10° IR RO CN BP 5° IR SO CN JT 5° IR RO Calcite JT 10° IR RO CN
			36.0						90		BP 5° PL SO Clay VN JT 40° PL RO CN JT 10° IR RO Calcite
									100		
			37.0		Hole Terminated at 36.72 m						
			38.0								
			39.0								

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

BH1 33.5m to 36.72m

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No.	RGS32900.1
	Project:	Deep Creek Bridge Replacement Tatham	Drawn By:	MR
			Date:	19.1.22
	Title:	BH1 Core Photo 33.5 to 36.72m	Core Photo No.	**BH1**

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH2

CLIENT: Bridge Knowledge
PAGE: 1 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515377 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800116 m
DATUM: AHD

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	Not Encountered					GP	**FILL:** COBBLES up to 100mm, with silty clay fines	M				FILL
							0.80m					
		SPT 1.00m 3,3,2 N=5		1.0		CH	**Silty CLAY:** High plasticity, brown	M > w_P	VSt	HP	340	ALLUVIAL
							1.80m					
				2.0		SP	**SAND:** Fine to medium grained, brown, with clay lenses, trace organics	M	L - MD			
		SPT 2.50m 2,1,1 N=2										
				3.0								
				4.0								
				5.0								
		SPT 5.50m 2,1,2 N=3										
				6.0								
				7.0								
				8.0								
		SPT 8.50m 3,1,1 N=2										
				9.0								
							10.00m					

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	

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: BH2

CLIENT: Bridge Knowledge
PAGE: 2 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515377 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800116 m
DATUM: AHD

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	Not Encountered	SPT 11.50m 0,0,1 N=1		11.0		CH	**Silty CLAY:** High plasticity, grey-yellow, trace shell fragments	M > w_P	St			MARINE
				12.0						HP	120	
				13.0								
				14.0								
		SPT 14.50m 0,0,1 N=1		15.0						HP	110	
				16.0						HP	350	
							16.20m					
						SP	**Clayey SAND:** Fine to medium grained, green-grey, with lenses of fine to medium grained brown sand and high plasticity, grey silty clay	W	MD			ALLUVIAL
		SPT 17.50m 1,3,4 N=7		17.0						HP	320	
				18.0								
				19.0								

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
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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: BH2

CLIENT: Bridge Knowledge
PAGE: 3 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515377 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800116 m
DATUM: AHD

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	Not Encountered	SPT 20.50m 9,7,10 N=17		21.0		SP	**Clayey SAND:** Fine to medium grained, green-grey, with lenses of fine to medium grained brown sand and high plasticity, grey silty clay *(continued)*	W	MD	HP	220	ALLUVIAL
		SPT 23.50m 6,7,8 N=15		23.0		SP	23.50m **SAND:** Fine to medium grained, orange-brown, with Sandy SILT lenses					
		SPT 26.50m 3,9,7 N=16		26.0								
		SPT 29.50m 6,8,10/20mm N=R		29.0		CH	29.50m 29.70m **Silty CLAY:** High plasticity, grey, with fine to coarse grained gravel, grading into extremely weathered then slightly weathered basalt					

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%

ENGINEERING LOG - CORED BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH2

CLIENT: Bridge Knowledge
PAGE: Page 4 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515377 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800116 m
DATUM: AHD

Drilling and Sampling				Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
			21.0								
			22.0								
			23.0								
			24.0								
			25.0								
			26.0								
			27.0								
			28.0								
			29.0								
	▲				START CORING AT 29.70m						
					BASALT: Dark grey, some calcified healed joints	FR			90		

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH2**

CLIENT: Bridge Knowledge
PROJECT NAME: Proposed Bridge Replacements
SITE LOCATION: Tatham Bridges
TEST LOCATION: Refer to Figure 1

PAGE: Page 5 of 5
JOB NO: RGS32900.1
LOGGED BY: JB
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°

EASTING: 515377 m
NORTHING: 6800116 m
SURFACE RL:
DATUM: AHD

Drilling and Sampling				Material description and profile information					Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
NMLC	0% LOSS 90% LOSS		31.0 32.0 33.0		**BASALT:** Dark grey, some calcified healed joints *(continued)*	FR	H - VH		90 100		JT 20° PL RO Calcite JT 10° PL RO Calcite JT 20° PL RO Calcite JT 30° PL RO Calcite JT 20° IR RO Calcite JT 50° PL RO Calcite JT 80° CU RO CN JT 10° PL RO Calcite BP 0° PL RO Calcite
			34.0 35.0 36.0 37.0 38.0 39.0		Hole Terminated at 32.98 m						

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

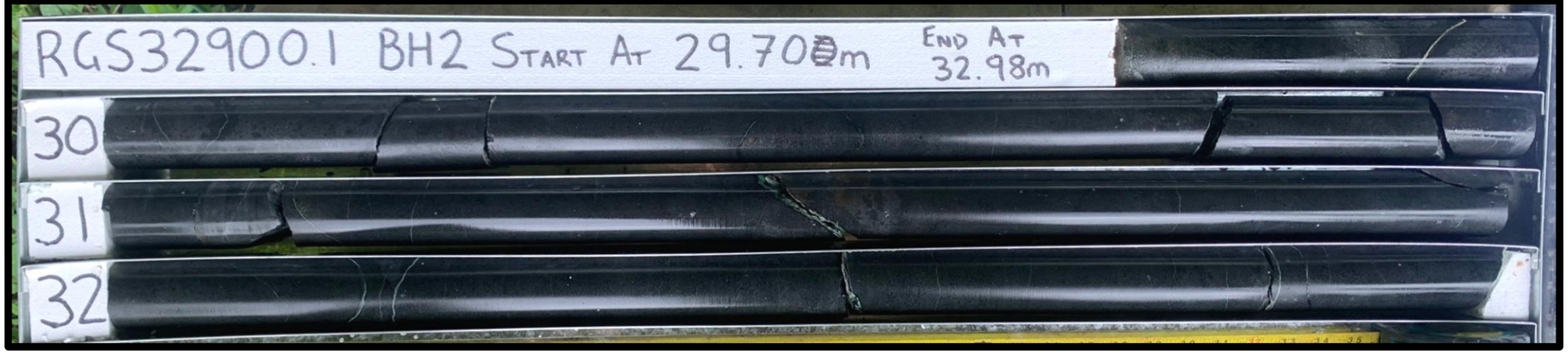
Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

BH2 29.7m to 32.98m



REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No.	RGS32900.1
	Project:	Deep Creek Bridge Replacement Tatham	Drawn By:	MR
			Date:	19.1.22
	Title:	BH2 Core Photo 29.7 to 32.98m	Core Photo No.	**BH2**

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH3

CLIENT: Bridge Knowledge
PAGE: 1 of 6
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515391 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800052 m
DATUM: AHD

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	Not Encountered	1.00m SPT 1,3,3 N=6		1.0		CI	**Silty CLAY:** Medium plasticity, brown, top 100mm root affected	$M > w_P$	St	HP	160	ALLUVIAL
							1.80m					
				2.0		CH	**Silty CLAY:** High plasticity, grey, with organics			HP	160	
WB		2.50m SPT 2,1,3 N=4		3.0								
				4.0								
				5.0								
		5.50m SPT 2,3,5 N=8								HP	120	
				6.0			5.80m					
						CL	**Sandy CLAY:** Low plasticity, green, brown, fine to medium grained sand					
				7.0								
							7.50m					
						SP	**SAND:** Fine to medium grained, grey, trace clay fines	W	MD			
		8.50m SPT 1,3,3 N=6		8.0								
				9.0								

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: Bridge Knowledge
PAGE: 2 of 6
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515391 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800052 m
DATUM: AHD

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	Not Encountered			11.0		SP	**SAND:** Fine to medium grained, grey, trace clay fines *(continued)*	W	MD			ALLUVIAL
							11.00m					
		SPT 11.50m 1,2,2 N=4				CH	**Silty CLAY:** High plasticity, grey, with shell fragments	M > w_P	VSt	HP	210	MARINE
				12.0								
				13.0								
				14.0					St			
		SPT 14.50m 0,1,3 N=4								HP	180	
				15.0								
				16.0								
				17.0								
		SPT 17.50m 0,0,2 N=2								HP	120	
				18.0								
				19.0								

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: Bridge Knowledge
PAGE: 3 of 6
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515391 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800052 m
DATUM: AHD

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	Not Encountered	20.50m SPT 0,1,3 N=4		20.5		CH	**Silty CLAY:** High plasticity, grey, with shell fragments *(continued)*	$M > w_P$	St			MARINE
							20.50m					
						CL	**Sandy CLAY:** Low plasticity, grey, fine grained sand, trace organics (wood fragments)			HP	120	
				21.0								
				22.0								
				23.0			23.00m					
		23.50m SPT 5,7,9 N=16				SC	**Clayey SAND:** Low plasticity, grey, fine to medium grained sand, orange-brown	W	D			ALLUVIAL
				24.0								
				25.0								
				26.0								
				27.0								
				28.0								
							28.50m					
				29.0		SC	**Clayey SAND:** Low plasticity, grey, fine to medium grained sand, orange-brown, with some gravelly layers					

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

ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH3
PAGE: 4 of 6
CLIENT: Bridge Knowledge
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515391 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800052 m
DATUM: AHD

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	Not Encountered			31.0		SC	**Clayey SAND:** Low plasticity, grey, fine to medium grained sand, orange-brown, with some gravelly layers *(continued)*	W	D			ALLUVIAL
				32.0								
				33.0								
				34.0								
							34.50m					
				35.0		Cl	**Silty CLAY:** Medium plasticity, dark grey					
							35.10m					
							BASALT: Dark grey, slightly weathered, high strength					
							35.40m					
							Continued as Cored Drill Hole					
				36.0								
				37.0								
				38.0								
				39.0								

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

ENGINEERING LOG - CORED BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH3

CLIENT: Bridge Knowledge | **PAGE:** Page 5 of 6

PROJECT NAME: Proposed Bridge Replacements | **JOB NO:** RGS32900.1

SITE LOCATION: Tatham Bridges | **LOGGED BY:** JB

TEST LOCATION: Refer to Figure 1 | **DATE:** 4/11/21

DRILL TYPE: NCD Tracked Rig | **EASTING:** 515391 m | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** 6800052 m | **DATUM:** AHD

Drilling and Sampling				Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
			31.0								
			32.0								
			33.0								
			34.0								
			35.0		START CORING AT 35.40m						
NMLC	10% LOSS		36.0		**BASALT:** High strength basalt boulders/cobbles with conglomerate and clay layers						
					BASALT: Dark grey	HW - MW	VL - L		50		JT 10° IR RO Clay VN JT 10° IR RO Clay VN Clay seam 20mm JT 5° PL SO CN JT 5° PL SO CN JT 40° PL RO Clay VN JT 40° PL SO Clay VN Some inclusions JT 10° PL RO Calcite JT 10° PL RO CN JT 40° IR RO Calcite JT IR RO CN JT 60° IR RO CN
			37.0		**BASALT:** Dark grey, vesicular	SW	H				
			38.0						80		JT 5° IR RO CN JT 30° IR RO Calcite Some inclusions JT 10° IR RO CN
			39.0		**BASALT:** Dark grey, some calcite inclusions	FR	H - VH				JT 30° CU RO Clay VN JT 10° CU RO CN JT 10° PL RO CN JT 20° PL RO CN

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

ENGINEERING LOG - CORED BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH3

CLIENT: Bridge Knowledge
PAGE: Page 6 of 6
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515391 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6800052 m
DATUM: AHD

Drilling and Sampling				Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
NMLC	10% LOSS		41.0		**BASALT:** Dark grey, some calcite inclusions *(continued)*	FR	H - VH		80		JT 10° PL RO CN JT 80° PL RO CN JT 30° PL RO Calcite JT 10° PL RO Calcite JT 10° PL RO Calcite
					Hole Terminated at 41.00 m						

42.0
43.0
44.0
45.0
46.0
47.0
48.0
49.0

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

BH3 35.4m to 41.0m

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No.	RGS32900.1
	Project:	Deep Creek Bridge Replacement Tatham	Drawn By:	MR
			Date:	19.1.22
	Title:	BH3 Core Photo 35.4 to 41.0m	Core Photo No.	**BH3**

Appendix B

Laboratory Test Result Sheets

RESULTS OF SOIL ANALYSIS

4 samples supplied by Regional Geotechnical Solutions Pty Ltd on 16/11/2021 - Lab Job No. M3547
Analysis requested by Joel Babbage. - **Your Project: RGS32900.1 Bridge Knowledge**
44 Bent Street WINGHAM NSW 2429

	Method	Sample 1 BH2 29.5-29.95	Sample 2 BH3 1-1.45	Sample 3 BH4 8.5-8.95	Sample 4 BH4 20.5-20.95
	EAL job No.	***M3547/1***	***M3547/2***	***M3547/3***	***M3547/4***
Moisture (%)	*inhouse*	32	24	25	28
Texture	*See note 2 below.*	Fine	Fine	Fine	Fine
pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.65	8.52	7.33	6.63
Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.090	0.546	3.683	0.054
Resistivity (ohm.mm)	** Calculation	111,111	18,315	2,715	185,185
Resistivity (ohm.cm)	** Calculation (ohm.mm / 10)	11,111	1,832	272	18,519
Chloride (mg/kg)	** Water Extract - ISE (1:5 Water)	35.4	145.5	561.6	90.6
Chloride **(as %)**	** Calculation	0.004	0.015	0.056	0.009
Sulfate (mg/kg)	** Water Extract-APHA 3120 ICPOES	89	371	10,307	1,221
Sulfate **(as % SO_4)**	** Calculation	0.009	0.037	1.031	0.122
Chloride / Sulfate Ratio	** Calculation	0.4	0.4	0.1	0.1

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 24/11/2021.

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

Point Load Strength Report - Diametral and Axial Testing of Rock Core

REGIONAL GEOTECHNICAL SOLUTIONS

Client:	Bridge Knowledge	**Job Number:**	RGS32900.1
Project:	Proposed Bridge Replacements	**Date:**	7/01/2022
Location:	Tatham Bridges	**By:**	JB

Date Sampled:	9/11/2021
Date Tested:	07-Jan-22

Test Method: AS4133.4.1 - 2007

Test Machine: HMA 6510

Date of Calibration: 18-Aug-20

Borehole	Test Depth (m)	Rock Type	Moisture Condition	Diametral Test							Axial Test								
				Length L (mm)	Diameter D (mm)	Load P (kN)	I_s (Mpa)	Size Correction	$I_{s(50)}$ (Mpa)	Strength Classification	Width W (diameter)	Platen Separation	Load P (kN)	I_s (Mpa)	Size Correction	$I_{s(50)}$ (Mpa)	Strength Classification	UCS (Mpa)	Anisotropy Index $I_{a(50)}$
BH1	34.2	BASALT	N	100.0	52.0	4.66	1.72	1.02	1.75	H	52	30	2.57	1.29	0.950	1.23	H	24.57252	1.43
	35.3	BASALT	N	120.0	52.0	16.72	6.18	1.02	6.29	VH									
	36.6	BASALT	N	140.0	52.0	6.49	2.40	1.02	2.44	H	52	40	4.36	1.65	1.013	1.67	H	33.35612	1.46
BH2	30.3	BASALT	N	80.0	52.0	21.70	8.03	1.02	8.17	VH	52	35	19.16	8.27	0.983	8.13	VH	162.5655	1.00
	31.4	BASALT	N	120.0	52.0	22.21	8.21	1.02	8.36	VH									
	32.9	BASALT	N	120.0	52.0	14.86	5.50	1.02	5.59	VH									
BH3	36.2	BASALT	N	100.0	52.0	0.35	0.13	1.02	0.13	L	52	41	0.27	0.10	1.019	0.10	L	2.026478	1.30
	37.4	BASALT	N	100.0	52.0	5.23	1.93	1.02	1.97	H	52	43	4.64	1.63	1.030	1.68	H	33.56336	1.17
	38.9	BASALT	N	100.0	52.0	6.68	2.47	1.02	2.51	H	52	36	5.78	2.43	0.989	2.40	H	47.98207	1.05
	39.6	BASALT	N	120.0	52.0	9.71	3.59	1.02	3.65	VH	52.0	27.0	7.72	4.32	0.927	4.00	VH	80.09325	0.91
	40.9	BASALT	N	110.0	52.0	12.38	4.58	1.02	4.66	VH									
BH4	35.9	BASALT	N	100.0	52.0	2.98	1.10	1.02	1.12	H									
	36.7	BASALT	N	160.0	52.0	2.39	0.88	1.02	0.90	M									
	37.8	BASALT	N	100.0	52.0	5.22	1.93	1.02	1.96	H									
	38.9	BASALT	N	100.0	52.0	3.16	1.17	1.02	1.19	H	52	40	3.14	1.19	1.013	1.20	H	24.02253	0.99

Moisture Condition:
D = Dry
N = Natural
S = Saturated

Strength Classification:

$I_{s(50)}$ Mpa	Term	Abbreviation
> 10	Extremely High Strength	EH
3 to 10	Very High Strength	VH
1 to 3	High Strength	H
0.3 to 1	Medium Strength	M
0.1 to 0.3	Low Strength	L
< 0.1	Very Low Strength	VL

Template Revision: B

Bridge Knowledge

Geotechnical Assessment

Tatham Bridges Replacement

Spring Gully Bridge

Report No. RGS32900.1-AC

31 January 2022

REGIONAL GEOTECHNICAL SOLUTIONS

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS32900.1-AC

31 January 2022

Bridge Knowledge
275 Nana Creek Road
NANA GLEN NSW 2450

Attention: Craig Riley

Dear Craig,

RE: Tatham Bridges Replacement – Spring Gully Bridge
Geotechnical Assessment

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment for the construction of a new bridge to replace the existing Spring Creek Bridge at Tatham. Spring Gully Bridge is the southern of two adjacent bridges located on Casino-Coraki Road, Tatham.

The investigation included the drilling of one borehole at the southern abutment which encountered a deep alluvial soil profile overlying bedrock. Additionally, the data obtained during the investigation for Deep Creek Bridge has been used in conjunction with this investigation.

Presented herein is a summary of the conditions encountered at the site along with comments and recommendations regarding foundation design and construction, and soil aggressivity.

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

Matt Rowbotham

Associate Engineering Geologist

Table of Contents

Figures

Appendices

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment for the replacement of Spring Gully Bridge located on Casino-Coraki Road, Tatham.

The purpose of the assessment was to provide comments and recommendations on the following:

- Extent and full description of the site investigations and laboratory testing undertaken at the site;
- An interpretive geotechnical model;
- Possible foundation systems that should be considered and a recommendation on suitable foundation configuration (from a practicality/construction perspective);
- Design parameters for various pile types (as appropriate for the conditions encountered);
- Determination of the geotechnical strength reduction factor; and
- Soil aggressivity.

The assessment was undertaken in general accordance with proposal RGS32900.1-AA, dated 9 September 2021. The initial scope of work involved drilling two holes at the bridge (boreholes on the northern and southern abutments). However, due to bedrock being encountered at greater than 30m on the southern abutment and bedrock being encountered at a similar depth on the adjacent Deep Creek Bridge to the north, the borehole on the northern abutment was not drilled.

2 METHODOLOGY

Field work for the assessment was undertaken by a Geotechnical Engineer from RGS in November 2021, and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- Drilling of one borehole at the southern abutment. The borehole was drilled using auger and washbore drilling techniques, and advanced with NMLC coring to recover rock core. Standard Penetration Tests (SPTs) were undertaken at regular intervals through the soil and upper weathered rock profiles; and
- Collection of soil samples for subsequent laboratory testing.

Engineering logs of the boreholes are presented in Appendix A. The borehole locations were measured from known points and are presented on Figure 1. Laboratory test result sheets are presented in Appendix B.

3 SITE CONDITIONS

3.1 Surface Conditions

A satellite photograph that illustrates the site location and site setting is reproduced below.

Satellite photograph that illustrates the site location and site setting obtained from Google Earth.

The site is situated within a region of alluvial floodplain associated with Richmond River and Spring Creek. The creek banks sloped towards the creek at approximately 20°. Soils on the creek bank consisted of alluvial silts and clays.

Surrounding the bridge are scattered rural properties with agricultural and grazing land.

Minimal was present within the creek during the period of the site investigation and appeared to be standing water at depths of less than 100mm. Water was approximately 4.0m below the bridge deck.

Site photographs are presented below.

Looking north along the existing bridge deck. Rig setup at BH5.

Looking north from the southern abutment

3.2 Subsurface Conditions

The 1:250,000 Tweed Heads Geological Map indicates that the site is underlain by quaternary alluvial consisting of river gravels, alluvium, sand and clay. Lismore Basalt is mapped as being within 2km to the southwest of the existing bridge.

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. BH3 from the investigation of Deep Creek Bridge is approximately 85m north of the northern abutment and has been included as a guide for estimating the subsurface profile. Further details are presented on the Engineering Logs. An interpretive geotechnical section is presented on Figure 2 and is also reproduced in Section 4.

Table 1: Summary of Subsurface Conditions Encountered in Boreholes

Unit	Material Description	Depth to Base of Layer (m)	
		BH5	BH3
Fill	Sandy to Gravelly CLAY, low plasticity, w fine to coarse grained cobbles and boulders	4.0	--
Alluvial Unit 1	Interbedded lenses of medium dense to dense SAND and Silty SAND and stiff to very stiff Silty CLAY and Sandy CLAY	32.2	11.0
Marine/Estuarine Soil	SILTY CLAY, stiff to very stiff, high plasticity, trace shell fragments	--	23.0
Alluvial Unit 2	SAND to Clayey SAND, fine to medium grained, medium dense, with lenses of high plasticity silty clay	--	35.1
Residual Soil	Silty CLAY, high plasticity, with fine to coarse grained gravel, grading into Extremely Weathered BASALT	35.5	--
EW-MW Basalt	BASALT, extremely to moderately weathered, partially weathered to boulders and cobbles with clay layers, low strength	35.8	36.5
SW-Fr Basalt	BASALT, slightly weathered to fresh, high to very high strength, average defect spacing of approximately 100 to 500mm,	≥39.23	≥41.00

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

The boreholes were progressed below 2.5m with wash bore drilling techniques and groundwater observations below this level were not possible. Water was measured within the creek 4.0m below the bridge deck during the period of the site investigation. Groundwater levels do fluctuate due to inclement 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

Due to the presence of deep alluvial soils with the potential for scour in the upper profile, shallow foundations are not feasible for the support of the new bridge, and it is recommended that the bridge be supported on piles such as bored and cased piles, grout injected continuous flight auger

(CFA) piles, or driven piles. Driven piles may include steel H-Section or tubular piles, or concrete piles.

It is understood that the proposed bridge will remain on approximately the same alignment as the existing bridge and therefore only minor changes to the embankments will be undertaken. Due to this, negative skin friction will not affect the piles and has not been addressed in this report. If the alignment of the bridge is altered, additional consideration will have to be made for negative skin friction.

Based on the nearby borehole (BH3) undertaken as part of the investigation for Deep Creek Bridge approximately 85m to the north, it has been assumed that the stiff marine clay layer may be encountered on the northern abutment.

It is recommended that piles be extended to found within either:

- Slightly weathered to fresh basalt; or
- Alluvial soil below the stiff marine soils encountered.

The ultimate design parameters presented in Table 2 can be adopted for bored or driven piles.

Table 2: Pile Design Parameters for Bored & Driven Piles

Material Name	Ultimate End Bearing Pressure, fb	Ultimate Skin Friction (Compression), $f_{m,s}$**	Effective Vertical Young's Modulus, E'$_v$*	Limiting Lateral Yield Pressure, p_y
Alluvial Unit 1	--	25 kPa	15 MPa	500 kPa***
Marine/Estuarine Soil	--	10 kPa	5 MPa	100 kPa***
Alluvial Unit 2	--	25 kPa	15 MPa	500 kPa
Residual Soil	--	35 kPa	20 MPa	600 kPa
EW-MW Basalt	5 MPa	150 kPa	100 MPa	1,500 kPa
SW-Fr Basalt	30 MPa	500 kPa	500 MPa	12.5MPa (upper 1m) 25MPa (below 1m)

Notes: * *The elastic modulus in the horizontal direction may be taken as* $E'_h = 0.75 \times E'_v$ *for both soil and rock materials.*

** *If bored piles are founded within the slightly weathered to fresh basalt, skin friction will be negligible throughout the soil profile*

*** *Parameters are applicable at depths of below 4.5 pile diameters*

If driven piles are adopted it is recommended that a pile drivability assessment be undertaken to determine the required hammer size and the appropriate pile type. Tubular piles driven may require periodic drilling out to achieve the require foundation depths.

As previously discussed, if new bridge embankments are required, then the potential settlements and negative skin friction will need to be calculated and taken into account in pile design.

Temporary or permanent granular working platforms must be constructed to support the piling rig. The platforms 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) and should also be designed to account for slope instability. To design the platforms 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.

4.2 Geotechnical Reduction Factor

In accordance with AS2159-2009, a geotechnical reduction factor (Φ_g) is to be applied to the ultimate values shown in Table 2 and Table 3 to derive ultimate geotechnical strengths for limit state design. This factor is dependent on assignment of an Average Risk Rating (ARR) which takes into account the redundancy of the pile system and the quantity and type of pile testing. RGS has undertaken calculation of Average Risk Ratings and resultant geotechnical reduction factors, as summarised in Appendix C of this report. The calculations require the consideration of a number of factors which can only be estimated by a geotechnical consultant at the site investigation stage of a project, and therefore some of the factors assumed in the calculation may need revision as project details become further available.

Based on the current understanding of the project, the following values have been calculated:

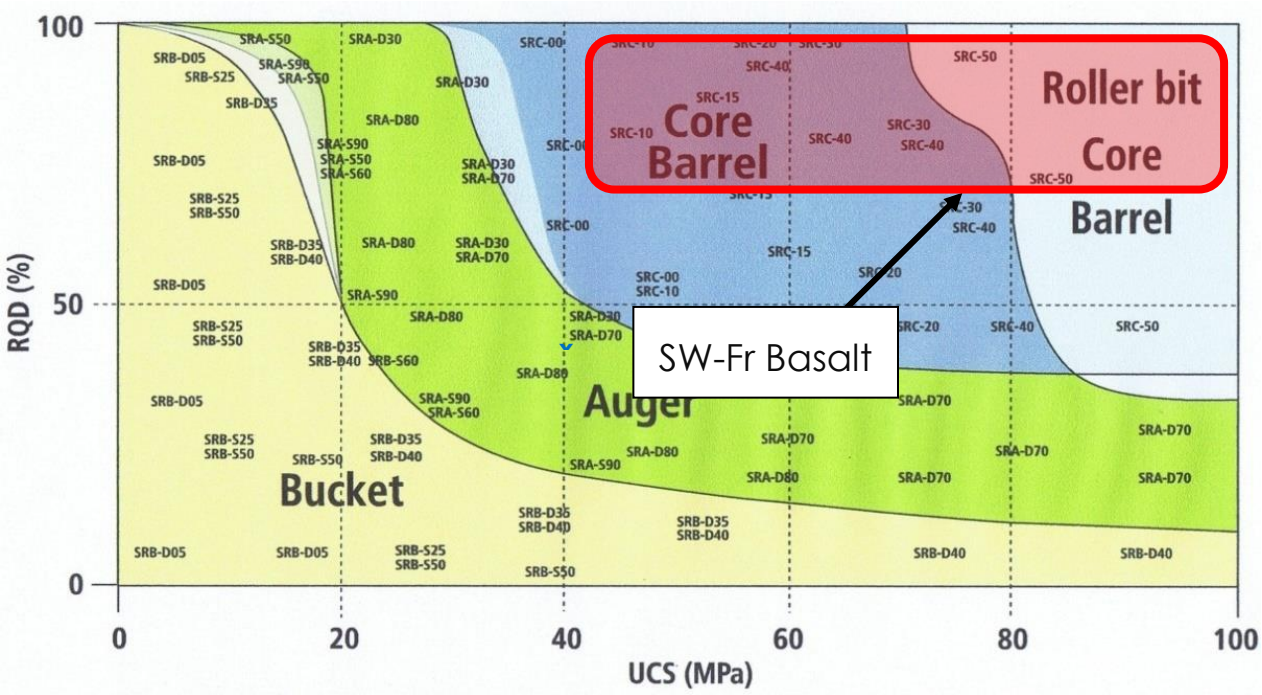
- Average Risk Rating 2.59
- Geotechnical strength reduction factor, Φ_g (no pile testing) 0.52
- Geotechnical strength reduction factor, Φ_g (static pile testing) 0.71

4.3 Excavation Conditions.

The excavation of open bored piles is not recommended due to the potential for groundwater inflows and collapse of the alluvial gravels. Temporary or permanent casing that extends to socket within the upper weathered rock profile are recommended.

Point load strength index testing was undertaken on the recovered core samples. The point load results have been converted to a Uniaxial Compressive Strength (UCS) based on a conversion factor of 25.

Soilmec provides a guideline for bored pile tool selection based on typical RQD and UCS, as shown below. The indicative UCS and RQD values indicate that excavation of the slightly weathered to fresh basalt will require a roller bit core barrel.



Guide to bored pile tool selection (Reproduced from Soilmec document 'Rock Drilling Tools' www.soilmec.com)

5 CHEMICAL AGGRESSIVITY

The results of the testing on samples of alluvial soil from both bridges are attached in Appendix B and are summarised below in Table 4.

Table 4: Summary of Aggressivity Results

Location and Material	Depth (m)	pH	Chlorides in Soil (mg/kg)	Sulfates in Soil (mg/kg)	Resistivity (ohm/cm)	Aggressivity Classification			
						Soil Condition A Sand and Gravel		Soil Condition B Silts and Clays	
						Steel	Concrete	Steel	Concrete
BH2 Clay	29.5 to 29.95	8.65	35.4	89	11,111	--	--	Non Aggressive	Non Aggressive
BH3 Clay	1.0 to 1.45	8.52	145.5	371	18,315	--	--	Non Aggressive	Non Aggressive
BH4 Clay	8.5 to 8.95	7.33	561.6	10,307	2,715	--	--	Non Aggressive	**Moderate**
BH4 Clay	20.5 to 20.95	6.63	90.6	1221	185,185	--	--	Non Aggressive	Non Aggressive

For piles installed in fresh water, the following classifications are recommended in accordance with AS2159-2009 '*Piling – Design and Installation*'.

- Concrete Piles in Submerged Fresh Water (Mild)
- Steel Piles in Fresh Water (**Moderate**)

Based on the above soil testing and the presence of running water at the site a **moderately aggressive** classification is recommended for **both concrete and steel elements** in accordance with AS2159-2009 '*Piling – Design and Installation*'.

6 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

Joel Babbage

Geotechnical Engineer

Reviewed by

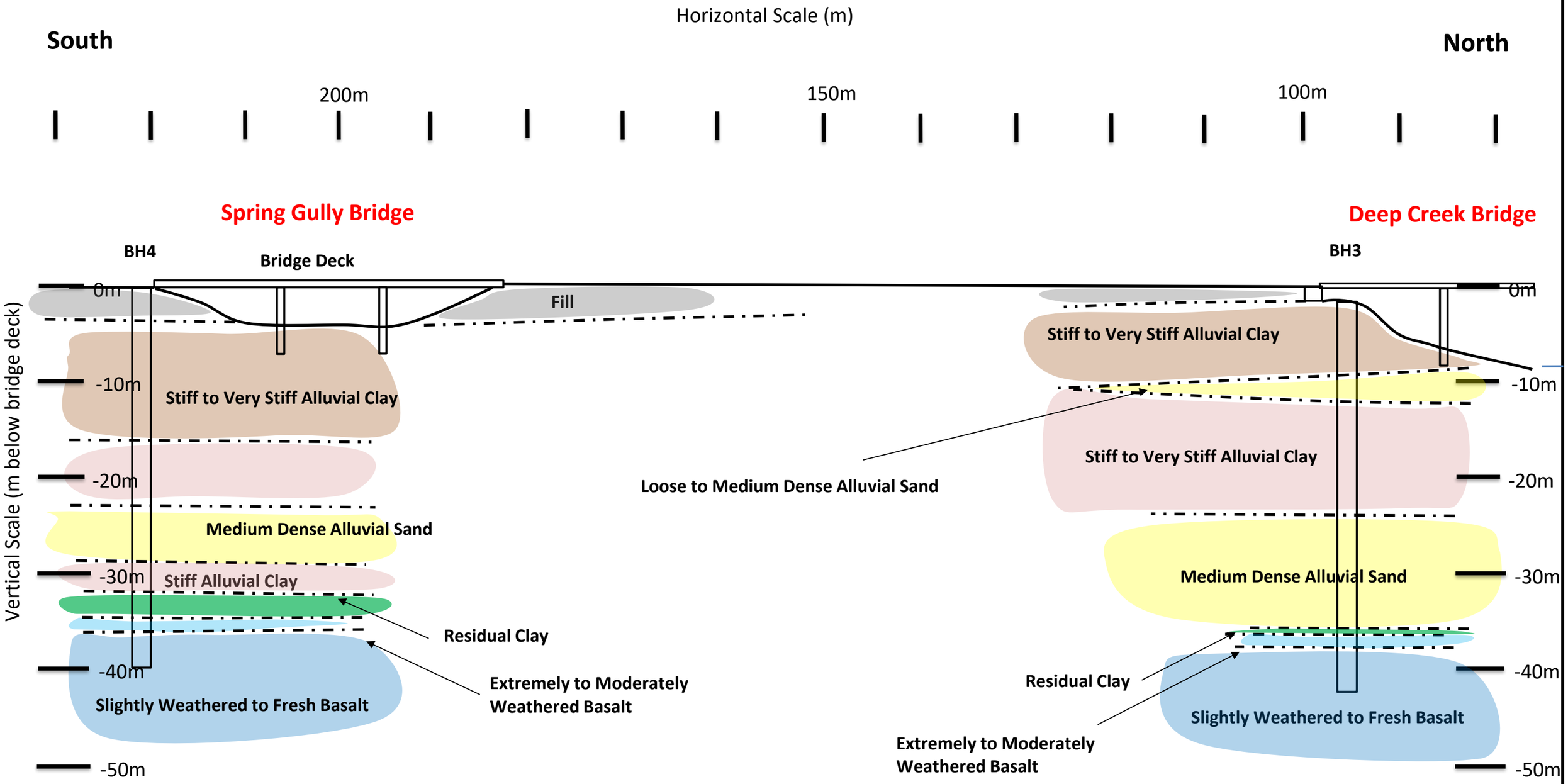
Matt Rowbotham

Associate Engineering Geologist

Figures

REGIONAL GEOTECHNICAL SOLUTIONS

Client	Bridge Knowledge	Job No.	RGS32900.1
Project:	Proposed Bridge Replacement Deep Creek and Spring Gully Bridge, Tatham	Drawn By:	JB
		Date:	7-Jan-22
Title:	Borehole Location Plan	Drawing No.	**FIGURE 1**



REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No. RGS32900.1
	Project:	Proposed Bridge Replacement Spring Creek Bridge, Tatham	Drawn By: JB Date: 7-Jan-22
	Title:	Interpreted Geotechnical Long Section	Drawing No. **FIGURE 2**

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH4

CLIENT: Bridge Knowledge
PAGE: 1 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515446 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6799934 m
DATUM: AHD

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	Not Encountered	1.00m SPT 13,10,8 N=18		1.0		CL	**FILL:** Sandy CLAY, low plasticity, brown and orange-brown, with fine to coarse grained gravel and cobbles	M < w_P				ALLUVIAL
							1.00m					
						CL	**FILL:** Gravelly CLAY, low plasticity, dark brown, fine to coarse grained gravel, with cobbles and boulders	M > w_P				
		2.50m SPT 1,2,4 N=6		2.0								
				3.0								
				4.0			4.00m					
						CH	**Silty CLAY:** High plasticity, grey, orange-brown		St			
		5.50m SPT 0,2,2 N=4		5.0								
				6.0						HP	140	
				7.0								
				8.0								
		8.50m SPT 3,4,6 N=10		9.0					VSt	HP	250	

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: BH4

CLIENT: Bridge Knowledge | **PAGE:** 2 of 5

PROJECT NAME: Proposed Bridge Replacements | **JOB NO:** RGS32900.1

SITE LOCATION: Tatham Bridges | **LOGGED BY:** JB

TEST LOCATION: Refer to Figure 1 | **DATE:** 4/11/21

DRILL TYPE: NCD Tracked Rig | **EASTING:** 515446 m | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** 6799934 m | **DATUM:** AHD

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	Not Encountered			11.0		CH	**Silty CLAY:** High plasticity, grey, orange-brown *(continued)*	$M > w_P$	VSt			ALLUVIAL
		SPT 11.50m 0,2,2 N=4		12.0						HP	210	
				13.0								
				14.0								
		SPT 14.50m 2,3,5 N=8		15.0		CH	14.50m **Silty CLAY:** High plasticity, grey, orange-brown, with shell fragments			HP	260	
				16.0								
				17.0		CI	16.50m **Silty CLAY:** Medium plasticity, grey and brown, trace fine grained sand		St			
		SPT 17.50m 3,5,7 N=12		18.0						HP	150	
				19.0		CI	19.00m **Silty CLAY:** Medium plasticity, grey and brown, trace fine grained sand					

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: BH4

CLIENT: Bridge Knowledge
PAGE: 3 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515446 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6799934 m
DATUM: AHD

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	Not Encountered	20.50m SPT 3,4,5 N=9		21.0		CI	**Silty CLAY:** Medium plasticity, grey and brown, trace fine grained sand *(continued)*	$M > w_P$	St	HP	180	ALLUVIAL
				22.0								
				23.0			23.00m					
		23.50m SPT 3,4,6 N=10		24.0		SP	**SAND:** Fine to medium grained, brown, trace clay fines	W	MD			
				25.0								
				26.0								
		26.50m SPT 3,6,10 N=16		27.0								
				28.0								
				29.0			29.00m					
		29.50m SPT 3,3,6 N=9				CL	**Sandy CLAY:** Low plasticity, brown, fine to medium grained sand	$M > w_P$	St	HP	140	

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: BH4

CLIENT: Bridge Knowledge
PAGE: 4 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515446 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6799934 m
DATUM: AHD

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	Not Encountered			31.0		CL	**Sandy CLAY:** Low plasticity, brown, fine to medium grained sand *(continued)*	M > w_P	St			ALLUVIAL
				32.0			32.20m					
		SPT 32.50m 11,15,22 N=37				Cl	**Sandy CLAY:** Medium plasticity, dark grey-brown, fine to medium grained sand	M < w_P	H / Fb			RESIDUAL
				33.0			**BASALT:** Dark grey, with some calcite inclusions					
				34.0								
				35.0			35.00m **EXTREMELY WEATHERED BASALT:** Sandy CLAY, low plasticity, grey-brown, fine to medium grained					
		SPT 35.50m 24,16/50mm N=R					35.80m					
				36.0			Continued as Cored Drill Hole					
				37.0								
				38.0								
				39.0								

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 - CORED BOREHOLE

BOREHOLE NO: BH4

CLIENT: Bridge Knowledge
PAGE: Page 5 of 5
PROJECT NAME: Proposed Bridge Replacements
JOB NO: RGS32900.1
SITE LOCATION: Tatham Bridges
LOGGED BY: JB
TEST LOCATION: Refer to Figure 1
DATE: 4/11/21

DRILL TYPE: NCD Tracked Rig
EASTING: 515446 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6799934 m
DATUM: AHD

Drilling and Sampling				Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
			31.0								
			32.0								
			33.0								
			34.0								
			35.0		START CORING AT 35.80m						
NMLC	0% LOSS		36.0		**BASALT:** Dark grey, with some calcite inclusions *(continued)*	SW	H		60		JT 20° PL RO Fe SN JT 50° IR RO Calcite JT 30° PL RO CN JT 10° IR RO CN JT 30° IR RO Calcite Clay seam 20mm JT 30° IR RO CN
			37.0		**BASALT:** Dark grey, vesicular (vesicles up to 30mm, some clay infill)						Extremely weathered clay seam JT 5° IR RO CN JT 50° PL RO CN JT 20° IR RO CN
			38.0						80		JT 20° IR RO CN JT 20° IR RO CN JT 10° IR RO CN JT 10° IR RO CN JT 10° IR RO Clay VN JT 40° IR RO CN
			39.0								JT 10° IR RO
					Hole Terminated at 39.23 m						

LEGEND:

Method

WB	Wash Bore
RR	Rock Roller
CB	Claw or Blad Bit
NMLC	NMLC Core
NQ,HQ,PQ	Wireline Coring

Bedding

Laminated	<20mm
Thinnly Bedded	20-200mm
Medium Bedded	200-600mm
Thickly Bedded	600-2000mm
Very Thickly Bedded	2000mm
Massive	No Visible Bedding

Degree of Fracturing

Fragmented	<20mm
Highly Fractured	20mm to 40mm
Fractured	40mm to 200mm
Slightly Fractured	200mm to 1000mm

Weathering

EW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
SW	Slightly Weathered
FR	Fresh

Strength

		$I_{s(50)}$
VL	Very Low	<0.1
L	Low	0.1 - 0.3
M	Medium	0.3 - 1
H	High	1 - 3
VH	Very High	3 - 10
EH	Extremely High	>10

Defect Type

JT	Joint
PT	Parting
SM	Seam
SZ	Shear Zone
CS	Crushed Seam

Roughness

VR	Very Rough
RO	Rough
SO	Smooth
SL	Slickensided

Coating

CN	Clean
SN	Stained
VN	Veneer(<1mm)
CO	Coating(1-5mm)

Planarity

PL	Planar
CU	Curved
ST	Stepped
IR	Irregular

BH4 35.8m to 39.23m

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Bridge Knowledge	Job No.	RGS32900.1
	Project:	Spring Gully Bridge Replacement Tatham	Drawn By:	MR
			Date:	19.1.22
	Title:	BH4 Core Photo 38.5 to 39.23m	Core Photo No.	**BH4**

Appendix B

Laboratory Test Result Sheets

RESULTS OF SOIL ANALYSIS

4 samples supplied by Regional Geotechnical Solutions Pty Ltd on 16/11/2021 - Lab Job No. M3547
Analysis requested by Joel Babbage. - **Your Project: RGS32900.1 Bridge Knowledge**
44 Bent Street WINGHAM NSW 2429

	Method	Sample 1 BH2 29.5-29.95	Sample 2 BH3 1-1.45	Sample 3 BH4 8.5-8.95	Sample 4 BH4 20.5-20.95
	EAL job No.	***M3547/1***	***M3547/2***	***M3547/3***	***M3547/4***
Moisture (%)	*inhouse*	32	24	25	28
Texture	*See note 2 below.*	Fine	Fine	Fine	Fine
pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.65	8.52	7.33	6.63
Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.090	0.546	3.683	0.054
Resistivity (ohm.mm)	** Calculation	111,111	18,315	2,715	185,185
Resistivity (ohm.cm)	** Calculation (ohm.mm / 10)	11,111	1,832	272	18,519
Chloride (mg/kg)	** Water Extract - ISE (1:5 Water)	35.4	145.5	561.6	90.6
Chloride **(as %)**	** Calculation	0.004	0.015	0.056	0.009
Sulfate (mg/kg)	** Water Extract-APHA 3120 ICPOES	89	371	10,307	1,221
Sulfate **(as % SO_4)**	** Calculation	0.009	0.037	1.031	0.122
Chloride / Sulfate Ratio	** Calculation	0.4	0.4	0.1	0.1

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 24/11/2021.

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

Point Load Strength Report - Diametral and Axial Testing of Rock Core

REGIONAL GEOTECHNICAL SOLUTIONS

Client:	Bridge Knowledge	**Job Number:**	RGS32900.1
Project:	Proposed Bridge Replacements	**Date:**	7/01/2022
Location:	Tatham Bridges	**By:**	JB

Date Sampled:	9/11/2021
Date Tested:	07-Jan-22

Test Method: AS4133.4.1 - 2007

Test Machine: HMA 6510

Date of Calibration: 18-Aug-20

Borehole	Test Depth (m)	Rock Type	Moisture Condition	Diametral Test							Axial Test								
				Length L (mm)	Diameter D (mm)	Load P (kN)	I_s (Mpa)	Size Correction	$I_{s(50)}$ (Mpa)	Strength Classification	Width W (diameter)	Platen Separation	Load P (kN)	I_s (Mpa)	Size Correction	$I_{s(50)}$ (Mpa)	Strength Classification	UCS (Mpa)	Anisotropy Index $I_{a(50)}$
BH1	34.2	BASALT	N	100.0	52.0	4.66	1.72	1.02	1.75	H	52	30	2.57	1.29	0.950	1.23	H	24.57252	1.43
	35.3	BASALT	N	120.0	52.0	16.72	6.18	1.02	6.29	VH									
	36.6	BASALT	N	140.0	52.0	6.49	2.40	1.02	2.44	H	52	40	4.36	1.65	1.013	1.67	H	33.35612	1.46
BH2	30.3	BASALT	N	80.0	52.0	21.70	8.03	1.02	8.17	VH	52	35	19.16	8.27	0.983	8.13	VH	162.5655	1.00
	31.4	BASALT	N	120.0	52.0	22.21	8.21	1.02	8.36	VH									
	32.9	BASALT	N	120.0	52.0	14.86	5.50	1.02	5.59	VH									
BH3	36.2	BASALT	N	100.0	52.0	0.35	0.13	1.02	0.13	L	52	41	0.27	0.10	1.019	0.10	L	2.026478	1.30
	37.4	BASALT	N	100.0	52.0	5.23	1.93	1.02	1.97	H	52	43	4.64	1.63	1.030	1.68	H	33.56336	1.17
	38.9	BASALT	N	100.0	52.0	6.68	2.47	1.02	2.51	H	52	36	5.78	2.43	0.989	2.40	H	47.98207	1.05
	39.6	BASALT	N	120.0	52.0	9.71	3.59	1.02	3.65	VH	52.0	27.0	7.72	4.32	0.927	4.00	VH	80.09325	0.91
	40.9	BASALT	N	110.0	52.0	12.38	4.58	1.02	4.66	VH									
BH4	35.9	BASALT	N	100.0	52.0	2.98	1.10	1.02	1.12	H									
	36.7	BASALT	N	160.0	52.0	2.39	0.88	1.02	0.90	M									
	37.8	BASALT	N	100.0	52.0	5.22	1.93	1.02	1.96	H									
	38.9	BASALT	N	100.0	52.0	3.16	1.17	1.02	1.19	H	52	40	3.14	1.19	1.013	1.20	H	24.02253	0.99

Moisture Condition:
D = Dry
N = Natural
S = Saturated

Strength Classification:

$I_{s(50)}$ Mpa	Term	Abbreviation
> 10	Extremely High Strength	EH
3 to 10	Very High Strength	VH
1 to 3	High Strength	H
0.3 to 1	Medium Strength	M
0.1 to 0.3	Low Strength	L
< 0.1	Very Low Strength	VL

Template Revision: B

Appendix L

SES Consultation

14 August 2024
Ref No: 5060-1004

New South Wales State Emergency Service

Via email: rra@ses.nsw.gov.au

To whom it may concern

State Environmental Planning Policy (Transport and Infrastructure) 2021: Deep Creek and Spring Gully Bridge Replacement, Casino-Coraki Road, Tatham

GeoLINK has been engaged by Quickway, on behalf of Richmond Valley Council (RVC), to prepare a Review of Environmental Factors (REF) for the replacement of Deep Creek and Spring Gully twin bridges on the Casino-Coraki Road at Tatham. These bridges are located on land that has been mapped by RVC as flood liable land.

Deep Creek and Spring Gully Bridges

Under the State Environmental Planning Policy (Transport and Infrastructure) 2021, RVC is required to consult with NSW State Emergency Services (SES) under Section 2.13 due to the development being on flood liable land. The new structures are anticipated to be constructed offline to the existing bridges so they can be used as temporary crossings during construction, and we do not expect any changes to flood regimes as a result of the proposed works; however, we are giving notice as per the planning requirements. Design drawing of the proposed bridge replacement works are attached.

PO Box 119
Lennox Head
NSW 2478
Bundjalung Nation
02 6687 7666

PO Box 1446
Coffs Harbour
NSW 2450
Gumbaynggir Country
02 6651 7666

PO Box 1267
Armidale
NSW 2350
Nganyaywana Country
02 6772 0454

PO Box 229
Lismore
NSW 2480
Bundjalung Nation
02 6621 6677

GeoLINK (on behalf of RVC) is currently preparing the REF, as per the requirements under Part 5 of the *Environmental Planning and Assessment Act 1979*. It would be appreciated if you could provide any comments State Emergency Service may have within 21 days of receipt of this letter.

If any further information is required, please do not hesitate to contact me by telephone on 02 6687 7666, or by email msmith@geolink.net.au.

Yours sincerely

GeoLINK

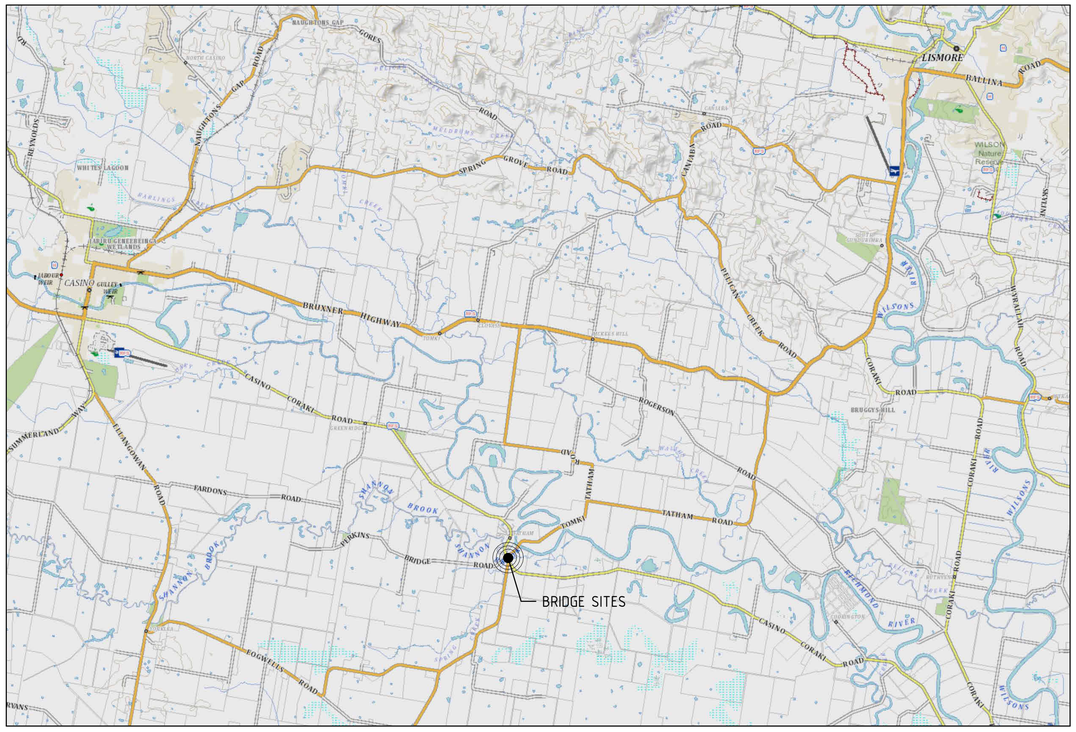
Megan Smith
Environmental Planner

Attach: Bridge over Spring Gully Desing Drawings

Bridge over Deep Creek Design Drawings

BRIDGES OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

AUTHORITY: RICHMOND VALLEY COUNCIL



1/001 **LOCATION**
N.T.S.

DRAWING LIST

SHEET No.	SHEET NAME	REV.	DATE
GENERAL			
VP402530-G001	COVER SHEET	T2	13/06/24
VP402530-S201	STRUCTURAL NOTES - SHEET 1	T2	13/06/24
VP402530-S202	STRUCTURAL NOTES - SHEET 2	T2	13/06/24
VP402530-S203	STRUCTURAL NOTES - SHEET 3	T2	13/06/24
STRUCTURAL (DEEP CREEK BRIDGE)			
VP402530-S210	GENERAL ARRANGEMENT	T2	13/06/24
VP402530-S211	TYPICAL SECTIONS - SHEET 1	T2	13/06/24
VP402530-S212	TYPICAL SECTIONS - SHEET 2	T2	13/06/24
VP402530-S213	PERSPECTIVE VIEW	T2	13/06/24
STRUCTURAL (SPRING GULLY BRIDGE)			
VP402530-S310	GENERAL ARRANGEMENT	T2	13/06/24
VP402530-S311	TYPICAL SECTIONS - SHEET 1	T2	13/06/24
VP402530-S312	TYPICAL SECTIONS - SHEET 2	T2	13/06/24
VP402530-S313	PERSPECTIVE VIEW	T2	13/06/24

BRIDGE DESIGN:
BRIDGE DESIGN TO AS5100-2017
TRAFFIC LOADING SM1600. DESIGN SPEED 100km/h.
EARTHQUAKE DESIGN CLASSIFICATION BEDC-2.
ALLOWANCE FOR SUPERIMPOSED DEAD LOADS 1.7kPa (serviceability)
TRAFFIC BARRIERS 'LOW PERFORMANCE' LEVEL.

WATERWAY DATA (EXCLUDING AFFLUX):

ANNUAL EXCEEDENCE PROBABILITY (%)	FLOW m^3/s	VELOCITY (AVERAGE) m/s	WATER LEVEL (excl. AFFLUX) RL (m)	ULTIMATE LOAD FACTOR γ_{WF}
5		max. 3	≈12.0	1.0
1		max. 3	≈12.25	1.3
0.05		max. 3	≈15.25	1.3

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

COVER SHEET

Project Number: **VP402530**
Sheet: **1 OF 12**
Issue: **T2**
Drawing Number: **VP402530-G001**

W:\Jobs\2024 Jobs\Quickway\VP402530 RVC Tatham\Tender Design\Tatham®_Tender Model.rvt 13/06/2024 2:34:37 PM

GENERAL:

G1. DESIGN SPECIFICATIONS: AS5100-2017 EXCEPT WHERE NOTED

G2. PRODUCT TRADE NAMES HAVE BEEN USED TO ESTABLISH A QUALITY REQUIREMENT NO SUBSTITUTIONS SHALL BE MADE WITHOUT WRITTEN APPROVAL.

G3. RESPONSIBILITY FOR DESIGN CERTIFICATION OF ITEMS SHOWN ON THESE DRAWINGS:
- ALL STRUCTURAL ELEMENTS: PETER LOWNDES CONSULTING ENGINEER.

G4. DRAWINGS TO BE READ IN CONJUNCTION WITH:
- GEOTECHNICAL REPORT: REGIONAL GEOTECHNICAL SOLUTIONS REPORT REF. NO. RGS32900.1-AB DATED JANUARY 2022

G5. EXTENTS OF SUPPLIED GEOTECHNICAL INFORMATION:
GENERAL INDICATION ONLY OF THE CONDITIONS LIKELY TO BE ENCOUNTERED.
GROUND CONDITIONS COULD VARY.

G6. ENGINEERING DESIGN IS BASED ON SURVEY SUPPLIED BY: RICHMOND VALLEY COUNCIL
IMPORTANT SURVEY NOTES:
- DESIGN USES DATA TERRAIN MODEL COMPUTER GENERATED FROM THE SITE SURVEY.
- SOME ELEMENTS OF THE SURVEY DATA ARE INTERPOLATED AND MAY VARY FROM THE ACTUAL SITE CONDITIONS.
- CONTRACTOR SHALL LIAISE WITH THE SURVEYOR AND SET OUT THE WORKS ONLY FROM APPROVED BENCHMARKS.

G7. CONSTRUCTION TO BE SET OUT USING FOLLOWING SURVEY INFORMATION:
BENCHMARKS PROVIDED BY RICHMOND VALLEY COUNCIL'S SURVEYOR.

G8. CONTRACTOR TO OBTAIN APPROVAL FOR FULL EXTENT OF VEGETATION CLEARING BEFORE COMMENCING WORKS.

G9. CONTRACTOR TO MAINTAIN 'AS CONSTRUCTED' RECORDS TO FOLLOWING STANDARD:
COUNCIL'S 'AS CONSTRUCTED' REQUIREMENTS

G10. CURRENT EDITION OF STANDARDS (AT TIME OF CONSTRUCTION) TO BE USED, UNO.

DIMENSIONS / LEVELS:

L1. REDUCED LEVELS, CHAINAGES AND COORDINATES ARE ALL IN METRES.

L2. ALL OTHER DIMENSIONS ARE IN MILLIMETRES.

L3. ALL LEVELS ARE TO LOCAL SITE DATUM ONLY

L4. ALL COORDINATES ARE TO LOCAL GRID DATUM ONLY

L5. DIMENSIONS SHALL NOT BE SCALED FROM DRAWINGS.

L6. BRIDGE LEVELS AND SETOUT POINTS ARE TO BE CONFIRMED ON SITE BY A REGISTERED SURVEYOR PRIOR TO CONSTRUCTION. ADVISE ANY DISCREPANCY BEFORE PROCEEDING.

EXISTING SERVICES:

ES1. LOCATE SERVICES BEFORE STARTING: SERVICE LOCATIONS SHOWN ON DRAWINGS ARE APPROXIMATE ONLY.

ES2. POTHOLE AND PROTECT SERVICES: ACCURATELY LOCATE SERVICES ADJACENT TO BRIDGE STRUCTURE BEFORE COMMENCING CONSTRUCTION. PROTECT SERVICES FROM DAMAGE.

TEMPORARY WORKS:

T1. OBTAIN DESIGN AND INSTALLATION CERTIFICATION FOR TEMPORARY WORKS:
STRUTS, PROPPING, TIE BACKS, EXCAVATION SHORING, PROTECTION WORKS, DE-WATERING SYSTEMS, FORMWORK, EARLY LOADING OF STRUCTURES AND THE LIKE.

T2. INSTALL SUITABLE AND STRONG BARRIERS FOR THE PROTECTION AND SAFEGUARDING OF TRAFFIC AND PEDESTRIANS.

T3. ANY TEMPORARY ROAD SURFACES TO BE TRAFFIC-ABLE AT ALL TIMES AT LOW SPEED (30 km/hr). POTHOLES, ETC. TO BE MONITORED AND REPAIRED.

DEMOLITION OF EXISTING BRIDGE:

DB1. DISMANTLE EXISTING BRIDGE SUPERSTRUCTURE. STACK GOOD TIMBER ON SITE FOR COUNCIL. CONTRACTOR TO DISPOSE OF REMAINDER.

DB2. CUT EXISTING HARDWOOD PILES OFF AT EXISTING GROUND LEVEL.

PROGRAM AND CONSTRUCTION CONSTRAINTS:

PR1. CONSTRUCTION CONSTRAINTS:
- ALLOW FOR LIKELIHOOD OF FLOODING WITHIN THE CREEK:
PROTECT CONSTRUCTION EQUIPMENT AND WORKS
- PROGRAM CONSTRUCTION WORKS TO OCCUR DURING DRY WINTER MONTHS (JUNE TO SEPTEMBER), TO REDUCE LIKELIHOOD OF FLOODING

PR2. PROVIDE WORK SCHEDULE AND CONSTRUCTION SITE PLAN INDICATING ACCESS, PROTECTIVE FENCING, BARRIERS, BOARDING'S, SIGNAGE AND SEDIMENT & EROSION CONTROL.

PR3. PROVIDE A TRAFFIC MANAGEMENT PLAN INCORPORATING:
- RICHMOND VALLEY COUNCIL REQUIREMENTS
- DETAILS OF PUBLIC NOTIFICATION PROPOSALS (IN ACCORDANCE WITH PROJECT SPECIFICATION)
- PROVISION TO ADVISE THE SUPERINTENDENT OF ALL IMPENDING CHANGES TO TRAFFIC CONDITIONS
- INFORMATION SIGNAGE FOR ALTERED TRAFFIC CONDITIONS INCLUDING TRAFFIC DETOURS AND ACCESS FOR PRIVATE PROPERTIES.
- CONTACT DETAILS OF PERSON RESPONSIBLE FOR MAINTENANCE OUTSIDE WORKING HOURS.
- DETAILS OF PROPOSED SIGNAGE LAYOUTS, INCLUDING REQUIREMENTS FOR NIGHT WORK AND TEMPORARY DIRECTION.

PR4. PROVIDE COMMENCEMENT NOTICE, OPERATIONAL WORKS SIGNAGE AND COMPLETION NOTICE AS REQUIRED BY THE ENVIRONMENTAL APPROVALS.

DESIGN LOADINGS / PARAMETERS:

D1. CONCRETE UNIT WEIGHT (INCL. REINFORCING): 25.5 kN/m^3

D2. ASPHALT UNIT WEIGHT: 24.5 kN/m^3

D3. TRAFFIC LOADING:
STANDARD HIGHWAY LOADING: SM1600, W80, A160 AS PER AS5100-2017

D4. ALLOWANCE FOR SUPERIMPOSED DEAD LOADS: 1.7 kPa (SERVICEABILITY)

D5. MINIMUM DESIGN LATERAL LOADING: 500 kN

D7. DESIGN LIFE: 100 YEARS FOR ALL CONCRETE ELEMENTS

D8. AVERAGE BRIDGE TEMPERATURE RANGES: +45°C, -5°C

D9. AVERAGE BRIDGE TEMPERATURE: 20-25 °C FOR SETTING BEARINGS AND JOINTS.

D10. WATERWAY/FLOOD DATA (EXCLUDING AFLUX):
HYDROLOGY/HYDRAULIC DATA TAKEN PRELIMINARY CALCULATIONS ONLY.
- AEP 5 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.0 m, γw=1.0
- AEP 1 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈12.25 m, γw=1.3
- AEP 0.05 EVENT: $V_{AVERAGE}$= max. 3 m/s, RL ≈15.25 m, γw=1.3

D11. THE FOLLOWING MAXIMUM SCOUR HAS BEEN CONSIDERED FOR BRIDGE ABUTMENT/PIER DESIGN:
ABUTMENT SCOUR TO APPROX. 2m
ABUTMENTS A & B - SCOUR PROTECTION SIZED TO ARI100 FLOOD VELOCITIES
PIER SCOUR TO APPROX. 3m

D12. DESIGN GUST WIND SPEED (ULTIMATE): V_{SITE} = 63 m/s; (TERRAIN CATEGORY 2; REGION B)

D13. EARTHQUAKE: BEDC-2

D14. PROBABILITY FACTOR: k_p = 1.0
SEISMIC HAZARD FACTOR: z = 0.08

D15. DESIGN LANE WIDTH: 3.2m

D16. ROAD DESIGN SPEED AS FOLLOWS: - ALL: 100 km/h

D17. DESIGN TRAFFIC VOLUMES: - CURRENT AADT:

D18. BRIDGE TRAFFIC BARRIERS: 'LOW PERFORMANCE' PERFORMANCE LEVEL (DETERMINED IN ACCORDANCE WITH AS5100)

STANDARD SPECIFICATIONS:

TRANSPORT FOR NEW SOUTH WALES (TfNSW) SPECIFICATIONS
R44 *EARTHWORKS*
B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*
B50 *DRIVEN REINFORCED CONCRETE PILES*
B53 DRIVEN H-SECTION STEEL PILES
B58 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITH PERMANENT STEEL CASINGS*
B59 *BORED CAST IN PLACE REINFORCED CONCRETE PILES WITHOUT PERMANENT STEEL CASINGS*
B80 *CONCRETE WORK FOR BRIDGES*
B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B150 *ERECTION OF PRETENSIONED PRECAST CONCRETE MEMBERS*
B170 *SUPPLY AND INSTALLATION OF VOID FORMERS*
B201 *STEELWORK FOR BRIDGES*
B220 *PROTECTIVE TREATMENT OF BRIDGE STEELWORK*
B240 *SUPPLY OF BOLTS, NUTS, SCREWS AND WASHERS*
B264 *ERECTION OF BARRIER RAILINGS AND MINOR COMPONENTS*
B280 *UNREINFORCED ELASTOMERIC BEARING PADS AND STRIPS*
B281 *LAMINATED ELASTOMERIC BEARINGS*
B284 *INSTALLATION OF BRIDGE BEARINGS*
3552 SUBSURFACE DRAINAGE PIPE (CORRUGATED PERFORATED AND NON-PERFORATED PLASTIC)

CONSTRUCTION SEQUENCE NOTES:

BRIDGE DESIGN IS BASED ON THE CONSTRUCTION SEQUENCE AS FOLLOWS:

CS1. DEMOLISH EXISTING BRIDGE SUPERSTRUCTURE AND PIERS AND REMOVE COMPLETLEY.
CUT DOWN EXISTING BRIDGE ABUTMENTS TO LEVEL OF UNDERSIDE OF NEW ABUTMENTS.

CS2. WHERE REQUIRED, CONSTRUCT ROCKWORK RETAINING STRUCTURES AROUND ABUTMENTS

CS3. CONSTRUCT WORKING SLABS UNDER NEW ABUTMENTS AND TIE IN TO RETAINED PORTIONS OF EXISTING ABUTMENT STRUCTURES.

CS4. INSTALL PILE/ROCK ANCHOR FOUNDATIONS.

CS5. LOCALLY INSTALL ANY ADDITIONAL ROCK PROTECTION AROUND ABUTMENTS.

CS6. CONSTRUCT ABUTMENT HEADSTOCKS AND WING WALLS.

CS7. PREPARE BEARING/GROUT PADS FOR DECK UNIT ERRECTION.

CS8. ERECT DECK UNITS ON BEARINGS/GROUT PADS AND GROUT INTO PLACE. ERECT NO EARLIER THAN 30 DAYS AFTER DECK UNIT MANUFACTURE.

CS9. CONSTRUCT DECK SLAB.

CS10. BACKFILL BEHIND ABUTMENTS. BACKFILL TO OCCUR NO EARLIER THAN 7 DAYS AFTER DECK CONSTRUCTION OF DECK SLAB. BACKFILL SHALL BE UNDERTAKEN IN A MANNER SUCH THAT THE FILL DEPTHS AT THE TWO OPPOSING ABUTMENTS DO NOT VARY BY MORE THAN 600mm.

CS11. INSTALL BRIDGE TRAFFIC BARRIERS.

CS12. COMPLETE APPROACH ROAD WORKS AND REMOVE EXISTING BRIDGE STRUCTURE,

CS13. COMPLETE ROCK PROTECTION WORKS AS REQUIRED.

NOT FOR CONSTRUCTION

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Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\ICAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 1

Project Number: VP402530
Sheet: 2 OF 12
Issue: T2
Drawing Number: VP402530-S201

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EARTHWORKS:

EW1. EARTHWORKS SHALL BE IN ACCORDANCE WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS*.

EW2. CLEAR ALL VEGETATION FROM AREAS TO BE EXCAVATED OR FILLED. ALL RUBBISH INCLUDING DEBRIS FROM CLEARING TO BE DISPOSED IN ACCORDANCE WITH LOCAL AUTHORITY STANDARDS. BURNING NOT ALLOWED.

EW3. ALL ORGANIC MATERIAL, TOPSOIL AND UNSUITABLE SUBGRADES ARE TO BE STRIPPED FROM THE AREA TO BE FILLED AND REMOVED FROM THE SITE. SUFFICIENT TOPSOIL IS TO BE RETAINED FOR RE-SPREADING TO A MINIMUM DEPTH OF 75 mm ALL OVER THE SITE AFTER EARTHWORKS. AFTER STRIPPING AS ABOVE THE WHOLE SITE IS TO BE COMPACTED AND PROOF ROLLED TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT PRIOR TO PLACING OF EMBANKMENT.

EW4. FILLING IS TO BE CARRIED OUT IN CONTROLLED LAYERS NOT TO EXCEED 200mm DEPTH. EACH LAYER IS TO BE COMPLETELY COMPACTED TO A MINIMUM OF 95% RELATIVE DRY DENSITY FOR COHESIVE SOILS OR A MINIMUM DENSITY INDEX OF 70% FOR NON-COHESIVE SOILS AND TESTED AND APPROVED BY THE GEOTECHNICAL CONSULTANT PRIOR TO THE PLACEMENT OF THE NEXT LAYER. THE TOP 300mm OF THE ROAD SUBGRADE IS TO BE COMPACTED TO A MINIMUM OF 98% RELATIVE DRY DENSITY.

EW5. MATERIAL IN ANY PARTICULAR LAYER SHOULD BE HOMOGENOUS. IF NECESSARY, SMALL QUANTITIES OF FILL DIFFERING FROM THE REST SHOULD BE SPREAD AS A THIN LAYER OVER THE WHOLE SITE AND INCORPORATED INTO A FULL LAYER. IN A CUT/FILL SITUATION THE GEOTECHNICAL CONSULTANT MAY DIRECT THAT ANY EXISTING SOIL WITHIN 600mm OF THE FINISHED SURFACE LEVEL BE REMOVED AND REPLACED WITH FILL EQUIVALENT TO THE GENERAL FILL MATERIAL. THE MATERIAL SO REMOVED MAY, IF IT OTHERWISE MEETS THE SPECIFICATION, BE USED AS GENERAL FILL AS ABOVE.

EW6. FILL (IMPORTED OR IN-SITU) IN ROADWAYS IS TO CONSIST OF HOMOGENOUS SITE MATERIAL CONTINUOUSLY GRADED WITH A MAXIMUM PARTICLE SIZE OF 75mm, A MINIMUM CBR OF 8 AND A MOISTURE CONTENT BETWEEN -2% TO +2% OF OPTIMUM MOISTURE CONTENT AT TIME OF COMPACTION. REFER NOTES BA1, BA2 FOR BACKFILL BEHIND STRUCTURES.

EW7. ALL TESTING IS TO BE CARRIED OUT BY A NATA CERTIFIED LABORATORY.

EW8. ALL "UNCONTROLLED FILL" IDENTIFIED ON SITE SHALL BE REMOVED TO NATURAL SURFACE LEVEL AND, IF SUITABLE, REUSED AND PLACED AS SPECIFIED ABOVE.

EW9. VISIBLE SUBGRADE MOVEMENT SHALL BE ASSESSED USING A WATER TRUCK WITH A SINGLE REAR AXLE AND A GROSS MASS OF NOT LESS THAN 15 TONNES OR APPROVED SIMILAR.

LEVELLING GROUT, INJECTION EPOXY AND NON-SHRINK GROUT:

LG1. GENERAL PURPOSE SHRINKAGE COMPENSATED CEMENTITIOUS GROUT TO BE PARCHEM "CONSTRUCTION GROUT" OR APPROVED EQUIVALENT.

LG2. LEVELLING GROUT FOR BEARING PADS TO BE PARCHEM "RENDEROC BB", OR APPROVED EQUIVALENT, SUITABLE FOR 20mm - 150mm THICKNESS.

LG3. INJECTION EPOXY FOR EPOXYING OF FIXING BOLTS AND REINFORCEMENT BARS TO BE RAMSET "CHEMSET REO502", OR APPROVED EQUIVALENT. HOLES TO BE BLOWN/VACUUMED AND DRY PRIOR TO INSTALLATION OF EPOXY.

CONCRETE:

C1. CONCRETE WORKS TO BE IN ACCORDANCE WITH: TfNSW B80 *CONCRETE WORKS FOR BRIDGES*.

C2. CONCRETE STRENGTH, EXPOSURE CLASSIFICATION AND REINFORCEMENT COVER SHALL BE AS FOLLOWS:

ITEM	EXPOSURE	f'c (MPa) & AGGREGATE SIZE	REINFORCEMENT COVER (ALL FACES) (mm)	TARGET SLUMP (mm)	SURFACE FINISH
ABUTMENTS & WINGWALLS	B1	S40/20	45	100	FORMED
DECK	B1	S40/20	45	100	LIGHT BROOM
PIER PILECAP, COLUMNS & HEADSTOCK	B1	S40/20	45	100	FORMED
PRECAST PILES	B1	S50/20	40	100	FORMED
PSC BEAMS	B1	S50/20	40	100	FORMED

NOTE: N = NORMAL PLACEMENT OF CONCRETE, T = TREMIE PLACEMENT OF CONCRETE

C3. CONCRETE SHALL BE VIBRATED AS FOLLOWS:
- PRECAST ELEMENTS TO BE CAST IN RIGID FORMS AND SUBJECTED TO INTENSE VIBRATION.
- ALL OTHER CONCRETE TO BE VIBRATED UNO.

C4. CONCRETE ELEMENT EDGE FINISHING:
- CHAMFER EDGES 20X20 AND FILLET RE-ENTRANT ANGLES 20X20 USO.
- NCF DENOTES NO CHAMFER OR FILLET.

C5. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER.

C6. REINFORCEMENT SHALL BE SUPPORTED TO GIVE THE CORRECT CONCRETE COVER ON CHAIRS AS FOLLOWS:
- ALL BRIDGE ABUTMENTS, PIERS AND PRECAST DECK UNITS: EXTRUDED FIBRE CONCRETE BLOCKS (60MPa MINIMUM COMPRESSIVE STRENGTH) OR STAINLESS STEEL NIBS WELDED TO THE REINFORCEMENT
- PILES IN GROUND: PLASTIC CHAIRS AND SPACERS
- ALL OTHER CONCRETE: PLASTIC CHAIRS AND SPACERS.

C7. CONSTRUCTION JOINTS SHALL BE USED ONLY AS SHOWN ON THE DRAWINGS. NO CONSTRUCTION JOINT SHOWN ON THE DRAWINGS SHALL BE OMITTED WITHOUT THE WRITTEN APPROVAL OF THE DESIGN ENGINEER.

C8. TIME FOR SAWCUTTING (WHERE SHOWN ON DRAWINGS): WITHIN 8-10 HOURS OF FINISHING WORKS.

C9. ANY CONCRETE FACE AGAINST WHICH NEW CONCRETE IS TO BE PLACED SHALL BE THOROUGHLY SCABBLED. CLEAN OFF DUST AND CONTAMINANTS BEFORE NEW POUR.

C10. FORMWORK TO REMAIN IN POSITION FOR FOLLOWING TIMEFRAMES UNO:
- SOFFITS OF SUSPENDED SLABS, BEAMS, HEADSTOCKS CONCRETE: COMPRESSIVE STRENGTH TO EXCEED 70% OF F'C AND MINIMUM CONCRETE AGE OF 7 DAYS
- SIDEFORMS: COMPLY WITH REQUIREMENTS OF AS5100.5 cl17.8 AND TIMEFRAMES DETAILED IN ITP FOR ELEMENT.

C11. LOADING OF STRUCTURES WITH COMPRESSIVE STRENGTH LESS THAN *f'c*: OBTAIN APPROVAL BEFORE APPLYING LOADS OR DESIGN & INSTALL SUITABLE PROPPING IN ACCORDANCE WITH NOTE T1.

C12. CONCRETE TO BE CURED TO THE STANDARD (SHOWN IN NOTE C1) AND BELOW REQUIREMENTS:
- ALL EXPOSED SURFACES: SPRAY WITH ALIPHATIC ALCOHOL AFTER FIRST SCREED, AND AGAIN AFTER EACH FINISHING OPERATION.

CURING PERIODS:
- ABUTMENT HEADSTOCKS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.
- BRIDGE DECK AND APPROACH SLABS: 7 DAYS DURATION, COMMENCING WITHIN 1 HOUR OF FORMWORK STRIPPING.

PREFERRED CURING METHODS:
- UNDER PLASTIC, LAPPED AND TAPED. HOSE WITH WATER ONCE DAILY UNDER PLASTIC AND RETAPE; OR
- COAT WITH FOSROC CONCURE A99 CURING COMPOUND TO TfNSW B80 cl8.4 REQUIREMENTS.
- PRECAST ELEMENTS TO BE STEAM CURED TO TfNSW B110 *SUPPLY OF PRETENSIONED PRECAST CONCRETE MEMBERS*.

REINFORCEMENT:

R1. REINFORCEMENT SHALL CONFORM WITH TfNSW B80 *CONCRETE WORK FOR BRIDGES*. ALL REINFORCEMENT TO BE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL) CERTIFIED.

R2. REINFORCEMENT SHALL BE GRADE D500N HOT ROLLED HIGH YIELD BARS TO AS4671 UNO. WHERE R BARS ARE SPECIFIED, THESE SHALL BE ROUND BARS GRADE R250N.

R3. BAR SHAPES ARE AS SHOWN ON DRAWING

R4. HOOKS AND COGS SHALL BE IN ACCORDANCE WITH AS5100 cl 13.1.2.7.

R5. LAPS AND OTHER SPLICES IN REINFORCEMENT SHALL ONLY BE MADE AT THE POSITIONS SHOWN ON THE DRAWINGS UNLESS ALTERNATIVE OR EXTRA LOCATIONS ARE APPROVED IN WRITING BY THE SUPERINTENDENT.

R6. DO NOT CUT REINFORCEMENT TO CLEAR PENETRATION, SLEEVES OR H.D. BOLTS. DISPLACE REINFORCEMENT SLIGHTLY AS NECESSARY AND PROVIDE CORRECT COVER TO THE PENETRATION, SLEEVES OR H.D. BOLTS.

R7. SIDE AND END LAPS IN WELDED MESH REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS5100.5 cl 13.2.3.

R8. REINFORCEMENT LAP SPLICE LENGTHS (UNO ON DRAWINGS) AS FOLLOWS ♦:

EXPOSURE CLASSIFICATION	f'c (MPa)	DEFORMED BAR DIAMETER								
		N10	N12	N16	N20	N24	N28	N32	N36	N40
B1	32	350	400	550	800	1050	1350	1650	2000	2350
	40	300	350	500	750	1000	1250	1500	1800	2150
B2	40	300	350	500	650	900	1150	1400	1700	2000
	50	300	350	500	650	850	1050	1300	1600	1850
C1	50	300	350	500	600	700	950	1200	1450	1750
	≥55	300	350	500	600	700	900	1150	1400	1650
C2	≥55	300	350	500	600	700	850	1050	1300	1600

♦ FOR HORIZONTAL BARS WITH MORE THAN 300 OF CONCRETE BELOW THE ABOVE BARS, THE LAP LENGTHS IN THIS TABLE SHALL BE MULTIPLIED BY 1.3. WHERE LAPS ARE REQUIRED BUT NOT SHOWN ON THE DRAWINGS, THEY SHOULD BE STAGGERED AND POSITIONED AWAY FROM POINTS OF MAXIMUM STRESS. WHERE MORE THAN 50% OF REINFORCEMENT IS SPLICED AT POINTS OF MAXIMUM STRESS, LAP LENGTHS SHOWN IN THE TABLE ABOVE ARE TO BE MULTIPLIED BY 1.3.

R9. REINFORCEMENT PLACEMENT ABBREVIATIONS AS FOLLOWS:

FF	FAR FACE
NF	NEAR FACE
EF	EACH FACE
EE	EACH END
NSOP	NOT SHOWN ON PLAN
NSOE	NOT SHOWN ON ELEVATION
+	LENGTH VARIES

NOT FOR CONSTRUCTION

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Project Identifier\-\CAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

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BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 2

Project Number	VP402530
Sheet	3 OF 12
Issue	T2
Drawing Number	VP402530-S202

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ELASTOMERIC BEARING PADS/STRIPS:

EB1. ELASTOMERIC BEARING STRIPS SHALL BE UNREINFORCED NATURAL RUBBER BEARING STRIP, TYPE 60H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB2. LAMINATED ELASTOMERIC BEARING PADS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE REQUIREMENTS OF AS5100.4 cl 12 FROM TYPE 50H MATERIAL IN ACCORDANCE WITH AS5100.4 TABLE B1.

EB3. LAMINATED ELASTOMERIC BEARING PADS SHALL BE SUPPLIED WITH HOLES TO SUIT THE BEARING RESTRAINT PINS. HOLE SETOUT SHALL BE AS SHOWN ON THE BEARING DETAIL DRAWINGS.

EB4. STORE BEARINGS UNDER COVER UNTIL INSTALLATION. ONCE INSTALLED, KEEP PROTECTED FROM THE ELEMENTS WITH COVER SHEET UNTIL DECK UNITS INSTALLED.

INSTALLATION OF ELASTOMERIC BEARINGS

PROCEDURE AS FOLLOWS:

BI1. PREPARE BEARING GROUT PAD TO LEVEL SPECIFIED (BEARING RL MINUS BEARING THICKNESS).

BI2. IF BEARING PIN NOT CAST INTO HEADSTOCK THEN DRILL AND CHEMSET BEARING RESTRAINT PIN IN POSITION (TOP OF PIN TO BE INSTALLED 12mm ABOVE LEVEL OF GROUT PAD).

BI3. INSTALL BEARING ON TOP OF PREPARED GROUT PAD, ENSURE BEARING IS IN FULL CONTACT WITH GROUT PAD.

BI4. IMMEDIATELY PRIOR TO PLACEMENT OF GIRDER PLACE NOMINAL 5mm LAYER OF MEGAPOXY PM OVER TOP SURFACE OF BEARING.

BI5. LOWER PSC GIRDER INTO POSITION OVER BEARING UNTIL GIRDER LIGHTLY CONTACTS THE TOP SURFACE OF THE BEARING. (CONTACT DOES NOT HAVE TO OCCUR ON ALL EDGES OF BEARING, LIGHT CONTACT IS DESCRIBED AS THE FIRST POINT OF CONTACT BETWEEN THE BEARING AND GIRDER).

BI6. SUSPEND GIRDER IN THIS POSITION WITH TIMBER WEDGES. WEDGES TO REMAIN IN POSITION UNTIL MEGAPOXY PM HAS CURED (NOMINAL 24hrs AT 25°C).

BI7. REMOVE WEDGES AND INSTALL ANY PERMANENT GIRDER FIXINGS.

PRESTRESSED BEAM NOTES

PB1. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE REQUIRED TO CLEAR EMBEDDED OBJECTS, HOLES AND RECESSES.

PB2. REFER DWG NO. TENDER-S260 FOR MASS OF BEAMS

PB3. DURING STORAGE, TRANSPORT AND HANDLING, KEEP BEAM UPRIGHT AND SUPPORTED AT NOT MORE THAN 600 mm FROM EACH END.

PB4. PROVIDE SUITABLE LIFTING DEVICES NOT FURTHER THAN 600mm FROM BEAM ENDS.

PB5. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT TRANSFER 40MPa.

PB6. STRANDS AS 4672.1 – 7 WIRE ORDINARY – 15.2 – 1 750 – RELAX 2.

PB7. THE FORCE REMAINING IN EACH STRAND AT BEAM MIDSPAN IMMEDIATELY AFTER TENSIONING SHALL BE: AS SHOWN ON DWG NO. TENDER-S260

PB8. CUT STRANDS FLUSH WITH THE END OF THE BEAM AND SEAL EXPOSED STRANDS AGAINST CORROSION WITH 3 mm THICK EPOXY RESIN – MEGAPOXY H THIXOTROPIC OR EQUIVALENT.

PB9. REFER DWG NO. TENDER-S260 FOR BEAM HOGS

BRIDGE TRAFFIC BARRIER NOTES:

SB1. DIMENSIONS ARE GIVEN TO THE NEAREST MILLIMETER AFTER FABRICATION.

SB2. STEELWORK SHALL BE FABRICATED TO THE REQUIREMENTS OF TfNSW B201.

SB3. RHS AND SHS TO BE GRADE C450LO TO AS/NZS 1163.

SB4. STEEL PLATE TO AS/NZS 3678.

SB5. FLAT BAR TO BE GRADE 300 TO AS/NZS 3679.1.

SB6. BOLTS CLASS 8.8, NUTS CLASS 8 AND WASHERS FOR CLASS 8.8 BOLTS SHALL BE FABRICATED IN ACCORDANCE WITH TfNSW B240 AND AS/NZS 1252, THIN NUTS CLASS 5 TO AS 1112.4.

SB7. THE EXPOSED END OF THREADED BAR SHALL HAVE THE ORIGINAL GALVANIZING FINISH.

SB8. ALL THREADED BARS, BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANIZED TO AS/NZS 4680 USO.

SB9. PRIOR TO GALVANIZAING ALL WELD SPLATTER AND WELDING SLAG IS TO BE REMOVED.

SB10. MEMBERS TO BE BRANDED WITH SUITABLE TYPE NUMBER AFTER FABRICATION.

SB11. EDGES TO BE PROTECTIVE TREATED SHALL BE ROUNDED TO A RADIUS OF 1.5mm USO.

SB12. ALL WELDING TO CONFORM TO AS/NZS 1554.1.

SB13. ALL WELDS EXCEPT LOCATION TACK WELDS TO BE SP CATEGORY.

SB14. WELDING CONSUMABLES TO BE CONTROLLED HYDROGEN TYPE: G493 TO AS/NZS ISO 14341-B OR T493 TO AS/NZS ISO 17632-B USO.

SB15. DELINEATION ON THE BRIDGE TRAFFIC BARRIER SYSTEM SHALL BE INSTALLED IN THE LOCATION AND TO THE MAXIMUM SPACING SHOWN ON THE DRAWINGS. DELINEATORS SHALL BE CONSISTENT WITH THE REQUIREMENTS SPECIFIED IN TfNSW R131.

STEELWORK GENERAL:

S1. ALL STEELWORK IS TO BE IN ACCORDANCE WITH TfNSW B201 *STEELWORKS FOR BRIDGES*.

S2. FILLET WELDS SHALL BE 6mm, CATEGORY SP, UNO.

S3. ALL WELDING ELECTODES TO BE E4916, E4918 OR W50X TO AS 4855, UNO.

S4. ALL STEELWORK, UNLESS OTHERWISE NOTED, SPECIFIED OR APPROVED, SHALL BE HOT DIP GALVANISED AFTER FABRICATION TO AS 4680. HIGH STRENGTH STRUCTURAL BOLTS (GRADE 8.8) TO BE UTILISED UNO. ALL BOLTS, NUTS AND WASHERS TO BE HOT DIP GALVANISED TO AS 1214 UNO.

BACKFILLING BEHIND ABUTMENTS:

BA1. BACKFILL MATERIAL SHALL BE AS FOLLOWS:
- BEHIND HEADSTOCKS, WINGWALLS AND RETAINING WALLS: FREE-DRAINING GRANULAR MATERIAL COMPLYING WITH TfNSW B30 *EXCAVATION AND BACKFILL FOR BRIDGEWORKS* cl 6.2.2.
- COMPACTION SHALL BE IN ACCORDANCE WITH TfNSW B30 cl 6.4.

BA2. WITHIN 1m OF WALLS AND HEADSTOCKS: PLACE IN LAYERS NOT EXCEEDING 100mm AND COMPACT TO 95% RELATIVE COMPACTION (70% MINIMUM DENSITY INDEX IN SAND) USING A HANDHELD VIBRATING PLATE COMPACTOR OR EQUAL. LARGE COMPACTION EQUIPMENT IS NOT PERMITTED IN THESE ZONES.

ROCK FACING:

ROCK GRADING		
	MIN	MAX
D15	185	265
D50	290	355
D85	395	470
D100		610

RF1. ROCK SHALL BE WELL GRADED WITH NOT LESS THAN 50% LARGER THAN A SIZE TWICE THE MINIMUM SIZE SPECIFIED.

RF2. ROCK SHALL BE CLEAN, HARD, DENSE AND DURABLE IGNEOUS OR METAMORPHIC ROCKS.

RF3. ROCK SHALL BE RESISTANT TO WEATHERING, FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER.

RF4. ROCK THAT IS LAMINATED, FRACTURED, POROUS, WITH DISCONTINUITIES OR OTHERWISE PHYSICALLY WEAK SHALL NOT BE USED.

RF5. THE BREADTH OF THICKNESS OF A SINGLE STONE SHALL NOT BE LESS THAT ONE-THIRD ITS LENGTH.

RF6. ROCK PROTECTION SHALL BE CONSTRUCTED IN THE LOCATIONS AND IN ACCORDANCE WITH THE DRAWINGS.

RF7. ROCK PROTECTION SHALL HAVE A UNIFORM APPEARANCE OVERALL AND SHALL NOT HAVE NOTICEABLE IRREGULARITIES IN HORIZONTAL AND VERTICAL ALIGNMENTS.

RF8. ROCK PROTECTION SHALL BE PLACED IN A MANNER WHICH ENSURES THAT THE LARGER ROCKS ARE UNIFORMLY DISTRIBUTED THROUGHOUT THE PROTECTION WORK AND THAT THE SMALLER ROCKS EFFECTIVELY FILL THE SPACES BETWEEN THE LARGE ROCKS WITHOUT LEAVING ANY LARGE VOIDS.

RF9. THE LAYERS OF PLACED ROCK SHALL BE OF EVEN THICKNESS AND OF EVEN GRADING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
Peter Lowndes Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked Signed:
Drawing Checked Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY & DEEP CREEK ON CASINO CORAKI ROAD

STRUCTURAL NOTES - SHEET 3

Project Number: VP402530
Sheet: 4 OF 12
Issue: T2
Drawing Number: VP402530-S203

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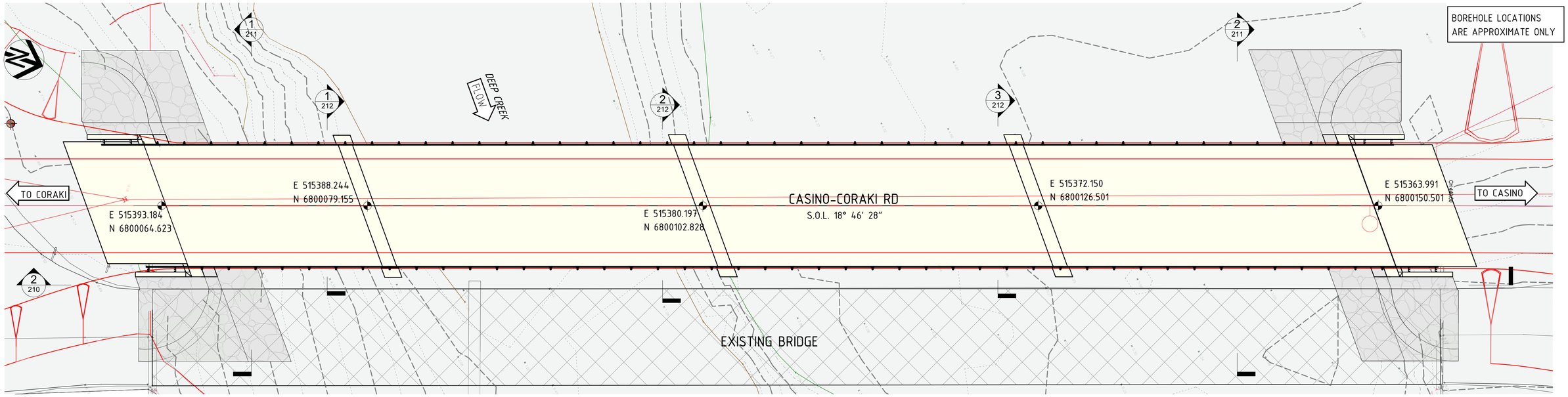
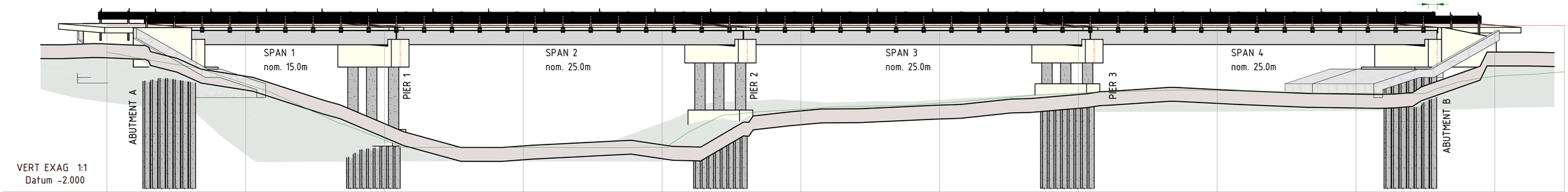


1 / 210 PLAN
DEEP CREEK BRIDGE | 1 : 150



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DESIGN LEVELS	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
EXISTING LEVELS	8.047	5.791	1.733	1.209	1.198	3.949	4.403	5.125	5.304	5.112	5.087	6.340	6.657
CHAINAGE	340.000	350.000	360.000	370.000	380.000	390.000	400.000	410.000	420.000	430.000	433.939	440.000	445.000

2 / 210 SECTION
DEEP CREEK BRIDGE | 1 : 150

GENERAL NOTES

SCALES AS SHOWN.
DIMENSIONS ARE IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE RELATED TO AHD DATUM.

LEGEND

Ⓕ DENOTES FIXED BEARING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
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Email: peter.lowndes@alengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Silverwater NSW 2128
Tel: 02 9644 6333 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:100 0 500 1000 1500 2000 2500 / 500 250
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

GENERAL ARRANGEMENT

Project Number: VP402530
Sheet: 5 OF 12
Issue: T2
Drawing Number: VP402530-S210

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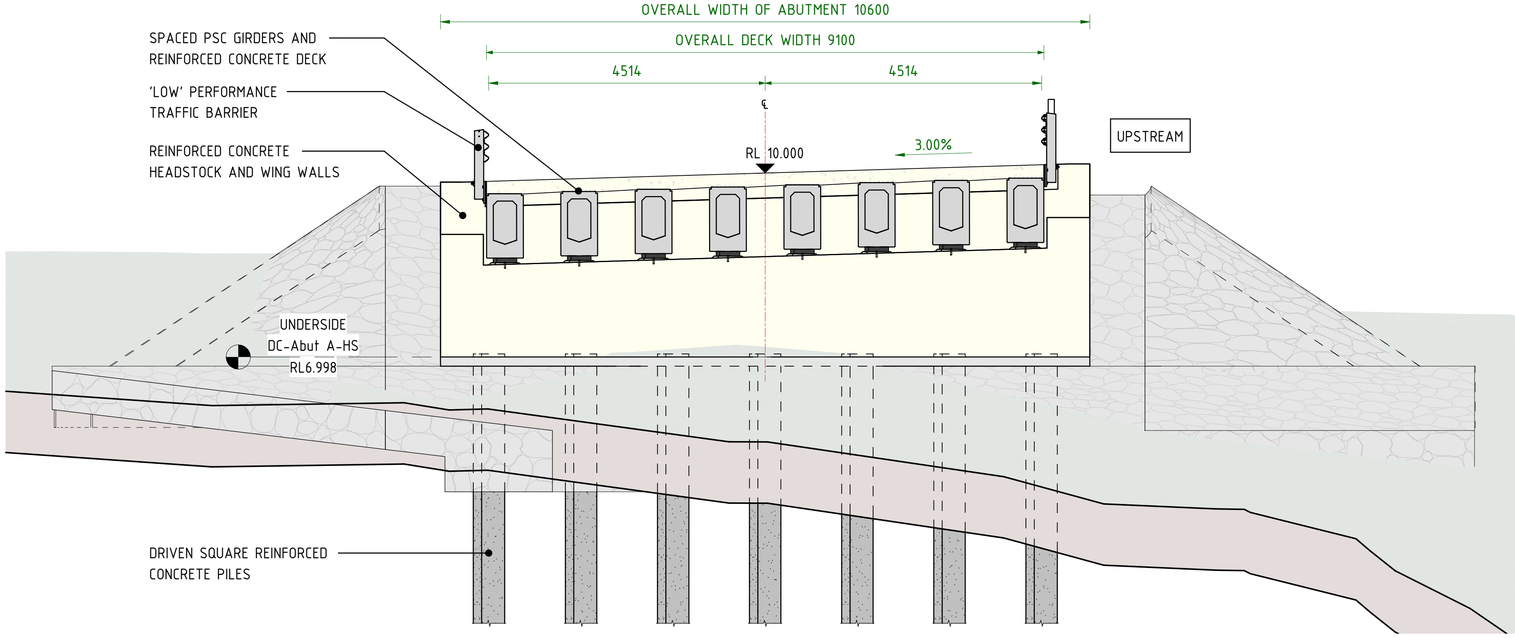
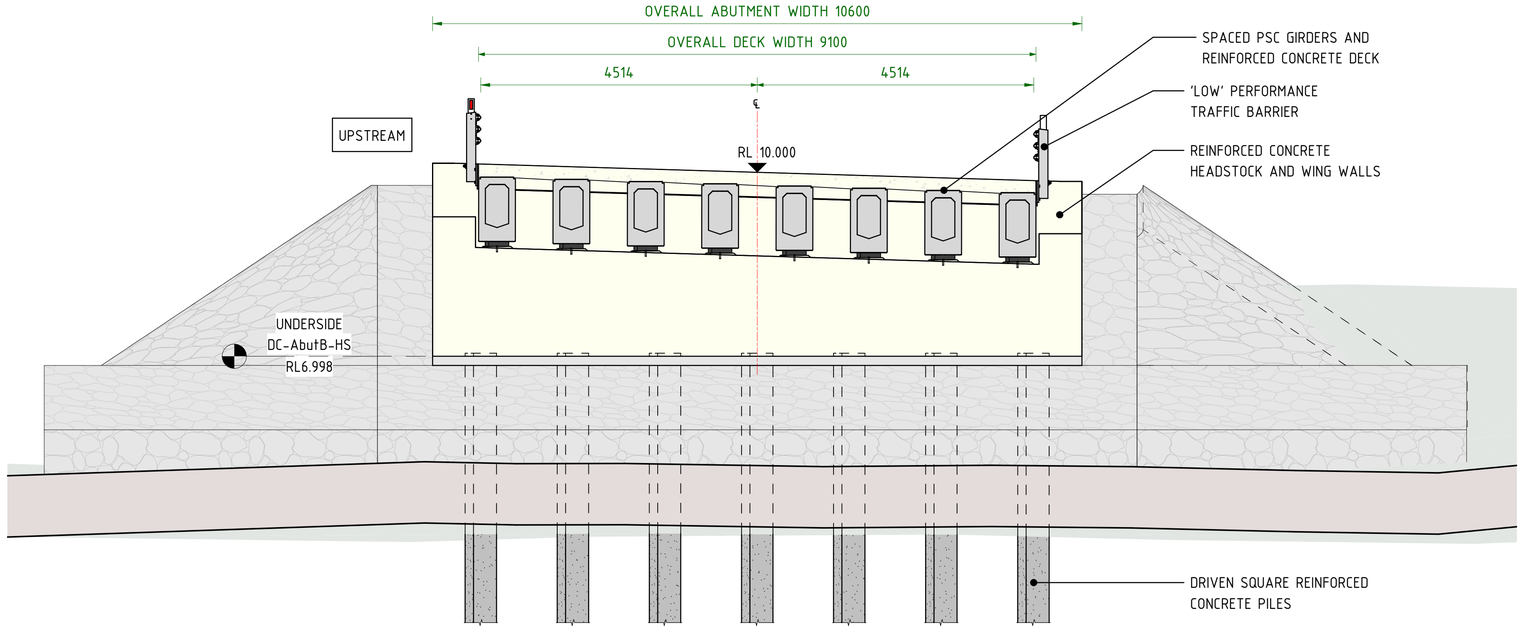


1 / 211 TYPICAL SECTION
DEEP CREEK BRIDGE - ABUTMENT A | 1 : 50



2 / 211 TYPICAL SECTION
DEEP CREEK BRIDGE - ABUTMENT B | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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PROJECT MANAGEMENT AND CONSTRUCTION BY:
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Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 1

Project Number: VP402530
Sheet: 6 OF 12
Issue: T2
Drawing Number: VP402530-S211

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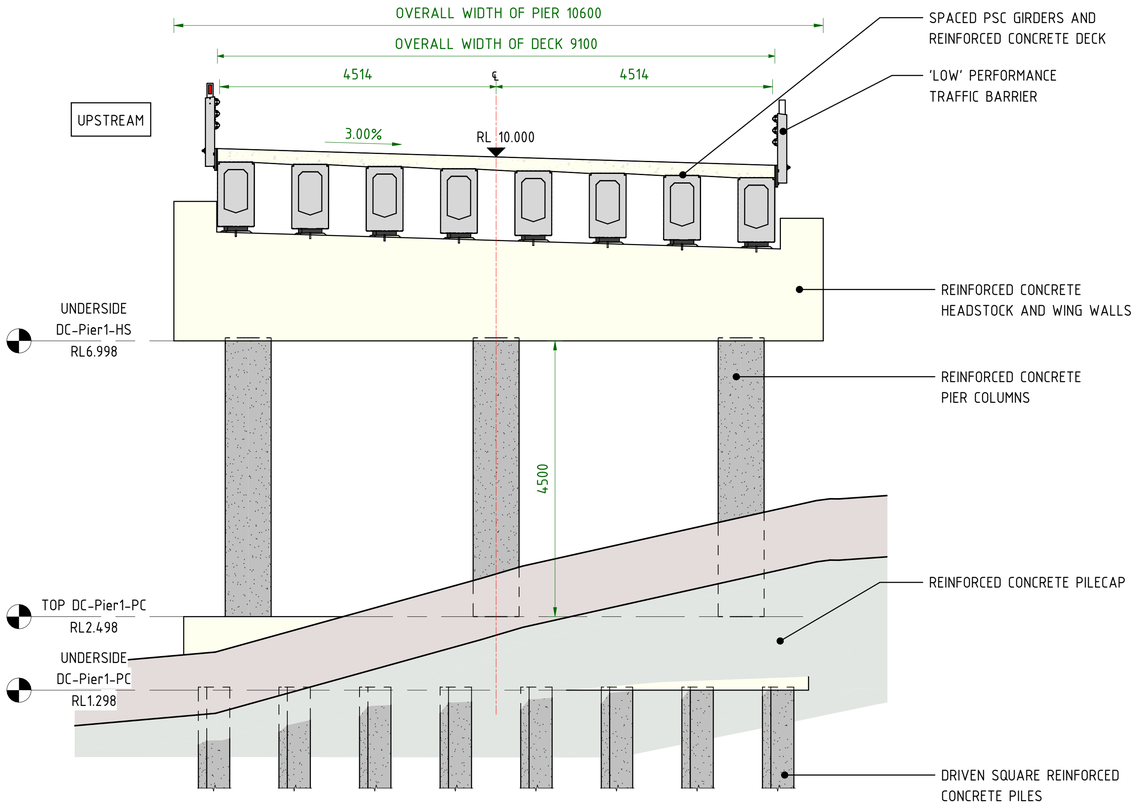
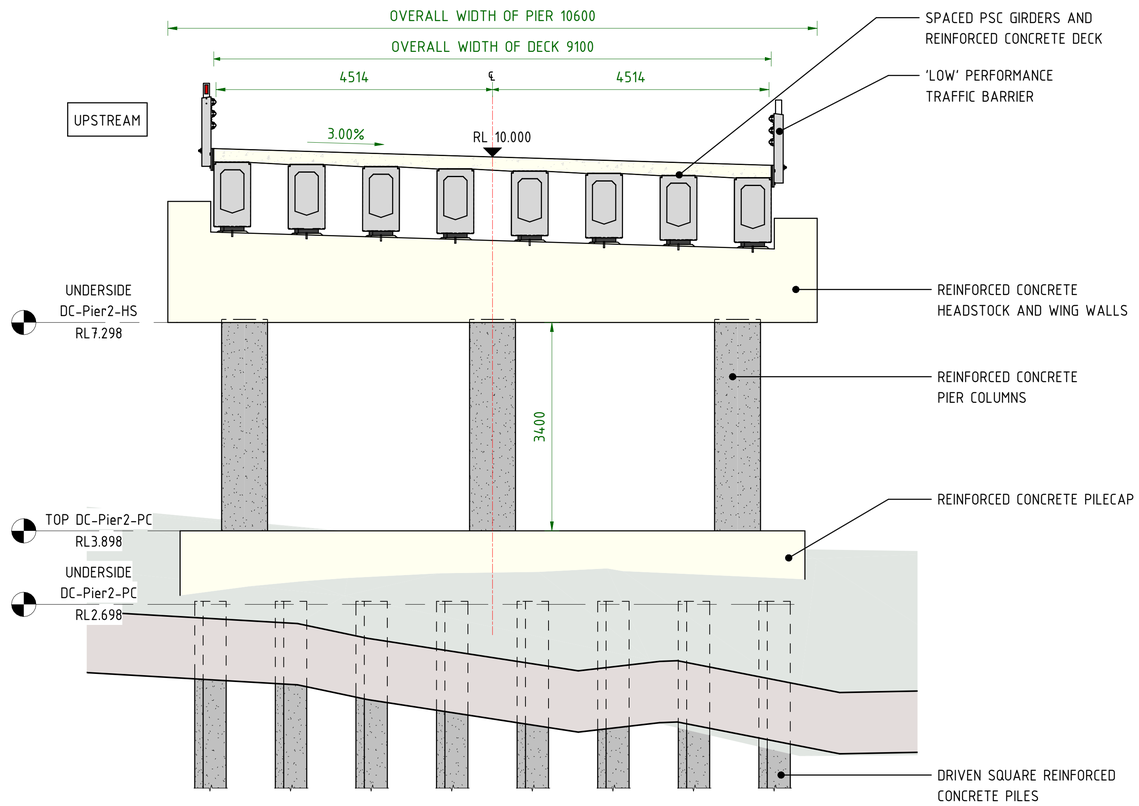
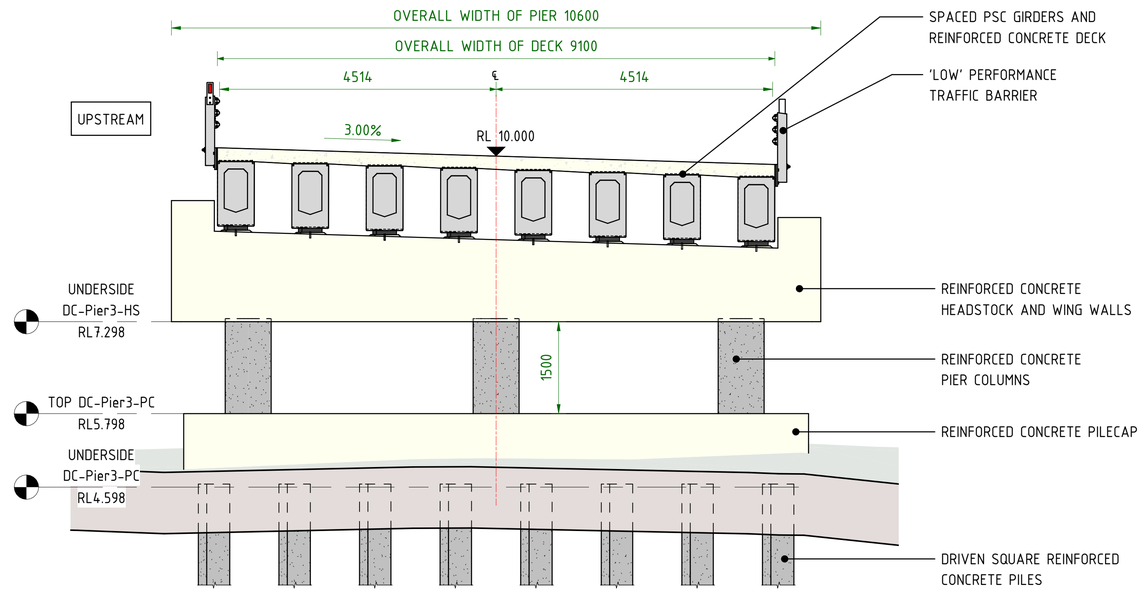


1/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 1 | 1 : 50



2/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 2 | 1 : 50



3/212 TYPICAL SECTION
DEEP CREEK BRIDGE - PIER 3 | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL | Design Checked | Signed:
Drafter: PAL | Drawing Checked | Signed:
Approved By: PAL | Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number
Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 2

Project Number: VP402530
Sheet: 7 OF 12
Issue: T2
Drawing Number: VP402530-S212

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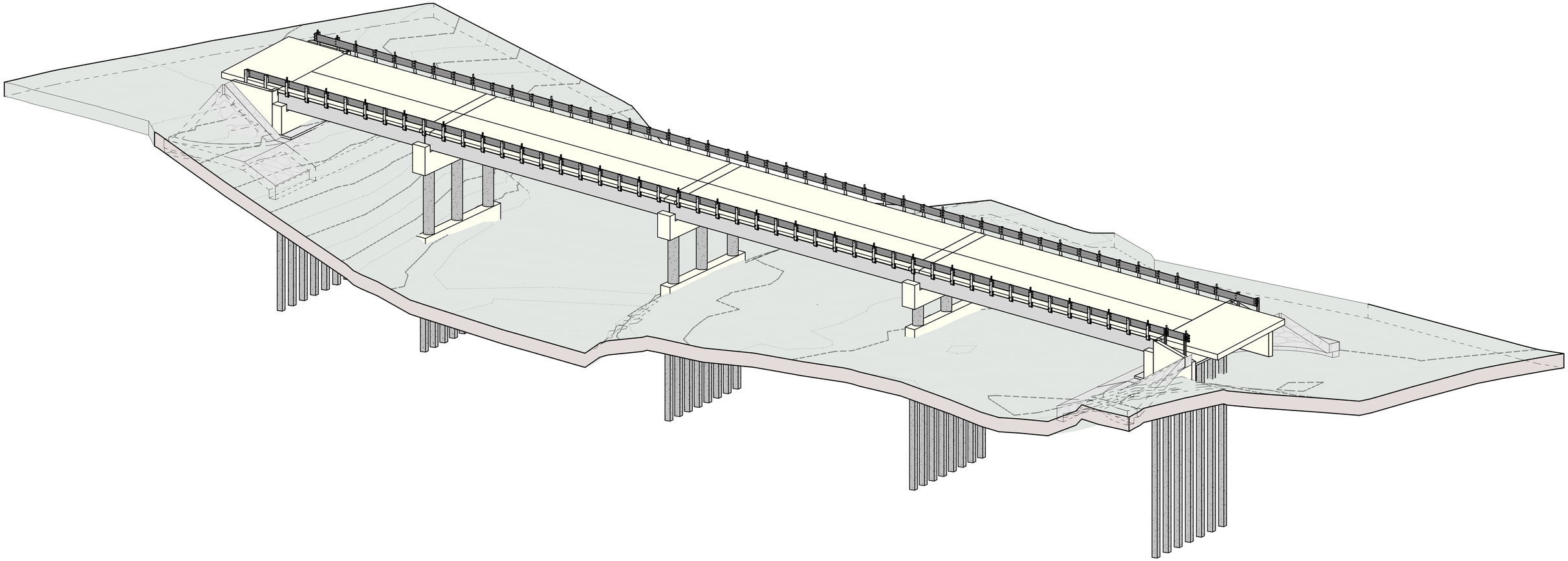

1/213 PERSPECTIVE VIEW
DEEP CREEK BRIDGE | NTS

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES
Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway
Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Design Certifier
Name: Peter Lowndes Signed:

Designer	PAL
Drafter	PAL
Approved By	PAL
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	
Project Identifier\-\CAD File Name	
Records File Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:

Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER DEEP CREEK ON CASINO CORAKI ROAD

PERSPECTIVE VIEW

Project Number: **VP402530**

Sheet: **7 OF 12** Issue: **T2**

Drawing Number: **VP402530-S213**

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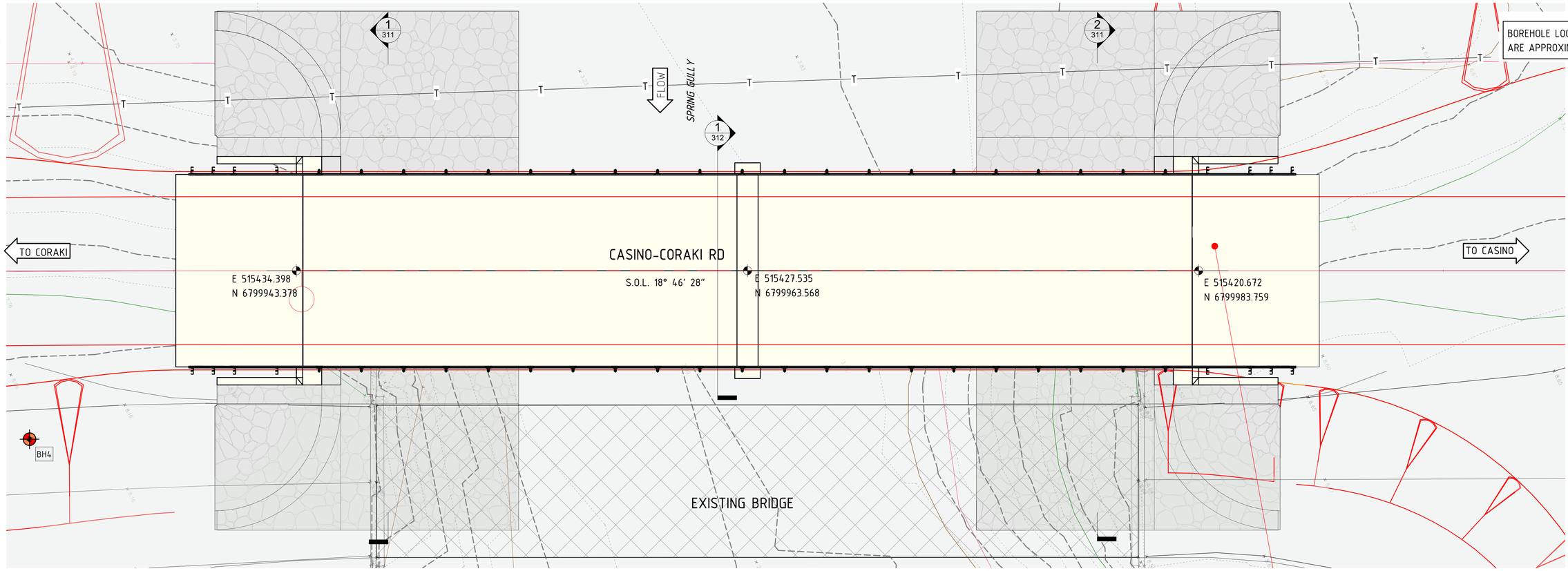
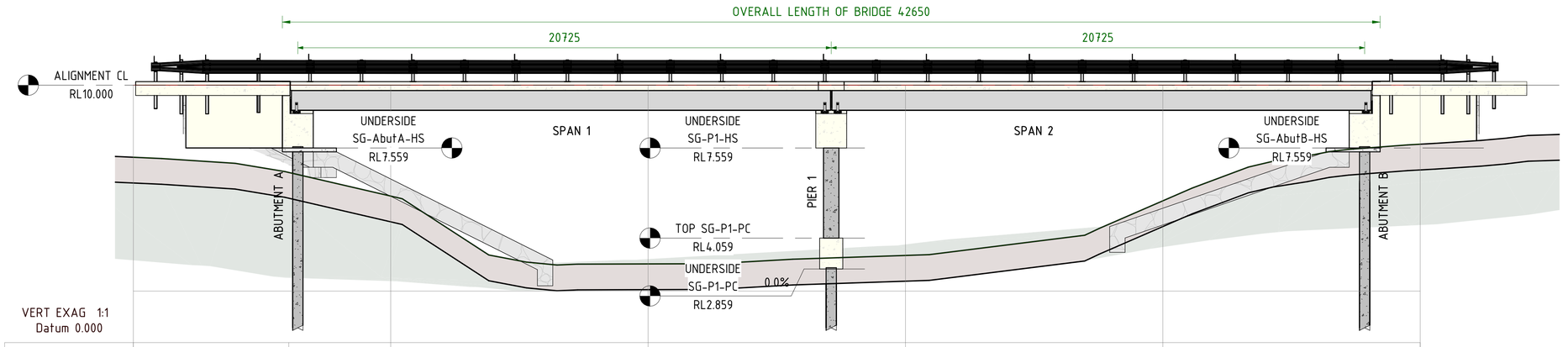


1/310 PLAN
SPRING GULLY BRIDGE | 1 : 100



DEPTH	2.799	3.392	4.313	6.944	6.615	4.493	2.289
DESIGN LEVELS	10.000	10.000	10.000	10.000	10.000	10.000	10.000
EXISTING LEVELS	7.201	6.608	5.687	3.056	3.385	5.507	7.711
CHAINAGE	210.000	216.040	220.000	230.000	240.000	250.000	260.000

2/310 SECTION
1 : 100

GENERAL NOTES
SCALES AS SHOWN.
DIMENSIONS ARE IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE RELATED TO AHD DATUM.

LEGEND
Ⓕ DENOTES FIXED BEARING.

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
Peter Lowndes Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904
Design Certifier
Name: Peter Lowndes Signed:

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer	PAL
Drafter	PAL
Approved By	PAL
Project Identifier\-\ICAD File Name	
Records File Number	
Design Checked	Signed:
Drawing Checked	Signed:
Survey Folder Number	

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales: 1:100 0 500 1000 1500 2000 2500 / 500 250
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

GENERAL ARRANGEMENT

Project Number: VP402530
Sheet: 9 OF 12
Issue: T2
Drawing Number: VP402530-S310

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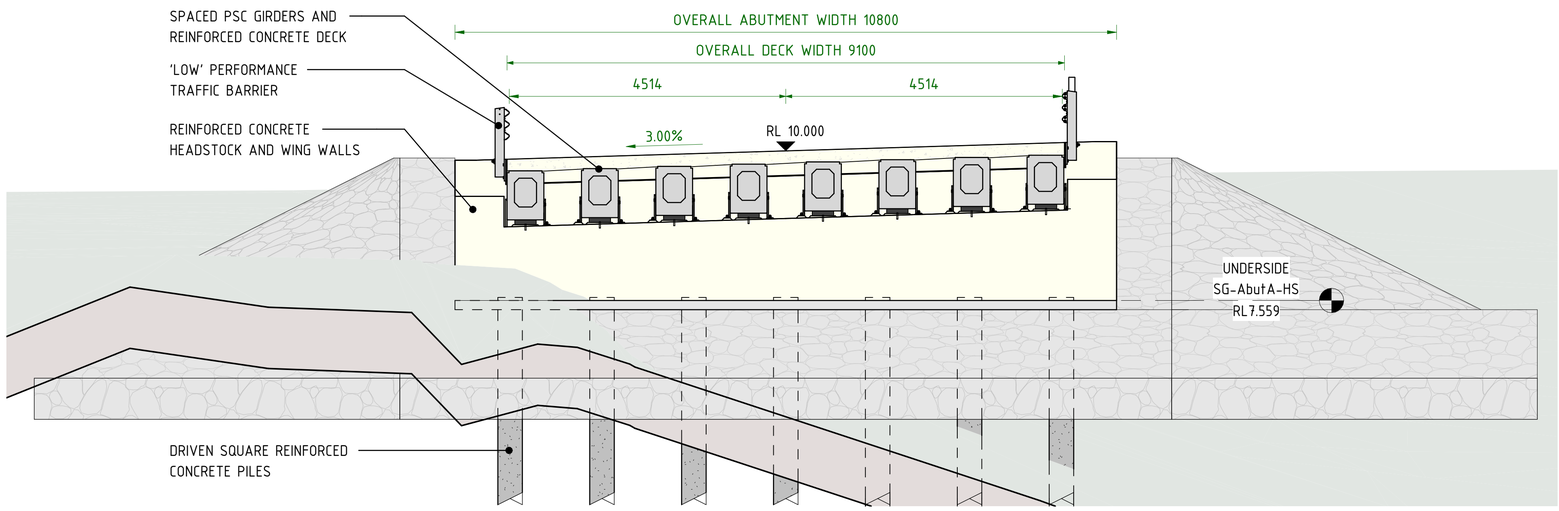
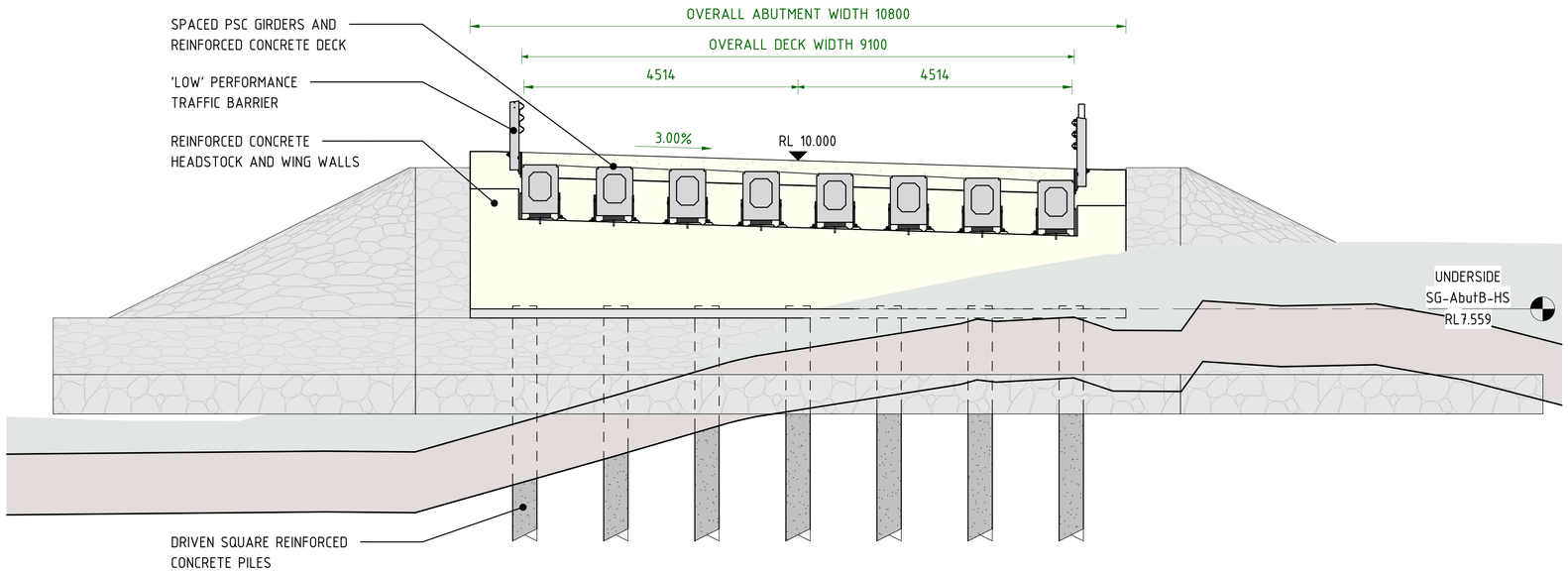


1/311 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT A | 1 : 50



2/311 TYPICAL SECTION
SPRING GULLY BRIDGE - ABUTMENT B | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
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Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL | Design Checked: Signed:
Drafter: PAL | Drawing Checked: Signed:
Approved By: PAL | Survey Folder Number:
Project Identifier\-\CAD File Name:
Records File Number:
Design Certifier Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

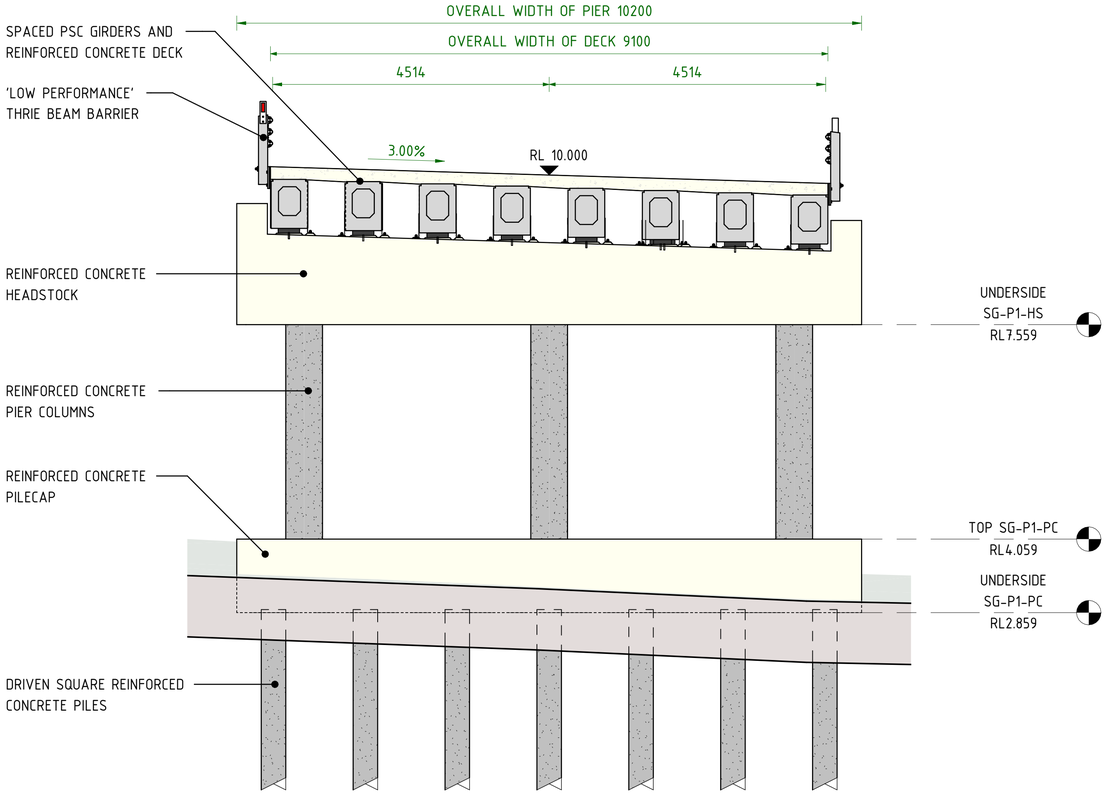
Bar Scales: 1:50 0 250 500 750 1000 1250 / 250 125
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 1

Project Number: **VP402530**
Sheet: **10 OF 12** | Issue: **T2**
Drawing Number: **VP402530-S311**



1 / 312 TYPICAL SECTION
SPRING GULLY BRIDGE - PIER | 1 : 50

NOT FOR CONSTRUCTION

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@alengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number
Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

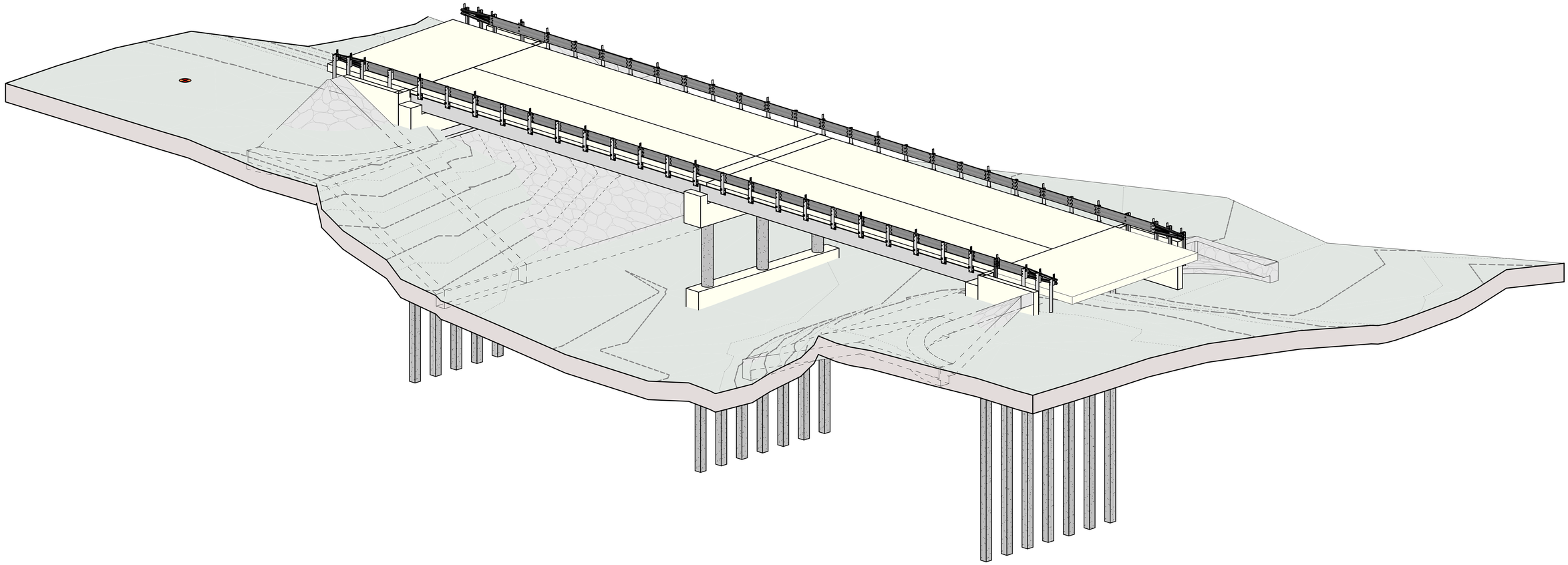
CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

TYPICAL SECTIONS - SHEET 2

Project Number: VP402530
Sheet: 11 OF 12
Issue: T2
Drawing Number: VP402530-S312

W:\Jobs\2024 Jobs\Quotes\Quickway\VP402530 RVC Eltham\Tender Dwgs\Eltham\Br_Tender Model.rvt 13/06/2024 2:35:23 PM



1 / 313 PERSPECTIVE VIEW
SPRING GULLY BRIDGE | NTS

NOT FOR CONSTRUCTION

W:\Jobs\2024 Jobs\Quotes\Quickway\VP402530 RVC Tatham\Tender Design\Tatham\Br_Tender Model.rvt 13/06/2024 2:33:32 PM

DESIGN AND DRAWINGS BY:
PETER LOWNDES Consulting Engineer
1305 Eltham Road, Alstonvale, NSW, 2477
Ph: (02) 6628 9225 Mob: 0458 274343
Email: peter.lowndes@plengineer.com.au
ACN: 140 182 476 ABN: 78 210 076 904

PROJECT MANAGEMENT AND CONSTRUCTION BY:
Quickway Transport & Utilities Infrastructure
Unit 40, 2 Slough Avenue Tel: 02 9644 6333
Silverwater NSW 2128 www.quickway.com.au

Designer: PAL
Drafter: PAL
Approved By: PAL
Design Checked
Signed:
Drawing Checked
Signed:
Survey Folder Number
Project Identifier\-\CAD File Name
Records File Number

Design Certifier
Name: Peter Lowndes Signed:

Issue	Description	Name	Initial	Date
T2	Issued for tender purposes	P.LOWNDES	PAL	13/06/24
T1	Issued for tender purposes	P.LOWNDES	PAL	12/06/24

Design not to be amended without authorisation by Certifier

Bar Scales:
Do not scale, use figured dimensions only

CLIENT:
Richmond Valley Council
Phone: 02 6660 0300
Email: council@richmondvalley.nsw.gov.au
Address: 10 Graham Place
Casino NSW 2470

BRIDGE OVER SPRING GULLY ON CASINO CORAKI ROAD

PERSPECTIVE VIEW

Project Number: VP402530
Sheet: 12 OF 12
Issue: T2
Drawing Number: VP402530-S313

Our Ref: ID 2615
Your Ref: 5060-1004

29 August 2024

Megan Smith
GeoLINK
PO Box 229
Lismore NSW 2480

Via email

email: msmith@geolink.net.au
CC: elena.palamara1@ses.nsw.gov.au

Dear Megan,

Notification under section 2.13 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 in relation to the proposed Deep Creek & Spring Gully Bridge Replacement, Casino-Coraki Road, Tatham Replacement

Thank you for the notification under section 2.13 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* in relation to the proposed replacement of Deep Creek & Spring Gully Bridge Replacement, Casino-Coraki Road, Tatham. It is understood that the proposed works include offline construction and replacement of the Deep Creek and Spring Gully twin bridges.

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

We have reviewed the proposed upgrade and the flood risk information available to the NSW SES (e.g. Richmond Valley Local Flood Plan 2023, Richmond Valley Flood Study 2023 etc.) and note the bridges span Shannon Brook and Spring Creek adjacent to their confluences with the Richmond River. The site is affected by flooding as frequently as a 5% Annual Exceedance Probability (AEP) event[1] reaching depths in excess of 4 metres during a Probable Maximum Flood (PMF) event[2].

[1] BMT, 2023, Richmond Valley Flood Study, Volume 2, Map R.B-7 Region B – 5% Peak Flood Depth, Page 41
[2] BMT, 2023, Richmond Valley Flood Study, Volume 2, Map R.B-11 Region B – PMF Peak Flood Depth, Page 45

Based on this review, we provide the following advice:

- **Consider** the impact of flooding on the infrastructure and people using the road up to and including the Probable Maximum Flood (PMF), along with the impact of climate change on the flood risks.
- **Pursue**, if relevant, site design and stormwater management that reduces the impact of flooding and minimises any risk to the community. Any improvements that can be made to reduce flood risk will benefit the community.
- **Ensure** workers and people using the road during and after the upgrades are aware of the flood risk, for example through site inductions and by using signage.
- **Consider** removing any plant and materials to a location above the PMF level on receipt of a Flood Warning, where safe to do so, to reduce the risk of them being washed into waterways.
- **Consider** closing the worksite and securing all materials and equipment prior to the start of the working day if there is a risk of riverine flooding, on receipt of advice from the Bureau of Meteorology (BoM), or when other evidence leads to an expectation of flooding. During site works, check the BoM website prior to start of the workday for any Flood Warnings or Severe Weather Warnings likely to lead to flooding.

To provide additional support in doing the above, we direct you to the online resources which are available to the community on the www.ses.nsw.gov.au website which include helpful pages such as:

- Know Your Risk | NSW State Emergency Service (enter your town or postcode).
- Local Plans and Guides
- Flood Storm and Tsunami Plans which includes locally endorsed NSW SES Flood Emergency Sub Plans
- Emergency Business Continuity Plan online tool which steps you through the process of developing your own Business Emergency Plan.

In addition, if the construction phase of the upgrades causes disruption to the operation of local roads, this may impact the ability for emergency vehicles to use these routes. The NSW SES requests that notification be provided where there are likely to be significant delays in the operation of the roads affected by the upgrades.

Please feel free to contact Kate Dawes via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely,

Gill S. Webber

Gillian Webber
Coordinator Emergency Risk Assessment
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