

Terania Street Bridge Demolition

Review of Environmental Factors

August 2024



Acknowledgement of Country

Transport for NSW acknowledges the Widjabul Wia-bal the traditional custodians of the land on which the Terania Street Bridge Demolition is proposed.

We pay our respects to their Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.



Approval and authorisation

Title	Terania Street Bridge Demolition
Accepted on behalf of Transport for NSW by:	Scott Pierce, Senior Project Engineer
Signed	<i>Scott Pierce</i>
Date:	02/08/2024

Executive summary

The proposal

Transport for NSW ('Transport') proposes to demolish the existing railway bridge crossing Terania Street in North Lismore. The bridge lies within Lot 4712 DP1223343 of the Casino-Murwillumbah rail corridor which is owned by the NSW Transport Asset Holding Entity (TAHE) and managed by Transport (inclusive of all corridor assets).

Key features of the proposal include:

Rail System

- Break the rail at the nearest joint on the embanked area either side of the bridge.
- Remove the rail between the broken joints, including all rail over the bridge structure.
- Remove all bridge transoms.

Superstructure

- Remove bridge girders (12 spans x 3ea).
- Remove corbels (11 piers x 3ea).

Piers

- Remove each of Piers 1 to 11 including columns, headstock, cross bracing, walers and fixings.

Footings/Pile Caps

- Footings in road Piers 4 to 7 removed to below Formation Level of Pavement
- Temporary Footings recently installed to support the propping to be removed entirely.

Piles

All piles in the road reserve (piers 4-7) to be removed to a nominated depth below Finished Surface Level (FSL) of the pavement.

- FSL to be determined by the Road Authority (Lismore City Council)
- Nominal depth to allow reinstatement of pavement.

All piles outside of the road reserve (piers 1-3 & 8-11) to be left in-situ

- FSL to match existing adjacent area.

Abutments

- Abutments to be stabilised and left in-situ.

Embankments

- Local earth works to level site to match surrounding topography.
- Any site won material to be re-used as fill to reinstate areas outside of the road reserve.
- Embankment surface to be stabilised with grass vegetation to match existing.
- D4-5-1 Obstruction Marker signs installed at ends of embankments, nominally where the rail ends.

Terania Street Road Pavement

- Reinstatement of the road pavement through the Rail Corridor for Terania Street.
 - Road and lane configuration to be proposed and agreed by the road authority Lismore City Council
 - Pavement design to be proposed and agreed by the road authority Lismore City Council
- a. Notionally any pavement reinstatement required will include granular base material and asphalt.
 - b. Pavement interface drains excluded.
 - c. Other drainage works is excluded, existing drains to be maintained.
- Line marking to be included.
 - Any additional signage is excluded.

Detour Route Pavement Rehabilitation

- Localised rehabilitation of deteriorated pavements along detour routes implemented from road closures.
- Rehabilitation method to be agreed with Road Authority Lismore City Council.
 - Notionally this will be pothole repairs and localised spray sealing.

Construction is expected to commence as soon as this REF is determined, Rail safety systems confirmed, and demolition methodology finalised, and may take around four (4) months to complete.

Need for the proposal

The proposal is required as Terania Street bridge is at end of life, not structurally sound and is a safety risk to the public and users of the road. It has low height clearances and narrow lane widths that are life-endangering with escalating safety risks including impeding disaster management egress and recovery. On this basis, demolition is proposed.

Proposal objectives

The objectives of the proposal are:

- Demolition of the entire bridge, thereby reducing maintenance costs and eliminating road safety issues.
- Complete demolition prior to end of 2024 calendar year.
- Ensure section 60 heritage exemption criteria is met, in addition to ensuring minimal/no environmental impacts.

Options considered

Options considered for the proposal within the project Strategic Options report included:

- **Option 1 (Raising spans)** would be technically challenging and unpractical, would have a moderately negative impact on heritage and would not resolve network restrictions and would only partially improve public safety.
- **Option 2 (Partial demolition)** would be feasible, and it would resolve most of the restrictions but it would have significant negative impact on heritage and there would be some residual risks from the retained spans.
- **Option 3 (Entire demolition)** would be feasible, and it would resolve all current constraints, but it would have significant negative impact on heritage.
- **Option 4 (Alternative route)** would be possible, but it would require a long traffic diversion and would result in even further network restrictions. The remaining viaduct would still impede rescue and evacuation operations during flooding and would retain residual safety risks to the public.
- **Option 5 (Rehabilitation)** would involve costly, lengthy and high-risk construction works. It would not resolve critical impacts like rescue and evacuation during flooding, clearance and network restrictions. It would, however, be a good heritage outcome.

- **Option 6 (Reconstruction)** would be feasible but very expensive and apart from some safety improvements and good heritage outcome, it would not remove any critical network restrictions and would not provide any additional benefits for the council and public.
- **Option 7 (Do nothing)** would not be acceptable as it would not resolve any constraints and would not eliminate any existing high-risk hazards.

Statutory and planning framework

The proposal is for a rail infrastructure facility and is to be carried out on behalf of Transport for NSW (Transport) and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)*. Development consent from Council is not required.

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State. Section 2.92 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a railway and rail infrastructure facilities to be carried out by or on behalf of a public authority without consent. Rail infrastructure facilities includes (among other matters):

- (a) *railway tracks, associated track structures, cuttings, drainage systems, fences, tunnels, ventilation shafts, emergency accessways, bridges, embankments, level crossings and roads, pedestrian and cycleway facilities, and*
- (b) *signalling, train control, communication and security systems*

As the proposal is for rail infrastructure facilities and is to be carried out on behalf of Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)*. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 2.10 to 2.15 of 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, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in chapter 5 of this REF.

The project would not impact any matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act), and referral to the Minister for the Environment is not required.

Community and stakeholder consultation

Heritage NSW has issued a Section 60 approval to undertake the removal of the structure. Consultation regarding the removal of the structure is part of the section 60 application process undertaken by Heritage NSW. TfNSW has undertaken targeted consultation with directly affected stakeholders. A brief summary of issues raised is outlined below:

Stakeholder	Summary of response	TfNSW Response	Comments addressed in REF
Heritage NSW	Discussions with heritage NSW undertaken as part of the Sec60 application process. Some general concerns related to the removal of a State Heritage listed Item, however	TfNSW has included conditions of approval within this REF	Sec 6.7 including safeguards

Stakeholder	Summary of response	TfNSW Response	Comments addressed in REF
	understood the need for removal given current state of the structure. Section 60 approval issued with conditions.		
Lismore City Council (LCC)	Fully supportive of the removal of the spans. LCC has previously requested that TfNSW remove the spans over Terrania Street.	TfNSW has worked closely with LCC through Assessment and section 60 application process.	N/A
UGL Regional Linx (UGLRL)	Recommended the spans be demolished through the Strategic Options Report commissioned in 2023	Strategic Options Report has been considered and included in this environmental assessment.	Sec 2 Sec 2.3.2
Transport Asset Holding company (TAHE)	Notified of the intention to remove. No objections raised.	N/A	N/A

TfNSW has not undertaken direct community consultation relating to the heritage aspects of the proposal as this was part of Heritage NSW S60 approval process. This process included considerable community and stakeholder consultation and this REF is therefore not completing any additional consultation as it has been deemed to not be required at this stage of the project. As noted in this REF and the accompanying Decision Not to Display Memo approved, previous consultation has been completed and targeted consultation with directly affected residents will be undertaken.

Other aspects that may affect the community such as road closures and noise generated during span removal were considered to be relatively minor in nature and best managed through direct consultation/notification to affected residences and businesses.

The NSW Transport Asset Holding Entity (TAHE) have also been notified on a number of occasions of the intention to remove the spans at Terania Street – including through Investment and Assurance Committee submissions. No objections have been received.

The decision not to display the REF (TfNSW memorandum dated 17/06/2024) outlines some of the consultation process, as below:

- There is evidence of widespread support for the project amongst the Lismore community and as shown in the Section 60 submission and display, there is a lack of disparate views in the community.
- Consultation with Transport Asset Holding Entity (TAHE), Heritage NSW, and Lismore City Council has been undertaken so far. All agencies have either formally (Section 60 exemption and letters to Transport for NSW from Lismore City Council), or informally endorsed the project in its objectives, i.e., to demolish the bridge. No direct consultation activities have been completed by the Transport for NSW team in Maintenance & Delivery to the community besides Aboriginal Heritage, but community consultation was completed during the Section 60 process by Country Rail Network and Heritage divisions of Transport for NSW.
- REF display for comment would not reveal any unknown substantive issues due to the Section 60, Statement of Heritage Impact, and previous structural investigations completed by Transport for NSW and UGLRL (outlined further in the REF).
- Targeted consultation to the directly impacted residents and business around Terania Street Bridge would better achieve the desired consultation outcomes as the community is highly supportive of the demolition, and consulting with the distinct and relevant persons impact directly by the demolition works would be a better use of time and effort for the project.

Environmental impacts

The main environmental impacts of the proposal are:

Traffic and transport

Terania Street has been re-opened to light vehicles in June as a temporary measure until the demolition can occur (Heavy Vehicles over 4.5 tonnes will still be subject to detour). The road will be closed again for the demolition works and previous detours will apply. The minor increase in local traffic to the site from contractors, plant etc. are not expected to be significant. While the construction area is adjacent to several residences, many of these are currently unoccupied due to the flood events of 2022. There are several occupied dwellings in the streets surrounding the works area including Peate and Currie Streets. Peate Street is the only access for these properties and must remain unobstructed for the duration of the works.

Low numbers of additional vehicles attending the site daily are unlikely to be disruptive in terms of noise, emissions, or amenity.

Noise and vibration

Noise impacts of the establishment and demolition phases of the project are likely to be relatively low and limited to operational noise from powered hand tools and plant (trucks, crane). As there are currently few local residents and businesses, the affects of noise impacts are substantially reduced from a 'normal' scenario where local urban areas at full occupancy.

A scenario completed using the Transport Noise Estimator (refer Section 6.5) determined an affected distance of 390 metres may occur where residences had a direct line of sight to the proposal for daytime works. The projected maximum duration of the project is up to 4 months, with the scale and noisiness of works fluctuating during this time depending on staging and requirements.

The most significant noise associated with the project is associated with removal of old concrete footings and stabilisation pads which have been poured to assist in securing the bridge. Removal of this material would require an excavator with a rock hammer (or potentially personnel with jackhammers) to break the material up so it can be removed from site. The expected duration of this work is 4-5 days (maximum). Minor localised vibration would be expected during this time.

It is expected that local residents/businesses appreciate the works providing a positive local benefit, however standard notification and engagement will be completed prior to and during the project. No night works will be required as part of the demolition process.

Non-Aboriginal heritage

The demolition of the bridge would result in the loss of a heritage item listed in the Lismore LEP (item A8), the State Heritage Register (#01044) and a heritage item of State significance and in the TfNSW s170 Heritage and Conservation Register. A S60 major works approval application has been approved, based on a Statement of Heritage Impact which concluded the bridge constitutes a danger to the public and users as:

- The underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.
- The underbridge has low height clearance and narrow lane widths that are life- endangering with escalating safety risks to the public and users of the road.
- The underbridge impedes disaster management egress and recovery, which is a life- endangering safety risk to the public and users of the Terania Street Evacuation Route.

Conditions in the S60 approval with regard to archival recordings and materials salvage will be completed as required.

Landscape character and visual impacts

The demolition of the bridge would result in a permanent change to the character of North Lismore via removal of the existing 'character' bridge. Safeguards and rationale for heritage (as above) apply.

Socio-economic

The project will have a long-term positive impact by alleviating the current road closure such that detours are no longer required and removal of the bridge removes restrictions on moving above average height loads. Removal of the bridge will

resolve issues relating to movement of houses and materials, while also improving conditions for watercraft rescues and access during future flood events.

Justification and conclusion

The proposed Terania Street Bridge Demolition at Terania Street, North Lismore is subject to assessment under Division 5.1 of the EP&A Act. The 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.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in some impacts on local heritage, traffic and noise. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also result in the restoration of traffic flow, provide safer conditions for motorists and pedestrians and provide improved outcomes with regard to transport of high loads and flood safety for rescues and assistance.

Display of the review of environmental factors

This REF will not be placed on display for comment on the basis of the TfNSW memorandum dated 17/06/2024 (refer Executive Summary/ Community and stakeholder consultation).

The REF will be available on the project website (refer below).

Internet

The documents are available as pdf files on the Transport for NSW website at:

<https://www.transport.nsw.gov.au/projects/current-projects/terania-street-lismore-rail-over-road-bridge>

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1. Introduction

This chapter introduces the proposal and provides context for the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

1.1 Proposal identification

Transport proposes to demolish the existing redundant railway bridge crossing Terania Street at North Lismore. The bridge lies within Lot 4712 DP1223343 of the Casino-Murwillumbah rail corridor which is owned by the NSW Transport Asset Holding Entity (TAHE) and managed by Transport (inclusive of all corridor assets).

Key features of the proposal would include:

Rail System

- Break the rail at the nearest joint on the embanked area either side of the bridge.
- Remove the rail between the broken joints, including all rail over the bridge structure.
- Remove all bridge transoms.

Superstructure

- Remove bridge girders (12 spans x 3ea).
- Remove corbels (11 piers x 3ea).

Piers

- Remove each of Piers 1 to 11 including columns, headstock, cross bracing, walers and fixings.

Footings/Pile Caps

- Footings in road Piers 4 to 7 removed to below Formation Level of Pavement
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All piles in the road reserve (piers 4-7) to be removed to a nominated depth below Finished Surface Level (FSL) of the pavement.

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- Embankment surface to be stabilised with grass vegetation to match existing.
- D4-5-1 Obstruction Marker signs installed at ends of embankments, nominally where the rail ends.

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- Road and lane configuration to be proposed and agreed by the road authority Lismore City Council
- Pavement design to be proposed and agreed by the road authority Lismore City Council
- a. Notionally any pavement reinstatement required will include granular base material and asphalt.
- b. Pavement interface drains excluded.
- c. Other drainage works is excluded, existing drains to be maintained.
- Line marking to be included.
- Any additional signage is excluded.

Detour Route Pavement Rehabilitation

- Localised rehabilitation of deteriorated pavements along detour routes implemented from road closures.
- Rehabilitation method to be agreed with Road Authority Lismore City Council.
- Notionally this will be pothole repairs and localised spray sealing.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail.

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by ReconEco on behalf of Regional Property & Asset Renewal, Regional & Outer Metropolitan Division. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of Section 171 of the Environmental Planning and Assessment Regulation 2021 (refer **Appendix A**), the factors in *Guidelines for Division 5.1 assessments*, (DPE 2022), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act, 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval 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 BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally-listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if offsets are required and able to be secured.

The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

Figure 1-1: Location of the proposal

Scale: 1:25,000
 EPSG: 28356
 Date: May 2024
 Datum: GDA94
 Author: SO

ReconEco makes every effort to ensure this map is free of errors but doesn't warrant the map or any data/features depicted are either spatially or temporally accurate or fit for a particular use. ReconEco provides this map without any warranty of any kind whatsoever, either expressed or implied.



Figure 1-2 The proposal

Legend

-  Project boundary
-  Roads
-  Rail line
-  Cadastral boundaries
-  Light vehicle detour
-  Waterway

Ancillary sites (proposed)

-  Ancillary site
-  Alternate ancillary site

Scale: 1:2500
EPSG: 28356
Date: May 2024
Datum: GDA94
Author: LD

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2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

A Strategic Options report for the Terania Street bridge was completed in July 2023 (Focus Bridge Engineering; refer **Appendix B**). The bridge was assessed as being in predominantly poor condition, noting that the assessment does not account for future vehicular accidents that would damage the piers and cause local and global structural instability.

2.2 Limitations of existing infrastructure

The Strategic Options report reported on various issues with the bridge with regard to road network impacts, clearance and public safety. A summary of limitations is as follows:

Road network impacts

- **Access.** Substandard vertical and horizontal clearance restricts access to heavy and oversized vehicles.
- **Traffic.** Not possible to improve daily travelling experience and traffic capacity thorough carriageway widening.
- **Safety.** Improvements to visibility and road safety are not feasible.

Bridge clearances

- **Height accessibility - Main road.** Vertical clearance over 2 lane (two way) main sealed road of 3.8 m is lower than general access vehicle height requirement of 4.6 m.
- **Height accessibility - Overheight Bypass.** Vertical clearance of one-way west and one- way east local diversion roads of 4.0 m is lower than general access vehicle height requirement of 4.6 m.
- **Width accessibility.** The sealed road width of 4.6 m has approximately 2.1 m wide lanes which is less than 3.5 m minimum width required by Austroads.

Public safety

- **Safety - condition.** Poor condition of the underbridge poses a risk of bridge elements falling onto road traffic and the public, including pedestrian traffic using the walkway under span 4.
- **Safety - vehicle strikes.** Lack of safety barriers at bypass roads and narrow carriageway limited by the short bridge spans increases the risk of vehicle strikes that would lead to accidents, injuries, and potential bridge span collapse. There is evidence of previous strikes by vehicles - two in 2024, three in the second half of 2023.
- **Safety - clearances.** Substandard low vertical clearance is a risk to heavy and oversized vehicles striking bridge superstructure leading to damage to the bridge and reduced public safety.
- **Safety - overheight bypasses.** The local overheight bypasses without clear merge priorities has an adverse effect on the traffic safety at the bridge.

The Lismore Railway Viaduct Underbridges, which includes Terania Street are on NSW State Heritage Register (item 01044) therefore any modification option would require:

- **Approvals.** S60 application.
- **Documentation.** Statement of heritage impact (SOHI).

NOTE: A SOHI has been completed for the project and a S60 (*Heritage Act 1977*) major works approval application package was submitted to NSW DCCEEW (Environment and Heritage) and has been approved with conditions (refer **Section 6.7**).

The SOHI is attached at **Appendix C**; the S60 Approval is attached at **Appendix D**.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Demolition of the entire bridge, thereby removing ongoing maintenance costs and eliminating road safety issues.
- Complete demolition prior to end of 2024 calendar year.
- Ensure section 60 heritage exemption criteria is met, in addition to ensuring minimal/no environmental impacts.

2.3.2 Development criteria

The development criteria for the proposal, as per the project Risk Assessment (Focus Bridge Engineering, 2023) include:

- Do nothing
- Demolish existing bridge structures
- Road detour
- Rehabilitation or reconstruction of bridge structure
- Raise the existing superstructure.

2.3.3 Urban design objectives

No urban design objectives have been developed for the project, however Transport are holding discussions with Lismore City Council. Current objectives are to align with the s60 Heritage Approval and SOHI objectives which are to reinstate any landscaping and turf removed as part of the works.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

The Strategic Options report was commissioned to assess the bridge and report on the various options to mitigate risks and deficiencies. The report summarised the bridge condition as follows:

The superstructure is in a predominantly poor condition and has a high risk of transoms falling off along with bolted connections. The main girders are also a medium to high risk of failure primarily owing to rotting and termite infestation. The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The piles are typically split or splitting with many having rotten or are infested with termites. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. The foundations are typically seen and estimated to be in a good to fair condition.

An additional engineering assessment was completed by SMEC (September 2023) to provide more detailed analysis of the bridge condition and any safety risks. The SMEC assessment recommended that the bridge should be removed as a matter of urgency.

2.4.2 Identified options

The Strategic Options report identified the following options:

- **Option 1 (Raising spans)** would be technically challenging and unpractical, would have a moderately negative impact on heritage and would not resolve network restrictions and would only partially improve public safety.
- **Option 2 (Partial demolition)** would be feasible, and it would resolve most of the restrictions but it would have significant negative impact on heritage and there would be some residual risks from the retained spans.
- **Option 3 (Entire demolition)** would be feasible, and it would resolve all current constraints, but it would have significant negative impact on heritage.
- **Option 4 (Alternative route)** would be possible, but it would require a long traffic diversion and would result in even further network restrictions. The remaining viaduct would still impede rescue and evacuation operations during flooding and would retain residual safety risks to the public.
- **Option 5 (Rehabilitation)** would involve costly, lengthy and high-risk construction works. It would not resolve critical impacts like rescue and evacuation during flooding, clearance and network restrictions. It would, however, be a good heritage outcome.
- **Option 6 (Reconstruction)** would be feasible but very expensive and apart from some safety improvements and good heritage outcome, it would not remove any critical network restrictions and would not provide any additional benefits for the council and public.
- **Option 7 (Do nothing)** would not be acceptable as it would not resolve any constraints and would not eliminate any existing high-risk hazards.

2.4.3 Analysis of options

A detailed analysis of options is provided in Appendix E of the Strategic Options report (refer **Appendix B**).

2.5 Preferred option

Based on the seven options proposed in the Strategic Options report, Option 3 (Entire demolition) was chosen on the basis that it would resolve all current constraints. Any negative heritage impacts have been identified and considered as part of the SOHI and approval of the S60 (*Heritage Act 1977*) major works application.

It should be noted that the SOHI concluded that: “...the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified...demolition is the only feasible option now open to TfNSW.

3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities. Photographs of the site and features are provided at Table 3-1.

3.1 The proposal

Transport proposes to demolish the existing railway bridge crossing Terania Street North Lismore within Lot 4712 DP1223343 within the Casino-Murwillumbah rail corridor. The proposal is shown in Figure 1-2 and Figure 3-1.

Key features of the proposal would include:

Rail System

- Break the rail at the nearest joint on the embanked area either side of the bridge.
- Remove the rail between the broken joints, including all rail over the bridge structure.
- Remove all bridge transoms.

Superstructure

- Remove bridge girders (12 spans x 3ea).
- Remove corbels (11 piers x 3ea).

Piers

- Remove each of Piers 1 to 11 including columns, headstock, cross bracing, walers and fixings.

Footings/Pile Caps

- Footings in road Piers 4 to 7 removed to below Formation Level of Pavement
- Temporary Footings recently installed to support the propping to be removed entirely.

Piles

All piles in the road reserve (piers 4-7) to be removed to a nominated depth below Finished Surface Level (FSL) of the pavement.

- FSL to be determined by the Road Authority (Lismore City Council)
- Nominal depth to allow reinstatement of pavement.

All piles outside of the road reserve (piers 1-3 & 8-11) to be left in-situ.

- FSL to match existing adjacent area.

Abutments

- Abutments to be stabilised and left in-situ.

Embankments

- Local earth works to level site to match surrounding topography.
- Any site won material to be re-used as fill to reinstate areas outside of the road reserve.
- Embankment surface to be stabilised with grass vegetation to match existing.
- D4-5-1 Obstruction Marker signs installed at ends of embankments, nominally where the rail ends.

Terania Street Road Pavement

- Reinstatement of the road pavement through the Rail Corridor for Terania Street.
 - Road and lane configuration to be proposed and agreed by the road authority Lismore City Council
 - Pavement design to be proposed and agreed by the road authority Lismore City Council
- a. Notionally any pavement reinstatement required will include granular base material and asphalt.
 - b. Pavement interface drains excluded.
 - c. Other drainage works is excluded, existing drains to be maintained.
- Line marking to be included.
 - Any additional signage is excluded.

Detour Route Pavement Rehabilitation

- Localised rehabilitation of deteriorated pavements along detour routes implemented from road closures.
- Rehabilitation method to be agreed with Road Authority Lismore City Council.
- Notionally this will be pothole repairs and localised spray sealing.

Traffic management is a major component of the works with regard to returning Terania Street to traffic as soon as possible – refer below:

- **Stage 1:** road closed to enable demolition (detour route in place).
- **Stage 2:** road partially re-opened while remaining demolition occurs (under Traffic Control).
- **Stage 3:** road fully re-opened once road rehabilitation/pavement works completed and team demobilised. The road will function as a 2 lane (1 each way) with shoulders to tie into either side of the bridge. A Traffic Management Plan (TMP) has been developed.

3.2 Design

3.2.1 Design criteria

No design criteria apply, as the project is for demolition. Consideration has been given to safety matters and road rehabilitation as necessary.

3.2.2 Engineering constraints

Engineering constraints are primarily limited to safely completing the demolition process. Standard procedures will apply.

3.2.3 Major design features

The bridge is a major design feature in itself, however due to the demolition process, requires no specific considerations with regard to retaining any structural integrity.

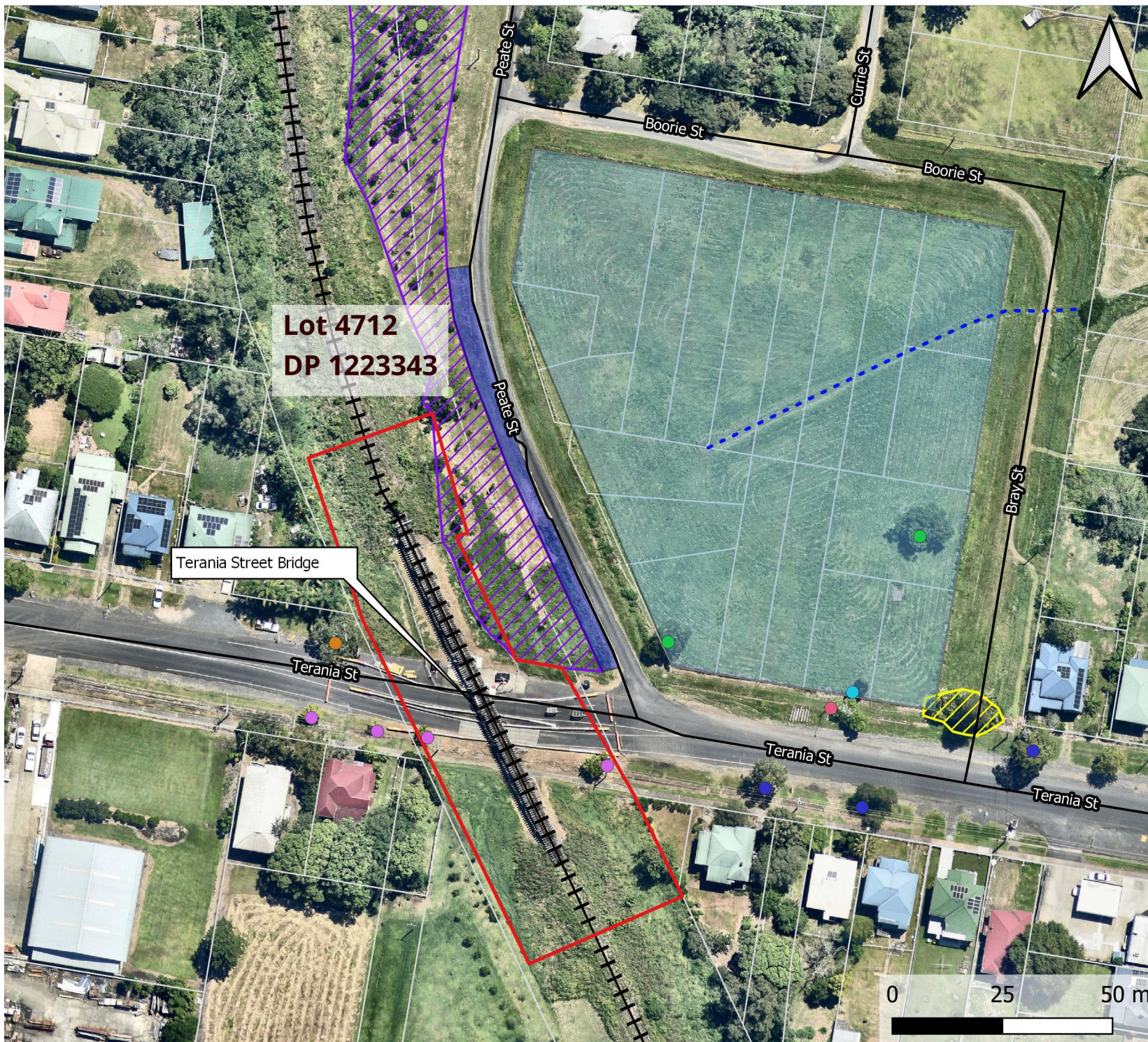


Figure 3-1 Key features of the proposal

Legend

- Project boundary
- Roads
- ++ Rail line
- Cadastral boundaries
- Stormwater drain

Ancillary sites (proposed)

- Ancillary site
- Alternate ancillary site

Vegetation

- Koala food tree planting
- Mixed planting

Trees

- Camphor Laurel
- Ornamental Cypress
- Riberry
- Spotted Gum
- Teak
- Tuckeroo
- Flooded Gum

Scale: 1:1200

EPSG: 28356

Date: May 2024

Datum: GDA94

Author: LD

ReconEco makes every effort to ensure this map is free of errors but doesn't warrant the map or any data/features depicted are either spatially or temporally accurate or fit for a particular use. ReconEco provides this map without any warranty of any kind whatsoever, either expressed or implied.

3.3 Construction activities

3.3.1 Work methodology

The construction methodology is described in detail in Section 3.1. The chronology of construction is as follows:

1. Establish and secure compound and ancillary area.
2. Assemble plant and equipment as required.
3. Fence off/establish project exclusion area.
4. Complete demolition works and stockpile/remove materials as required.
5. Layback and stabilise embankments if required
6. Complete pavement rehabilitation works (both at site and along detour route)
7. Disestablish site and removal all fencing, signage and materials.

The main scope of the project will involve use of an excavator with crusher to remove the spans, then piers of the bridge, starting at the road location to allow for road re-opening. The headstocks and abutments (if allowed for by Heritage NSW – TBC) will then be removed along with any current concrete and traffic items. The timber would then be disposed of as waste unless it can be salvaged and recycled.

3.3.2 Construction workforce

The project may take up to 4 months (upper limit) to complete, with the number of personnel working on the project fluctuating in accordance with staging and requirements. The construction workforce will be mobilised by Transport and as required by engaged contractors, however it would be unlikely that a substantial strain is placed on local accommodation or resources.

3.3.3 Construction hours and duration

The works will be completed during standard working hours:

- Monday to Friday: 7.00am to 6.00pm
- Saturday: 8.00am to 1.00pm
- Sunday and Public Holidays: no work.

A total duration of 4 months/100 days is anticipated for the works inclusive of the entire scope of works (including detour route rehabilitation, pavement works and site mobilisation and de-mobilisation). Note: this is a higher end duration and the works are predicted to be less than 100 days. The demolition process is estimated to take about 5 weeks (25 days) pending confirmation of methodology and timber recycling specifications (as per the S60 approval conditions).

3.3.4 Plant and equipment

The project will require the use of mobile plant and machinery as well as other tools and equipment including but not limited to; cranes, excavators, load shifting equipment, hand tools, EWPs, and trucks.

3.3.5 Earthworks

Earthworks are minor and limited to topsoil stripping for hardstand areas and excavator pads, and battering works to existing embankments, with any site won material to be re-used as fill to reinstate areas outside of the road reserve.

3.3.6 Source and quantity of materials

As the project is for demolition, no specific materials are required. All materials removed (steel and timber) are to be disposed of in accordance with M&D waste guidelines. Note that all timber materials are considered to be contaminated, subject to testing (refer **Section 6.11** for more detail).

A recycling and reuse plan will be developed as part of the project documentation. As per conditions in the S60 approval, there are requirements to salvage timber for heritage purposes (refer **Appendix D, Section 6.7**). Any salvageable timber will be delivered to a nominated M&D TfNSW storage location.

3.3.7 Traffic management and access

Currently Terania Street is open to local light vehicular traffic (as of June). Heavy Vehicles will continue to be detoured (>4.5t and 6m length) in accordance with current detour arrangements (refer **Figure 3-1**). This detour will remain in place during the works until demolition is complete and single lane access can be safely restored (with traffic management). Other detour information is as follows (refer **Plate 1**):

- A detour for all heavy and light vehicles is available via Wilson Street, Elliott Road and Ballina Road.
- Light vehicles can access Terania and Bridge streets via Dawson and Woodlark streets, which are not suitable for heavy vehicles. Light vehicles with 2.4 metre clearance can access Tweed Street northbound from Terania Street via Pine and Crane streets.



Plate 1: Detour routes for the project

3.4 Ancillary facilities

A central ancillary site is proposed on vacant land between Peate Street and Bray Street and Boorie Street (refer Figure 1-2). This is a large (~ 1 ha) low lying grassy area which is flat land containing a small drainage channel and three isolated trees. This site will be used for the establishment of a site office/lunchroom, in addition to providing parking for plant/vehicles and temporary storage for demolished materials.

The likely process of establishing the compound area is:

1. Strip topsoil in defined compound area – aiming to avoid low spots
2. Lay geofabric and drainage layer (if required)
3. Bunding/swale drain including erosion/sediment controls
4. Construct driveway connecting Peate St to Site Compound including temporary drainage pipe under driveway
5. Place and compact and trim road base
6. Install fencing and site compound sheds.

An example of the design is shown at **Plate 2**, however without the asphalt wearing course installed.

The main ancillary site is owned by Council and while Transport have approval to use the land for the duration of works, Council's expectations are that Transport improve or reinstate current conditions.

No tree removal is required. No fuel storage would be necessary as a service station occurs immediately east of the site on Terania Street.

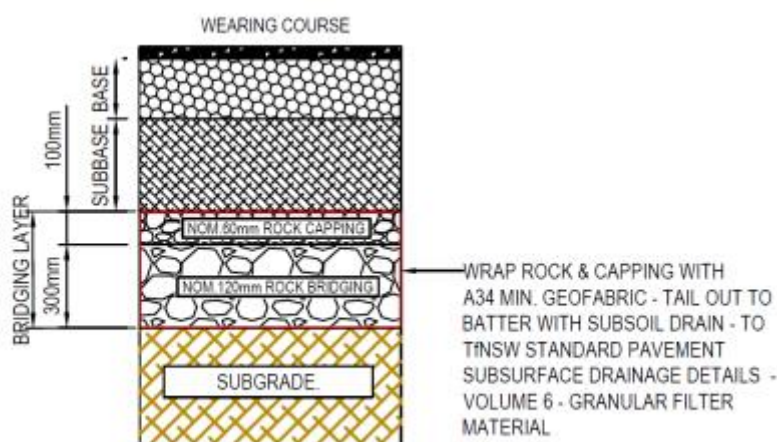


Plate 2: Hardstand detail for compound hardstand (pending further investigation and minus wearing course)

An additional ancillary site is proposed opposite within the road reserve on the western side of Peate Street – vacant land dominated by pasture grass and Koala food tree plantings (refer Figure 1-2). This area may be utilised as additional parking/laydown for vehicles/plant if required. Established Koala food trees (which are harvested by volunteers from Lismore Friends of the Koala) would not be affected.

Both sites have been chosen for their proximity to the site and that they provide open, flat areas of sufficient size which have been cleared and modified and are therefore relatively unconstrained. However, it should be noted that both sites occur on flood prone land and are prone to waterlogging after rain events.

While the ancillary sites are adjacent to several residences, many of these are currently unoccupied due to the flood events of 2022. There are several occupied dwellings in the streets surrounding the works area including Peate and Currie Streets. Peate Street is the only access for these properties and must remain unobstructed for the duration of the works. Consultation with occupants will be required (refer **Section 6.9**).

Photographs of ancillary sites are provided in Table 3-1.

Table 3-1: Site photographs

	Photo 1: Road closure (at time of assessment) and bridge at Terania Street
	Photo 2: Terania Street bridge viewed across main ancillary site (view to west)
	Photo 3: Terania Street bridge - detail



Photo 4: Weedy regrowth on bridge abutments



Photo 5: Safety scaffolding; note poured concrete bases, which will require removal following demolition (est. 4-5 days)



Photo 6: Potential ancillary area in western part of Peate Street road reserve – Koala feed tree planting, services and a table drain limit use of this area to some degree

3.5 Public utility adjustment

A dial before you dig (DBYD) enquiry has already been completed for the project. Public utilities are present in the rail corridor and in proximity to the works, but none are anticipated to require adjustment. Physical potholing will occur to determine the exact location of utilities and appropriate flagging and signage will be implemented to ensure utilities are clearly identified.

3.6 Property acquisition

No property acquisition is required.

A Schedule 6A Certificate (Notice to Enter) has been issued by Lismore City Council – refer summary below and **Appendix E**.

Approval Briefing - Schedule 6A Certificate Notice to Enter - Lismore City Council

Approval to issue Notice of Certificate of Entry to utilize Third Party Land

Purpose: To seek approval to exercise Schedule 6A powers under the Transport Administration Act 1998 (NSW) (the Act) and issue a notice of intention and Schedule 6A Certificate to enter and use third party land outside the Country Regional Network (CRN) at Lismore.

Analysis: Transport for New South Wales (TfNSW) wish to utilise land owned by Lismore City Council (the Council) to facilitate urgent repair works (the Works) to a CRN rail underbridge asset, CRN asset number 67467 (old asset reference UBN62837A) (the Infrastructure) which is situated over Terania Street, Lismore NSW.

The Works will be detailed under separate cover and require different approvals. The proposed entry and use of land under Schedule 6A allows TfNSW to occupy non-CRN land adjacent to the non-operational Casino to Murwillumbah line at approximately 837.125 km, off Terania Street, Lismore NSW. The various Lots and DP's (the Land) associated with the worksite, are as follows:

- Lots 1, 2 and 3 DP 798803
- Lots 3, 4, 14, 15, 16, 17, 18 and 19, Section 2, DP 975080
- Lots 1, 2 and 3 DP 197618
- Lot 1 and 2 DP 798796
- Lots 1, 2 and 3 DP 798811.

The use of the Council's Land will enable the TfNSW Project Team to deliver the Works in a manner that provides greater worksite management and worksite protection for TfNSW staff and TfNSW appointed contractors.

The reputational risk is high if the Works are delayed, as there is considerable disruption and inconvenience to the local Community due to the closure of Terania Street and redirection of all local traffic to ensure safety.

The Director Regional Property and Asset Renewal is one of the delegates authorised to undertake all activities as agent for TAHE and to exercise the functions of TfNSW under Schedule 6A of the Act.

4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State. Section 2.92 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a railway and rail infrastructure facilities to be carried out by or on behalf of a public authority without consent. Rail infrastructure facilities includes (among other matters):

- (a) *railway tracks, associated track structures, cuttings, drainage systems, fences, tunnels, ventilation shafts, emergency accessways, bridges, embankments, level crossings and roads, pedestrian and cycleway facilities, and*
- (b) *signalling, train control, communication and security systems*

As the proposal is for rail infrastructure facilities and is to be carried out on behalf of Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW). Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 2.10 to 2.15 of 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, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in chapter 5 of this REF.

4.1.2 Local Environmental Plans

Lismore Local Environmental Plan 2012 (LLEP)

Under the Lismore Local Environmental Plan 2012 (LLEP), the majority of the bridge (northern portion) and the proposed ancillary areas are zoned - RU2 Rural Landscape (refer **Plate 3**).

Objectives of the RU2 zone are as follows:

RU2 Rural Landscape

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To maintain the rural landscape character of the land.*
- *To provide for a range of compatible land uses, including extensive agriculture.*
- *To enable a range of other uses that are compatible with the flood hazard associated with the land.*
- *To provide for a limited range of development that does not have an adverse effect on the ecological values of the land.*

As noted, Terania Street bridge is listed as a heritage item in Schedule 5 of the LLEP as 'North Lismore Railway viaduct Terania Street State Item no. A8'.

Lismore Local Environmental Plan 2000

The southernmost portion of the bridge is zoned - A Residential Zone (Medium Density Residential) in the LEP 2000. There are no objectives for this zone in the 2000 LEP.

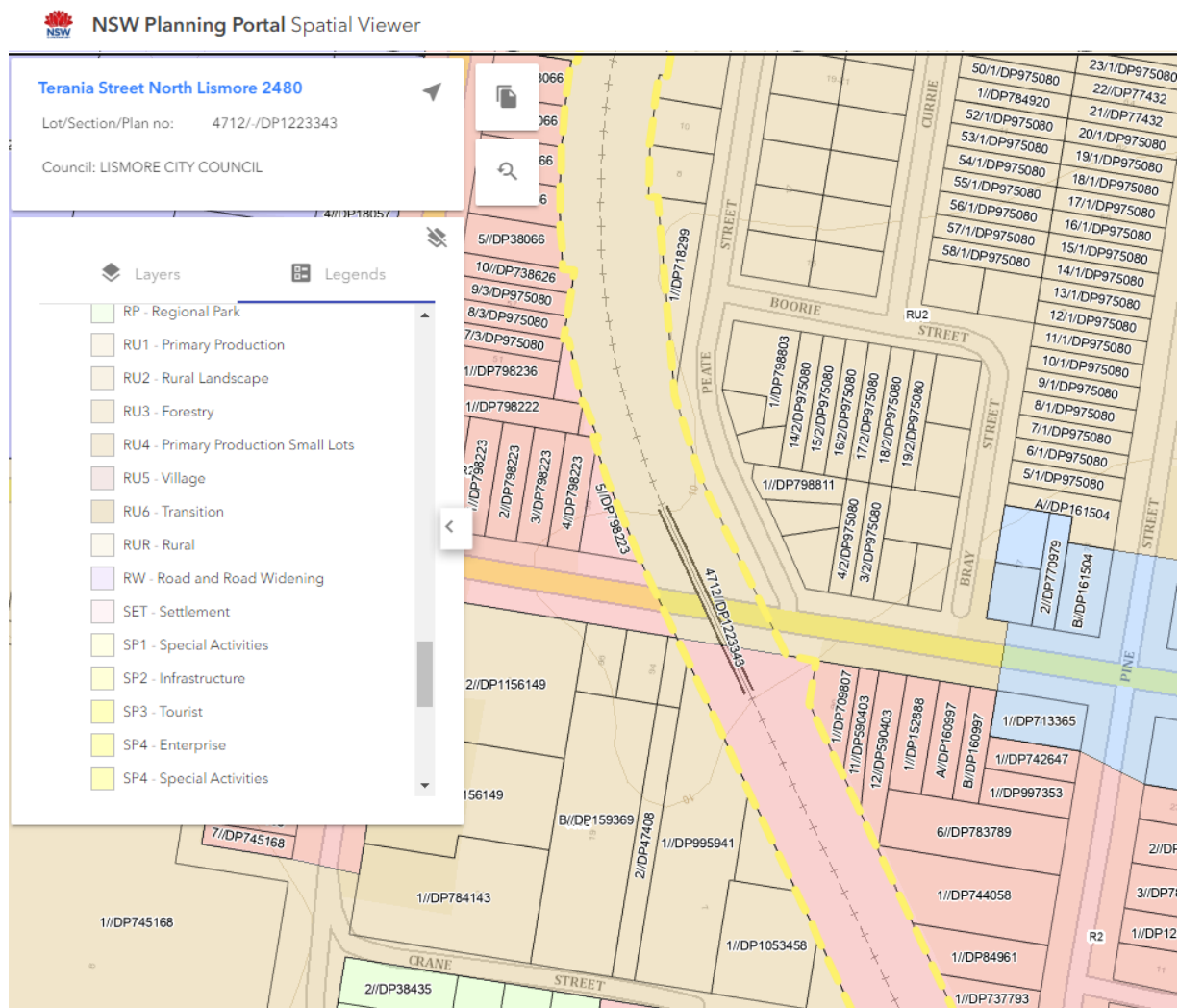


Plate 3: Zonings in the Lismore Local Environmental Plan 2012

4.2 Other relevant NSW legislation

Other relevant NSW legislation is discussed in Table 4-1.

Table 4-1: Relevant NSW legislation

Legislation	Section	Comment
<i>Biodiversity Conservation Act 2016</i>	Section 7.3	Biodiversity assessment with regard to the possible occurrence of threatened species and communities listed in the Biodiversity Conservation Act 2016 was completed (refer Section 6.2). A test of significance (as required by s7.3 BC Act) has been undertaken for several species which have a moderate to high likelihood of occurrence at the site. The assessment concluded that no State listed threatened species and/or communities are likely to be significantly impacted by the proposed works, therefore a Species Impact Assessment or BDAR is not required.
<i>Biosecurity Act 2015</i>		The <i>North Coast Regional Strategic Weed Management Plan (2023-2027)</i> provides a framework for regional weed management and supports regional implementation of the <i>NSW Biosecurity Act 2015</i>. The plan outlines how land managers can meet requirements under the General Biosecurity Duty and identifies state level and other priority weeds to provide focus to weed management in the region. The environmental weed Kudzu occurs at the site on the northern side of the abutments on both sides, where large infestations occur. Within Lismore LGA (part of the core infestation) the following applies: <i>Land managers should mitigate spread of the plant from their land. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.</i> Works will require the removal of areas dominated by Kudzu but would not contribute to the spread of the species (which is currently unchecked at the site). Various other common environmental weeds also occur, works are unlikely to contribute to the spread of any of these weed species. On 16 August 2023, NSW Department of Primary Industries issued the NSW Biosecurity (Fire Ant) Emergency Order (Order). The Order makes the entire State of NSW an Emergency Zone and places restrictions on the movement of 'fire ant carrier' materials into NSW from a known infested area including: organic mulch (including manure), soil and anything with soil on it, hay and baled material, potted plants, turf, agriculture or earth moving machinery, mining or quarry materials and sand and gravel. An Interstate Biosecurity Certificate, also known as a plant health certificate or equivalent must accompany 'fire ant carriers' that have been procured from a known infested area and brought into NSW. All of Transport for NSW staff, contractors and operators must comply with the requirements of the Order.
<i>Fisheries Management Act 1994</i>	Sections 198-202, 205 and 218-220	One of the key objectives of the <i>Fisheries Management Act 1994</i> is to conserve 'key fish habitats' (KFH) and NSW Department of Primary Industries focus the application of the Act, Fisheries Management Regulations and other policies and guidelines on KFH. Concurrence from the Department of Primary Industries (Fisheries) is required prior to the commencement of works if triggers in accordance with Sections 198-202, 205 and 218-220 of the Act are met. No watercourses occur at the site; Leycester Creek (which is designated as KFH) occurs ~ 270m to the south of the bridge. No consultation and/or permits are required under the Act.
<i>Heritage Act 1977</i>	S60	Terania Street Bridge is listed in the Lismore LEP (item A8) and is also listed on the State Heritage Register (#01044) as a heritage item of State significance. The bridge is also listed in the TfNSW s170 Heritage and Conservation Register. As the bridge is proposed for demolition, a SOHI has been prepared and a S60 (major works approval application package was submitted to NSW DCCEEW (Environment and Heritage) on 15 March 2024.

Legislation	Section	Comment
		The S60 application was approved on the 8 th of May 2024, subject to conditions (refer Appendix D).
<i>National Parks and Wildlife Act 1974</i>	Sections 87(1), 90	The provisions of the <i>National Parks and Wildlife Act 1974</i> as they relate to the conservation of nature and cultural heritage items are unlikely to be triggered by the Proposal. Under the Act it is an offence to cause damage to a plant or animal or cultural heritage item unless it is essential for carrying out an activity by a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part. A basic Aboriginal Heritage Information Management System (AHIMS) was undertaken in April 2024 and did not identify any registered heritage sites in the locality (refer Section 6.6). Safeguards are identified in Section 6.6 to mitigate any unforeseen impacts associated with the proposal.
<i>Protection of the Environment Operations Act 1997</i>	Parts 5.5, 5.7	The <i>Protection of the Environment Operations Act 1997</i> (POEO Act) is the key piece of environment protection legislation administered by the EPA. Part 5.4 of the Act sets out requirements to minimise air pollution, which will be complied with throughout the proposal. Part 5.5 sets out requirements to minimise noise pollution, which will be complied with throughout the proposal. Part 5.7 sets out a duty to notify pollution incidents. In the unlikely event of a pollution incident occurring during the proposed works, notification will be as required.
<i>Crown Land Management Act 2016</i>		The <i>Crown Land Management Act 2016</i> outlines the ownership, use and management of Crown Land in New South Wales. Within the broader locality Leycester Creek, the Wilsons River and the adjacent reserves (Wharf Reserve, The Stops) are all designated as Crown Land, with Wharf Reserve and The Stops being Crown reserves. Crown land does not occur at the site.
<i>State Environmental Planning Policy (Biodiversity and Conservation) 2021</i>		Chapter 2 'Vegetation in non-rural areas' of the Policy does not apply as the land is zoned RU2. Chapters 3 and 4 of the Policy aim to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline. The Policy applies to Local Government Areas listed under Schedule 2 of the Policy which includes the subject site. The Policy only applies in relation to activities which require a development application to be made. As Section 2.109(1) of TISEPP precludes the proposal from requiring development consent, the SEPP does not apply to the Proposal. However, it is TfNSW policy to consider all potential environmental impacts of proposed works, including potential impacts to Koalas and/or their habitat. The proposed works will not impact potential Koala habitat.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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. These are considered in **Appendix A** and chapter 6 of the REF.

A referral is not required for proposed road activities that may affect nationally-listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of **Section 6.1** of the REF.

Findings - matters of national environmental significance

The assessment of the proposal's impact, on matters of national environmental significance and the environment of Commonwealth land, found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land (refer **Appendix A**). Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

4.3.2 Other relevant Commonwealth legislation

4.3.3 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the [Native Title Tribunal](#) [Native Title Vision](#) website was undertaken, with one Native Title holders/claimant identified: the Widjabul Wia-Bal People (NC2022/001); refer **Appendix F**. While the site is included within the Widjabul Wia-Bal claim, as the site is not crown land, Native Title does not require further consideration.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of [a road and/or road infrastructure facilities] and is being carried out by or on behalf of a public authority. Under section 2.108 of SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Transport for NSW is the determining authority for the proposal. This REF fulfils Transport's obligation under section 5.5 of the EP&A Act including 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.

5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future. Details of any general consultation are provided at **Appendix G**. A statutory consultation checklist is provided at **Appendix H**.

5.1 Consultation strategy

Transport have provided ongoing community advice via a dedicated web page:

<https://www.transport.nsw.gov.au/projects/current-projects/terania-street-lismore-rail-over-road-bridge-closure#:~:text=April%202024%20%E2%80%93%20Plans%20to%20reopen%20Terania%20Street&text=We%20are%20currently%20working%20on,Terania%20Street%20is%20now%20open>

Heritage NSW has issued a Section 60 approval to undertake the removal of the structure. Consultation regarding the removal of the structure is part of the section 60 application process undertaken by Heritage NSW. TfNSW has undertaken targeted consultation with directly affected stakeholders. A brief summary of issues raised is outlined below:

Stakeholder	Summary of response	TfNSW Response	Comments addressed in REF
Heritage NSW	Discussions with heritage NSW undertaken as part of the Sec60 application process. Some general concerns related to the removal of a Stage Heritage Listed Item however understood the need for removal given current state of the structure. Section 60 approval issued with conditions.	TfNSW has included conditions of approval within this REF	Sec 6.7 including safeguards
Lismore City Council (LCC)	Fully supportive of the removal of the spans. LCC has previously requested that TfNSW remove the spans over Terrania Street.	TfNSW has worked closely with LCC through Assessment and section 60 application process.	N/A
UGL Regional Linx (UGLRL)	Recommended the spans be demolished through the Strategic Options Report commissioned in 2023	Strategic Options Report has been considered and included in this environmental assessment.	Sec 2 Sec 2.3.2
Transport Asset Holding company (TAHE)	Notified of the intention to remove. No objections raised.	N/A	N/A

TfNSW has not undertaken direct community consultation relating to the heritage aspects of the proposal as this was part of Heritage NSW S60 approval process. This process included considerable community and stakeholder consultation and this REF is therefore not completing any additional consultation as it has been deemed to not be required at this stage of the project. As noted in this REF and the accompanying Decision Not to Display Memo approved, previous consultation has been completed and targeted consultation with directly affected residents will be undertaken.

Other aspects that may affect the community such as road closures and noise generated during span removal were considered to be relatively minor in nature and best managed through direct consultation/notification to affected residences and businesses.

5.2 Community involvement

Lismore City Council have provided community updates via the Council webpage (and Lismore App). The TfNSW website was updated in June to note that:

Transport for NSW (Transport) is pleased to inform the community that the new safety treatments are now in place and Terania Street is reopened to light vehicles.

Heavy vehicles over 4.5 tonne gross vehicle mass are restricted from approaching the rail bridge on Terania St. Please detour via Wilson Street, Elliott Road and Ballina Road.

The 'No Right Turn' restrictions turning into and out of Peate Street means that vehicles entering Peate Street from Terania Street or exiting Peate Street to travel westbound would need to detour via Pine, Crane and Tweed streets.

A surveillance camera will be in place to monitor vehicle compliance with these new restrictions.

These restrictions are temporary, while Transport continues to prioritise the process relating to the removal of the rail bridge.

While the ancillary sites are adjacent to several residences, many of these are currently unoccupied due to the flood events of 2022. There are several occupied dwellings in the streets surrounding the works area including Peate and Currie Streets. Peate Street is the only access for these properties and must remain unobstructed for the duration of the works. Consultation with occupants will be required (refer Section 6.9). Letterbox drops advising of the works will be completed for neighbouring properties as per standard works notifications during project commencement.

5.3 Aboriginal community involvement

Consideration of the local Aboriginal community reflected the results of the TfNSW *Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI) completed for the project, which concluded that the project is unlikely to harm known Aboriginal objects or places and that the study area does not contain landscape features that indicate the presence of Aboriginal objects.

A courtesy email was supplied to the NTSCORP contacts for the Widjabul Wia-bal Native Title group in May 2024, advising of the impending works and providing an opportunity for comment. No response was received.

5.4 SEPP (Transport and Infrastructure) consultation

No consultation completed.

5.5 Government agency and stakeholder involvement

The NSW Transport Asset Holding Entity (TAHE) have been notified on a number of occasions of the intention to remove the spans at Terania Street – including through Investment and Assurance Committee submissions. No objections have been received.

5.6 Ongoing or future consultation

None required/applicable.

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment, potentially impacted upon by the proposal, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE 2022) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in **Appendix A**.
- Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

6.1.1 Methodology

Prior to field assessment, database searches were completed using:

- BioNet – confirmed threatened species records within a 10km x 10km tile centred on the site
- Protected Matters Search Tool (PMST): potential habitat for threatened species and communities within a 5km radius of the site.

Database search results are attached at **Appendix I**.

The site was assessed by an experienced ecologist on 13/05/2024. Field assessment included:

- Identification (and GPS recording) of all street trees and isolated trees
- Assessment of ground layer vegetation within the bridge footprint, road verges and ancillary areas
- Targeted surveys for threatened flora (namely Hairy Jointgrass *Arthraxon hispidus* within areas of poor drainage)
- Identification of any microhabitats or fauna features (eg. hollow-bearing trees, termitaria etc)
- Targeted survey for microbats within the bridge (using a hand-held spotlight).

6.1.2 Existing environment

Vegetation

The site has been historically cleared and modified and native vegetation is largely absent and no plant community types (PCTs) are present. Vegetation elements include:

- Street trees planted along Terania Street: two large Teak (*Flindersia australis*), several immature Tuckeroo (*Cupaniopsis anacardioides*) and single trees of Spotted Gum (*Corymbia variegata*) and Riberry (*Syzygium luehmannii*) occur. A small stand of planted trees (mostly Riberry and Bangalow Palm) occurs at the entry of Bray Street (unformed).
- Koala feed tree plantings: mixed immature plantings of mostly Forest Red Gum (*Eucalyptus tereticornis*) and Swamp Mahogany (*E. robusta*) occur on the western side of Peate Street and are kept pruned for leaf harvesting by Koala care and rescue organisation, Friends of the Koala. Scattered larger trees (Flooded Gum) occur within this area.
- Disturbed pasture: degraded/disturbed pasture and weed species dominate the ancillary area, road reserve and verges and the bridge footprint. Typical species include Kikuyu* (*Cenchrus clandestinus*), Paspalum* (*Paspalum* sp.), Setaria* (*Setaria sphacelata*), Torpedo Grass* (*Panicum repens*), Johnson Grass* (*Sorghum halepense*) and typical weeds of wet and disturbed areas – Waxweed* (*Cuphea carthagenensis*), Billygoat Weed* (*Ageratum houstonianum*), Cobblers Pegs* (*Bidens pilosa*) and Curled Dock* (*Rumex crispus*). The main ancillary area contains two Camphor Laurel* (*Cinnamomum camphora*) and an ornamental Cypress* (*Cupressus* sp.). A shallow drain

occurs within the main ancillary area and is dominated by Torpedo Grass* with occasional Hairy Commelina* (*Commelina benghalensis*) and Knotweed (*Persicaria decipiens*, *P. strigosa*).

*non-native species

Vegetation at the site is depicted at **Figure 3-1**; refer also to photographs in **Table 3-1**.

Threatened flora and communities

No threatened flora or communities are present at the site.

Weeds

Weeds dominate the site, with several listed species (*Biosecurity Act 2015*) recorded in low numbers: Climbing Asparagus (*Asparagus plumosus*), Cockspur Coral Tree (*Erythrina crista-galli*), Giant Devil's Fig (*Solanum chrysotrichum*).

Fauna habitat

The site provides poor quality fauna habitat due to the lack of structure and cover. The ancillary areas provide foraging habitat for a range of common 'open' country and wetland birds (eg. Australian Magpie, Pied Butcherbird, White Ibis, Straw-necked Ibis, Cattle Egret), with the constructed drain providing habitat for a limited range of common frog species. Camphor Laurel within the ancillary area provide habitat for birds such as the White-headed Pigeon and Australasian Figbird, with the tree near Peate Street containing a small nest of Native Stingless Bees (*Austroplebeia australis*).

The bridge contains numerous splits, holes and rotted areas which provide potential low quality roost habitat for microbats, however none were observed. Several Striped Wall Skink (*Cryptoblepharus virgatus*) were observed within bridge timbers.

Threatened fauna

No threatened fauna were recorded; the limited habitats at the site do not provide significant habitat for any threatened fauna species. Contractors installing bridge scaffolding did not report any microbat observations. And no signs of microbat use were observed (guano, staining). A habitat suitability assessment was completed to determine the likelihood of any threatened fauna recorded in the BioNet search utilising habitat at the site (refer **Appendix J**).

While no microbats were recorded, and roost habitat is generally poor, it is acknowledged that the bridge provides potential opportunistic roost habitat for bridge roosting species such as Bent-winged bats (*Miniopterus* sp.) and Southern Myotis (*Myotis macropus*). Significant roost habitat occurs for both species within the nearby Browns Creek stormwater outlet (pers. data).

Species identified from the habitat suitability assessment which may potentially occur at the site have been subject to a Test of Significance (ToS) ('5 part test') as per s7.3 of the *Biodiversity Conservation Act 2016* (BC Act); refer **Appendix K**.

Matters of national environmental significance

Potential habitat for up to five threatened ecological communities, 65 threatened species and 17 migratory species listed in the EPBC act occurs in the locality. Field assessment determined that no nationally threatened flora species or TECs are present in the works footprint and the site does not provide important habitat for any nationally threatened fauna species. No MNES are present at the site (refer assessment at **Appendix A**).

6.1.3 Potential impacts

Construction

The proposed demolition works would not require the removal of any proximate native trees, and ancillary areas are degraded and modified. On this basis, biodiversity impacts are very low. Should any microbats be opportunistically roosting in the bridge at/during demolition, there are sufficient nearby structures (several other nearby railway under bridges, Browns Creek outlet) which provide suitable roost habitat.

Tests of Significance (refer **Appendix K**) concluded that the proposed works would not significantly affect threatened fauna habitat.

Operation

The operation of Terania Street following the works would remain unchanged with regard to most fauna groups, with permanent loss of habitat for common skink species and potential opportunistic microbat roost habitat due to the removal of the bridge.

Conclusion on significance of impacts

The proposal is not likely to significantly impact 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 is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.

6.1.4 Safeguards and management measures

Table 6-1 Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	Pre-clearing inspection for microbats to be completed prior to demolition. If any microbats are present they will be captured and relocated to roost habitat at the Browns Creek stormwater outlet (known roost habitat).	Contractor/Ecologist	Pre-construction	
Biodiversity	A local ecologist shall be engaged to be on standby during demolition works, in case any fauna are present (eg. carpet pythons, green tree snakes, geckos) within the bridge which may require relocation.	Contractor/Ecologist	Demolition	
Biodiversity	If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport Unexpected Threatened Species Find Procedure contained in the Transport Biodiversity Guidelines – Guide 1 (Pre-clearing process (EMF-BD-GD-0032).	Contractor	Construction	
Biodiversity	Works with the potential to directly or indirectly impact potential microbat roosting or breeding habitat such as on bridges and culverts will be carried out in accordance with Transport Microbat Management Guidelines (EMF-BD-GD-0012).	Contractor	Construction	Microbat Management Guidelines (EMF-BD-GD-0012).
Biodiversity	Installation of 'no go' fencing around Koala feed tree plantings to be completed prior to commencement and ongoing access provided for collection of foliage.	Contractor	Pre-construction	
Biodiversity	An Interstate Biosecurity Certificate (or equivalent) must accompany 'fire ant carriers' that have been procured from a known infested area and brought into NSW in accordance with the NSW Biosecurity (Fire Ant) Emergency Order. This applies to Transport for NSW staff, contractors and operators. No mulch shall be imported to the site unless required, and if so must be certified as free of waste/contaminants.	Contractor	Construction	NSW Biosecurity (Fire Ant) Emergency Order

6.1.5 Biodiversity offsets

As no native trees or significant vegetation/habitat would be impacted, no offsets are required.

6.2 Hydrology and flooding (surface water and groundwater)

6.2.1 Existing environment

The entire site (including ancillary areas) is located on flood-prone land, with low lying areas subject to waterlogging and poor drainage. During the 2022 flood events, Terania Street bridge was almost completely submerged. No naturally occurring watercourses occur at the site. As noted a minor drain bisects the main ancillary area, with Peate Street and Terania Street also having constructed drains. Leycester Creek occurs ~ 270m immediately south of the site.

6.2.2 Potential impacts

Construction

The works are unlikely to have any impacts on local hydrology due to the relatively benign nature of the works (demolition) and that there is no likelihood of any materials being mobilised and carried to local water sources (Leycester Creek). No excavation would occur that have potential to intercept groundwater.

Operation

Operation of Terania Street post demolition will not alter existing hydrological conditions.

6.2.3 Safeguards and management measures

Table 6-2 Hydrology safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Hydrology and flooding	A site-specific Erosion and Sediment Control Plan will be prepared and implemented as part of the CEMP. The Plan will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Contractor	Pre-construction	Section 2.2 of <i>QA G38 Soil and Water Management</i>
Hydrology and flooding	No materials or works shall be completed within 5m of the drainage channel within the compound area. Silt fencing shall be installed along the length of the drain consistent with requirements of the Erosion and Sediment Control Plan/CEMP.	Contractor	Pre-construction	

6.3 Soils

6.3.1 Methodology

The following assessment was completed (refer **Appendix L**):

- Soil map review – eSPADE v2.2
- Review of EPA contaminated land database and DPI cattle dip site locator.

6.3.2 Existing environment

The site occurs on the Leycester Soil landscape, described as follows:

- Landscape: level to gently undulating broad to extensive (500→1 500 m) alluvial plains of extremely low relief, draining the MacKellar Hills. Extensively cleared closed- and open-forest.

- Soils: deep (>200 cm), poorly to moderately welldrained alluvial Black Earths and Structured Clays occur throughout the floodplains. Wetter areas, such as ox-bow floors, have deep (>200 cm), poorly drained Weisenboden. Deep (>200 cm), well-drained Earthy Sands line channels.
- Limitations: moderately erodible, moderately plastic soils with low wet bearing strength, moderate shrink-swell and localised waterlogging. Flooding, stream bank erosion.

No registered contaminated land sites or cattle dip sites occur in close proximity to the site.

6.3.3 Potential impacts

Construction

The project requires minor earthworks for treatment of the bridge abutments. Any removed material will be placed within adjacent disturbed land within the rail corridor and stabilised. On this basis, impacts are limited to the potential for a flood event occurring and mobilising placed spoil.

Operation

Following works and soil stabilisation there are unlikely to be any ongoing impacts to the environment.

6.3.4 Safeguards and management measures

Table 6-3 Soils safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Senior Manager Environment and Sustainability and/or EPA.	Contractor	Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
Accidental spill	A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport EPA officers).	Contractor	Pre-construction	Section 4.3 of QA G36 <i>Environment Protection</i>

6.4 Traffic and transport

6.4.1 Existing environment

Terania Street is a single lane two-way sealed road with a 50 km/hr posted speed limit which is the main street in North Lismore and services traffic north to the villages of Tullera, Modanville and Dunoon (via Dunoon Road), in addition to being the main road connecting to Nimbin Road which connects to the villages of Goolmangar, Coffee Camp and Nimbin. Terania Street also supports local traffic accessing residences and local businesses.

Currently Terania Street is closed at the rail bridge, with light vehicles directed via Wilson Street or Alexandra Parade. Larger vehicles must use alternative detours, as noted in **Section 3.3.7**. The current detours have been in place since February 2024 when the bridge was closed due to a truck accident.

During site establishment and demolition works (Stage 1), Terania Street will remain closed to traffic. Following demolition and any associated tasks, Terania Street will re-open to traffic as below:

- **Stage 1:** road closed to enable demolition (detour route in place).
- **Stage 2:** road partially re-opened while remaining demolition occurs (under Traffic Control).
- **Stage 3:** road fully re-opened once road rehabilitation/pavement works completed and team demobilised. The road will function as a 2 lane (1 each way) with shoulders to tie into either side of the bridge. A Traffic Management Plan (TMP) has been developed.

6.4.2 Potential impacts

Construction

As the road is already closed (and detours established), the project will not result in any changes to the current traffic restrictions, other than extending them for up to an additional 4 months (but at the same time, being a solution in itself). The minor increase in local traffic to the site from contractors, plant etc would not be significant.

While the construction area is adjacent to several residences, many of these are currently unoccupied due to the flood events of 2022. There are several occupied dwellings in the streets surrounding the works area including Peate and Currie Streets. Peate Street is the only access for these properties and must remain unobstructed for the duration of the works.

Low numbers of additional vehicles attending the site daily are unlikely to be disruptive in terms of noise, emissions, or amenity however consultation with occupants will be required (refer **Section 6.9**).

Operation

Post completion, traffic would be restored, road conditions improved and there would be no restrictions on local traffic or vehicle movements. The removal of the bridge would be beneficial in terms of lifting current height restrictions for heavy vehicles.

6.4.3 Safeguards and management measures

Table 6-4 Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the <i>Transport Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Transport for NSW, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site-specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident	Contractor	Pre-construction	Section 4.8 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	- consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic - monitoring, review and amendment mechanisms.			

6.5 Noise and vibration

6.5.1 Existing environment

As noted, Terania Street is typically a moderately busy local street, particularly due to vehicles entering and leaving Lismore. However, since the 2022 floods and vacancy of the majority of residences (and some businesses) in North Lismore, traffic noise has significantly reduced. The closest occupied dwelling to the site appears to be ~ 50m west of the bridge. Other sensitive receivers in the locality include

- Liberty service station ~100m to the east
- Baker's Corner Service Station ~150m to the west
- A flood-affected residential dwelling occurs approximately 100m north of the site compound at Lots 54 and 55 DP 975080 where tenants are occupying temporary accommodation (caravan) in the yard with direct line of sight to the compound
- A residential dwelling at Lot 1 DP 798874 approximately 180m north of the rail bridge.

Several other dwellings in North Lismore remain occupied and a letterbox drop will be required to notify these residents of the project activities.

6.5.2 Potential impacts

Construction

Noise impacts of the establishment and demolition phases of the project are likely to be relatively low and limited to operational noise from powered hand tools and plant (trucks, crane). As there are currently few local residents and businesses, the affects of noise impacts are substantially reduced from a 'normal' scenario where local urban areas at full occupancy.

The most significant noise associated with the project is associated with removal of old concrete footings and stabilisation pads which have been poured to assist in securing the bridge. Removal of this material would require an excavator with a rock hammer (or potentially personnel with jackhammers) to break the material up so it can be removed from site. The expected duration of this work is 4-5 days (maximum). Minor localised vibration would be expected during this time.

A scenario completed using the Transport Noise Estimator was completed using a structural demolition scenario using a 13.5t excavator with rock hammer within an urban scenario (refer **Appendix M**). An affected distance of 390 metres was modelled where residences had a direct line of sight to the proposal for daytime works. As noted, the projected maximum duration of the project is up to 4 months, with the scale and noisiness of works fluctuating during this time depending on staging and requirements.

It is expected that local residents/businesses appreciate the works providing a positive local benefit, however standard notification and engagement will be completed prior to and during the project.

Operation

Once works have finished and the site demobilised there would be no ongoing impacts associated with the bridge locality.

6.5.3 Safeguards and management measures

Table 6-5 Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in <i>the Interim Construction Noise Guideline (ICNG) (DECC, 2009)</i> and identify: - all potential significant noise and vibration generating activities associated with the activity - feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (Transport, 2014). - a monitoring program to assess performance against relevant noise and vibration criteria - arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures - contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Pre-construction	Section 4.6 of QA G36 <i>Environment Protection</i>
Noise and vibration	All sensitive receivers (businesses, local residents) likely to be affected will be notified at least 10 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: - the project - the construction period and construction hours - contact information for project management staff - complaint and incident reporting - how to obtain further information.	Contractor	Pre-construction	
Noise and vibration	Works will be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts.	Contractor	Construction	

6.6 Aboriginal cultural heritage

6.6.1 Methodology

A search of the AHIMS database was completed to identify and registered Aboriginal heritage places (refer **Appendix N**).

6.6.2 Existing environment

The site is highly modified and disturbed, with the rail corridor subject to extensive clearing, foiling and earthworks as part of its construction. The AHIMS results identified one registered Aboriginal heritage place in the locality, which is outside the project area. A Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) has been completed for the project (refer **Appendix N**) and concluded:

- The project is unlikely to harm known Aboriginal objects or places
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area. One registered site was identified outside the project area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to current past disturbance (construction of the bridge).

6.6.3 Potential impacts

Construction

Given the main works are associated with demolition of a non-indigenous structure, no impacts would apply. Similarly earthworks in the rail corridor apply to land which has been significantly disturbed and filled – the potential for unearthing any Aboriginal artefacts is expected to be low. The ancillary areas would not be subject to any below ground works, excavation or significant disturbance.

Operation

Once works have finished and the site demobilised, there would be no impacts to Aboriginal cultural heritage in the locality.

6.6.4 Safeguards and management measures

Table 6-6 Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	• The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>

6.7 Non-Aboriginal heritage

6.7.1 Methodology

Terania Street Bridge is listed in the Lismore LEP (item A8), the State Heritage Register (#01044) as a heritage item of State significance and in the TfNSW s170 Heritage and Conservation Register. As the bridge is proposed for demolition, a SOHI has been prepared (refer **Appendix C**) and a S60 major works approval application package was submitted to NSW DCCEEW (Environment and Heritage) and approved on the 8th of May 2024, subject to conditions (refer **Appendix D**).

6.7.2 Existing environment

As per the SOHI: *Originally built in the 1890s, the Lismore underbridges were constructed using timber girder beams supported on a series of closely spaced timber trestle piers in old growth hardwood timbers. Timber beam or timber girder construction is a simple bridge type that relies on a single support point, distributing load along its length as an integrated system. The span length is limited by the carrying capacity of the shorter girder beams and does not have the load carrying advantages of a sophisticated trussed beam system.*

Terania Street bridge is located on the (non-operational) Casino to Murwillumbah Line that ceased operations in 2004. Since then, rail operations have been replaced with bus services and there is no plan to reopen the railway line. The SOHI states that: *the existing timber rail underbridge at Terania Street cannot be retained insitu, maintained and repaired, or reused, and unable to carry live rail loads as it is structurally unsound.*

6.7.3 Potential impacts

Construction

The demolition of the bridge would result in the loss of a state heritage listed item, however, as concluded in the SOHI, the bridge constitutes a danger to the public and users as:

- The underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.
- The underbridge has low height clearance and narrow lane widths that are life- endangering with escalating safety risks to the public and users of the road.
- The underbridge impedes disaster management egress and recovery, which is a life- endangering safety risk to the public and users of the Terania Street Evacuation Route.

Operation

n/a

6.7.4 Safeguards and management measures

Table 6-7 Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	All conditions in the s60 approval for the bridge demolition must be complied with as follows (for full conditions – refer Appendix D): <i>ADDITIONAL CONDITIONS OF APPROVAL</i> • A timber recycling and reuse plan for the fabric of Terania St underbridge must be developed and submitted to Heritage NSW for approval prior to demolition works commencing on site. This plan must include details on how suitable salvageable timbers will be marked before removal from the bridge, where they will be stored to ensure they will not be subject to pest or weathering and which of the other Lismore Railway Underbridges these	TfNSW/Contractor	Pre-construction	S60 Approval

Impact	Environmental safeguards	Responsibility	Timing	Reference
	timbers will be incorporated into during future works. - Transport for NSW must submit a curtilage amendment request, which includes an updated heritage assessment for the remaining Lismore Underbridges to the Heritage Council of NSW to remove Terania St underbridge from the wider Lismore Railway underbridges State Heritage Register item 01044 within six months of its demolition. HERITAGE INTERPRETATION PLAN - An interpretation plan for the Lismore Railway underbridges must be prepared in accordance with Heritage NSW publication 'Interpreting Heritage Places and Items Guidelines' (2005) and submitted for approval to the Heritage Council of NSW (or delegate). - The interpretation plan must detail how information on the history and significance of the underbridges, with an emphasis on Terania St underbridge will be provided for the public, and make recommendations regarding public accessibility, signage and lighting. The plan must identify the types, locations, materials, colours, dimensions, fixings and text of interpretive devices that will be installed as part of this project. - Interpretation relating to the Terania St underbridge to be installed on site within 12 months of its demolition. PHOTOGRAPHIC ARCHIVAL RECORDING - A photographic archival recording must be prepared prior to the commencement of works and during works. This recording must be in accordance with the Heritage NSW publication 'Photographic Recording of Heritage Items using Film or Digital Capture' (2006). The digital copy of the archival record must be provided to Heritage NSW.			
Non-Aboriginal heritage	- The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. - Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / Pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>

6.8 Landscape character and visual impacts

6.8.1 Existing environment

The site and immediate locality comprise an urban zone where vacant land and the railway corridor comprise weedy degraded land. Since the 2022 flood event, the landscape character in North Lismore has substantially declined as houses have been vacated and exclusion fencing erected around many houses. The slightly neglected landscape character is softened by several established street trees in proximity to the site (several mature Teak and a Spotted Gum).

While the bridge itself provides an item of visual value – as a timber heritage bridge, this is detracted from by its derelict state and surrounding degraded rail corridor. Visual amenity associated with the bridge stabilisation (barriers, scaffolding, signage etc) is currently that of a construction site.

6.8.2 Potential impacts

Construction

The works will improve the visual amenity by removing construction elements from the landscape and remediating adjacent weedy areas adjacent to the abutments. While the loss of the bridge will be a significant loss in the landscape, its current state/condition is of low amenity.

Operation

n/a

6.8.3 Safeguards and management measures

Table 6-8 Landscape character and visual safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual amenity	Working areas must be maintained and kept free of rubbish at the end of each working day.	Contractor	Construction	
Landscape character and visual amenity	Works will be carried out in accordance with Transport EIA-N04 <i>Guideline for Landscape Character and visual impact assessment 2020</i> .	Contractor	Construction	EIA-N04 <i>Guideline for Landscape Character and visual impact assessment 2020</i>

6.9 Socio-economic

6.9.1 Existing environment

The impact of the 2022 flood event has been devastating for Lismore and the town is still recovering from the event. Substantial parts of North Lismore were affected by the flood and large numbers of dwellings are vacant or unviable. Some local businesses have also been affected in the Terania Street locality. On this basis, the locality is still under substantial economic hardship as flood affected residents and business seek to re-establish or relocate.

The current road closure exacerbates existing hardships by requiring detours for local residents and transport operators, in addition to the low height limit limiting the ability move materials (including moving/relocating houses) via Terania Street. Several residences remain occupied in Peate Street (a dead end road), and free access to these properties will be required for the duration of works

6.9.2 Potential impacts

Construction

While the construction area and ancillary sites are adjacent to several residences, many of these are currently unoccupied due to the flood events of 2022. There are several occupied dwellings in the streets surrounding the works area including Peate and Currie Streets. Peate Street is the only access for these properties and must remain unobstructed for the duration of the works. Potential noise and vibration impacts have been considered in **Section 6.5**. Consultation with occupants will be required. Letterbox drops advising of the works will be completed for neighbouring properties as per standard works notifications during project commencement.

The works will disadvantage local residents to a minor degree as pedestrian access would be temporarily closed during demolition works – forcing pedestrians to walk via the light vehicle traffic detour route (Crane Street).

Operation

The works will alleviate the current road closure such that detours are no longer required and removal of the bridge removes restrictions on moving above average height loads. The socio-economic impacts of the works will be positive for the local community on this basis. Removal of the bridge will resolve issues relating to movement of houses and materials, while also improving conditions for watercraft rescues and access during future flood events.

6.9.3 Safeguards and management measures

Table 6-9 Socio economic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): - mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions. - contact name and number for complaints. The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).	Contractor	Pre-construction	
Socio-economic	All residents and business and any other key stakeholders affected by the works would be notified at least 10 working days prior to works commencing. Project updates will be made available for the duration of the project as required.	TfNSW	Pre-construction, construction	

6.10 Air quality

6.10.1 Existing environment

As noted, due to the lack of active residences and vehicles in the immediate locality, the current air quality is likely to be relatively good due to low emissions and an absence of heavy vehicles and heavy industry.

6.10.2 Potential impacts

Construction

The proposed works would impact local air quality for the project duration via:

- Exhaust emissions from vehicles and plant
- Dust generated by earthworks and/or concrete removal.

It is not considered that the short time frame and relatively minor machinery/plant and works would result in excessive impacts to air quality, particularly when residential dwellings closest to the bridge appear unoccupied.

Operation

Once the bridge is removed, normal traffic conditions would return and there would be an expected nominal increase in emissions as vehicles return to using Terania Street as a main throughfare (as per previously until February 2024 when the bridge was closed due to a truck accident).

6.10.3 Safeguards and management measures

Table 6-10 Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or Office of Environment and Heritage (OEH) guidelines • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces.	Contractor	Pre-construction	Section 4.4 of QA G36 Environment Protection
Air quality	Measures (including watering or covering exposed areas) will be used to minimise or prevent air pollution and dust.	Contractor	Pre-construction, construction	
Air quality	Works (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Pre-construction, construction	
Air quality	Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with the Transport Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Pre-construction, construction	Stockpile Site Management Guideline (EMS-TG-10)

6.11 Waste and resources

6.11.1 Existing environment

The railway corridor comprises unmanaged land which contains minor flood debris and rubbish, which will be removed for the project. The project will generate waste via the demolition of the bridge (timber materials, bolts, pins etc) and removal of concrete stabilisation pads and pier foundations.

6.11.2 Potential impacts

Construction

The works would generate waste via the demolition process, with all materials initially removed to the ancillary area for temporary stockpiling prior to disposal, or directly placed on trucks and removed from site to the suitable certified waste facility, in accordance with the waste management plan developed for the project. The bridge timbers are considered contaminated material (due to potential exposure to oil, fuel, various chemicals and potentially asbestos), however this will be determined by an on-site condition assessment. All contaminated material will be disposed of at Lismore waste facility.

The s60 heritage has requested that examples of 'suitable salvageable timbers' are retained for heritage purposes. Suitability for future re-use would be determined through condition assessments of timbers following demolition.

Any spoil generated during the works will be re-used on site/within the railway corridor. Other wastes generated by the project would be limited to:

- General construction and office wastes – disposal via onsite skip and sent to Lismore waste facility
- Portaloo wastes – removed and disposed of by certified practitioner.

The project would not require any additional resources.

Operation

n/a

6.11.3 Safeguards and management measures

Table 6-11 Waste and resources safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. The WMP will align with the <i>Environmental Procedure - Management of Wastes on Transport for NSW Land</i> (Transport, 2014) and relevant Transport Waste fact sheets.	Contractor	Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
Waste	Any contaminated material must be disposed of in accordance with requirements in the WMP.	Contractor	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction	
Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	

6.12 Other impacts

6.12.1 Existing environment and potential impacts

Table 6-12 Other potential impacts

Environmental factor	Existing environment	Potential impacts
Utilities	A power pole and stay occur on either side of the bridge on the southern side of Terania Street, with services also within the Peates Street road reserve.	There is potential to damage utilities within/adjacent to the works area.

6.12.2 Safeguards and management measures

Table 6-13 Other impacts Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Utilities	Prior to the commencement of works: - the location of existing utilities and relocation details will be confirmed following consultation with affected utility owners (Note: a dial before you dig search has already been completed). - further assessment will be undertaken if the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint.	Contractor	Pre-construction	
Hazards and risk management	A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to: - details of hazards and risks associated with the activity - measures to be implemented during construction to minimise these risks - record keeping for materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials - a monitoring program to assess performance in managing identified risks - contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEI publications.	Contractor	Pre-construction	

6.13 Cumulative impacts

6.13.1 Study area

The cumulative impact assessment area is considered as comprising the Lismore Local Government Area (LGA).

6.13.2 Broader program of work

The proposal is part of a broader program of work, with several other railway bridges potentially proposed for demolition due to structural/safety issues. These include (refer **Plate 4**):

- Crane Street bridge
- Union Street bridge
- Winterton Parade bridge.

However, it is understood there are no formal agreements between relevant stakeholders in this regard. At the moment there is no other work in the immediate vicinity of the proposal under TfNSW authority. The removal of the Terania Street bridge would add to the wider removal of houses and structures and the changing urban landscape following the 2022 flooding event which has significantly affected Lismore. In this sense, the removal of this one structure is not considered to be cumulatively significant in a historical sense, particularly given there are around 40 similar structures across NSW.



Plate 4: Additional bridges proposed for demolition in Lismore CBD (Source: UGLRL)

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts during detailed design, construction, and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

Safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer, (northern) prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in: *QA Specification G36 - Environmental Protection (Management System)*, *QA Specification G38 - Soil and Water Management (Soil and Water Plan)*, *QA Specification G10 - Traffic Management*.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Senior Manager Environment and Sustainability prior to commencement of the activity. As a minimum, the CEMP will address the following: - any requirements associated with statutory approvals - details of how the project will implement the identified safeguards outlined in the REF - issue-specific environmental management plans - roles and responsibilities - communication requirements - induction and training requirements - procedures for monitoring and evaluating environmental performance, and for corrective action - reporting requirements and record-keeping - procedures for emergency and incident management - procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity. A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to: - details of hazards and risks associated with the activity - measures to be implemented during construction to minimise these risks - record keeping for materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials - a monitoring program to assess performance in managing identified risks - contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEH publications.	Contractor / Transport for NSW project manager	Pre-construction / detailed design	

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN2	General - notification	Letterbox drops advising of the works will be completed for neighbouring properties as per standard works notifications during project commencement.	Contractor / Transport for NSW project manager	Pre-construction	
GEN3	General - environmental awareness	Toolbox talks regarding noise management/working near residences and/or other relevant issues as required.	Contractor / Transport for NSW project manager	Pre-construction, construction	
	Biodiversity	- Pre-clearing inspection for microbats to be completed prior to demolition. If any microbats are present they will be captured and relocated to roost habitat at the Browns Creek stormwater outlet (known roost habitat). - A local ecologist shall be engaged to be on standby during demolition works, in case any fauna are present (eg. carpet pythons, green tree snakes, geckos) within the bridge which may require relocation. - If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport <i>Unexpected Threatened Species Find Procedure</i> contained in the Transport Biodiversity Guidelines – Guide 1 (Pre-clearing process (EMF-BD-GD-0032). - Works with the potential to directly or indirectly impact potential microbat roosting or breeding habitat such as on bridges and culverts will be carried out in accordance with Transport Microbat Management Guidelines (EMF-BD-GD-0012). - Installation of 'no go' fencing around Koala feed tree plantings to be completed prior to commencement and ongoing access provided for collection of foliage. - An Interstate Biosecurity Certificate (or equivalent) must accompany 'fire ant carriers' that have been procured from a known infested area and brought into NSW in accordance with the NSW Biosecurity (Fire Ant) Emergency Order. This applies to Transport for NSW staff, contractors and operators. No mulch shall be imported to the site unless required, and if so must be certified as free of waste/contaminants.	Contractor / Transport for NSW project manager / Project ecologist	Pre-construction	Biodiversity Guidelines – Guide 1 (Pre-clearing process (EMF-BD-GD-0032)) Microbat Management Guidelines (EMF-BD-GD-0012)
	Hydrology and flooding	- A site-specific Erosion and Sediment Control Plan will be prepared and implemented as part of the CEMP. The Plan will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. - No materials or works shall be completed within 5m of the drainage channel within the compound area. Silt fencing shall be installed along the length of the drain consistent with requirements of the Erosion and Sediment Control Plan/CEMP.	Contractor / Transport for NSW project manager	Pre-construction	
	Soils	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Senior Manager Environment and Sustainability and/or EPA.	Contractor	Pre-construction	

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport EPA officers).			
	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Transport for NSW, 2008).	Contractor	Pre-construction	<i>Traffic Control at Work Sites Manual</i> (RTA, 2010) <i>QA Specification G10 Control of Traffic</i> (Transport for NSW, 2008).
	Noise and vibration	- A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009). - All sensitive receivers (businesses, local residents) likely to be affected will be notified at least 10 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: - the project - the construction period and construction hours - contact information for project management staff - complaint and incident reporting - how to obtain further information. - Works will be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts.	Contractor	Pre-construction	<i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009)
	Aboriginal cultural heritage	- The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. - Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction	<i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport, 2015)
	Non-Aboriginal heritage	- All conditions in the s60 approval for the bridge demolition must be complied with as follows: - A timber recycling and reuse plan for the fabric of Terania St underbridge must be developed and submitted to Heritage NSW for approval prior to demolition works commencing on site. This plan	TfNSW/Contractor	Detailed design / Pre-construction	S60 Approval

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		must include details on how suitable salvageable timbers will be marked before removal from the bridge, where they will be stored to ensure they will not be subject to pest or weathering and which of the other Lismore Railway Underbridges these timbers will be incorporated into during future works. - Transport for NSW must submit a curtilage amendment request, which includes an updated heritage assessment for the remaining Lismore Underbridges to the Heritage Council of NSW to remove Terania St underbridge from the wider Lismore Railway underbridges State Heritage Register item 01044 within six months of its demolition. - An interpretation plan for the Lismore Railway underbridges must be prepared in accordance with Heritage NSW publication 'Interpreting Heritage Places and Items Guidelines' (2005) and submitted for approval to the Heritage Council of NSW (or delegate). - The interpretation plan must detail how information on the history and significance of the underbridges, with an emphasis on Terania St underbridge will be provided for the public, and make recommendations regarding public accessibility, signage and lighting. The plan must identify the types, locations, materials, colours, dimensions, fixings and text of interpretive devices that will be installed as part of this project. - Interpretation relating to the Terania St underbridge to be installed on site within 12 months of its demolition. - A photographic archival recording must be prepared prior to the commencement of works and during works. This recording must be in accordance with the Heritage NSW publication 'Photographic Recording of Heritage Items using Film or Digital Capture' (2006). The digital copy of the archival record must be provided to Heritage NSW. • The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. • Work will only re-commence once the requirements of that Procedure have been satisfied.			Section 4.9 of QA G36 <i>Environment Protection</i>
	Landscape character and visual impacts	• Working areas must be maintained and kept free of rubbish at the end of each working day. • Works will be carried out in accordance with Transport EIA-N04 <i>Guideline for Landscape Character and visual impact assessment 2020</i>.	Contractor	Construction	EIA-N04 <i>Guideline for Landscape Character and visual impact assessment 2020</i>
	Socio-economic	• A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008) and include (as a minimum): - mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions. - contact name and number for complaints.	Contractor/TfNSW	Pre-construction, construction	

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		All residents and business and any other key stakeholders affected by the works would be notified at least 10 working days prior to works commencing. Project updates will be made available for the duration of the project as required.			
	Air quality	- An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: - potential sources of air pollution - air quality management objectives consistent with any relevant published EPA and/or Office of Environment and Heritage (OEH) guidelines - mitigation and suppression measures to be implemented - methods to manage work during strong winds or other adverse weather conditions - a progressive rehabilitation strategy for exposed surfaces. - Measures (including watering or covering exposed areas) will be used to minimise or prevent air pollution and dust. - Works (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. - Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with the Transport <i>Stockpile Site Management Guideline</i> (EMS-TG-10).	Contractor	Pre-construction, construction	Section 4.4 of <i>QA G36 Environment Protection</i> <i>Stockpile Site Management Guideline</i> (EMS-TG-10)
	Waste and resources	- A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will align with the <i>Environmental Procedure - Management of Wastes on Transport for NSW Land</i> (Transport, 2014) and relevant Transport Waste fact sheets and include but not be limited to: - measures to avoid and minimise waste associated with the project - classification of wastes and management options (re-use, recycle, stockpile, disposal) - statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions - procedures for storage, transport and disposal - monitoring, record keeping and reporting. - Any contaminated material must be disposed of in accordance with requirements in the WMP. - Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed. - Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Pre-construction	Section 4.2 of <i>QA G36 Environment Protection</i>

7.3 Licensing and approvals

Licensing/approval required for the project are summarized in **Table 7-2**.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Heritage Act 1977 (s60)</i>	Permit to carry out activities to an item listed on the State Heritage Register or to which an interim heritage order applies from the Heritage Council of NSW.	Permission for demolition has been approved (refer Appendix D)

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

While the outcome of the project is the demolition of a heritage listed item, the proposal is justified on the basis of:

- The S60 heritage approval
- The existing structure is unsafe in its current state
- Engineering assessments have determined the bridge is in a poor state of disrepair and is not salvageable
- Removal of the bridge (i.e. resolution of the current unsafe conditions) will restore vehicle flow along Terania Street for local residents and businesses
- Removal of the existing height restricted bridge will enable trucks to move higher loads (including houses) through Terania Street without impediment
- Removal of the bridge will provide safer conditions for watercraft rescues and access during future flood events.

Adoption of safeguards through the project duration will mitigate any temporary unavoidable impacts resulting from the demolition process. The project will have a net community benefit and assist in more effective flood recovery for local residents and business and provide better conditions for flood safety where watercraft rescues and operations are necessary.

8.2 Objects of the EP&A Act

Table 8-1 Objects of the *Environmental Planning and Assessment Act 1979*

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	Promoting local flood recovery and restoring road infrastructure are major components of the project.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Refer Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	Not relevant to the project.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Not relevant to the project.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Not relevant to the project.

Instrument	Requirement
1.3(g) To promote good design and amenity of the built environment.	Not relevant to the project.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the project.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation has been ongoing throughout the project.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures.

The following are examples statements only:

- Issues that may cause serious or irreversible environmental damage as a result of the proposed project and where there is scientific uncertainty as to the nature of the damage have been identified.
- The best-available technical information, environmental standards and measures have been used to minimise environmental risks.
- Preferred route alignment that minimises vegetation clearance, with particular consideration of sensitive areas, was selected.
- Preferred route alignment to avoid or minimise potential damage to known items or areas of cultural significance was selected.
- Route alignment that minimises potential impacts on existing residential properties and other existing land uses, while also taking into consideration potential impacts on proposed future land use, was selected.
- Conservative 'worst case' scenarios were considered while assessing environmental impact.
- Specialist studies were incorporated to gain a detailed understanding of the existing environment.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

Inter-generational equity concerns have shaped the project, assessment and mitigation measures as follows:

- The economic benefits in the form of transport/freight efficiency for surrounding areas for the current and future generation were identified.
- Benefits that the project provides to current and future generations of local communities and the surrounding region, that would maintain or enhance the local community were identified.

Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has not been relevant to the project, assessment and mitigation as no native trees requires removal and the site consists of land of low conservation value.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

Valuation of environmental resources has shaped the project and mitigation measures as follows:

- The poor condition of the bridge determined it would not be economically feasible to repair
- The value of the project to the community in terms of improved safety was recognised.
- Mitigation measures for the avoidance, reuse, recycling and management of waste during construction and operation are to be implemented.

8.3 Conclusion

The proposed Terania Street Bridge Demolition at Terania Street, North Lismore is subject to assessment under Division 5.1 of the EP&A Act. The 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.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in the demolition of an item registered as having state heritage significance, and some minor impacts associated with traffic noise etc. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also result in the restoration of traffic flow, provide safer conditions for motorists and pedestrians and provide improved outcomes with regard to transport of high loads and flood safety for rescues and assistance.

On balance, the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Name: Ian Colvin
Position: Senior Ecologist
Company name: ReconEco
Date: 03/07/2024

I certify that I have reviewed and endorsed the contents of this REF 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 is neither false nor misleading. I accept it on behalf of Transport for NSW.



Name: Mikhail Lyte
Position: Senior Manager Bridges Maintenance North
Transport region/program: Bridge Maintenance North, Regional & Outer Metropolitan
Date: 01/08/2024

10. EP&A Regulation publication requirement

Table 10-1 EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	Yes

11. References

Focus Bridge Engineering 2023, UGL Regional Linx Lismore Railway Viaduct Underbridges Stage 2: Strategic Options Report Revision B.

Focus Bridge Engineering 2023, UGL Regional Linx Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 ST Revision 0.

Transport for NSW 2024, Statement of Heritage Impact SHR 1044 Lismore Railway Underbridges.

Terms and acronyms used in this REF

Table 11-1 Terms and acronyms used in this REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
CEMP	Construction environmental management plan
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i> . Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i> . Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers
MNES	Matters of national environmental significance under the <i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
PEA Act	<i>Protection of the Environment Administration Act 1991</i> .
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RMS	NSW Roads and Maritime Services, now Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Precincts – Regional)	State Environmental Planning Policy (Precincts – Regional) 2021
SEPP (Resilience and Hazards)	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
Transport	Transport for NSW

Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a <i>Any environmental impact on a community?</i> The proposed work may cause minor short-term environmental impacts on the community, such as noise impacts on residents; however, the potential impacts would be minimised with the implementation of the safeguards as detailed in this REF. The works would have a long-term positive environmental impact on the community, and road users would benefit from safer travelling conditions.	Positive - long-term
b <i>Any transformation of a locality?</i> The proposed work would transform the aesthetics of North Lismore by the removal of a state listed heritage item. However, based on there being no other options, this impact is unavoidable and would not result in any long term impacts on the locality as a whole. Heritage values of the bridge will be preserved via conditions in the S60 approval.	Negative - long-term
c <i>Any environmental impact on the ecosystems of the locality?</i> The proposal would have negligible impacts on local ecosystems as the site is highly disturbed.	Positive - long-term
d <i>Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</i> The works would reduce the aesthetic value of North Lismore due to the bridge removal, but would be unlikely to comprise the Lismore locality. The risk of potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF.	Negative - long-term
e <i>Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</i> The proposal will result in the permanent loss of a local heritage item. Heritage values of the bridge will be preserved via conditions in the S60 approval.	Negative - long-term
f <i>Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?</i> The works are unlikely to significantly impact any habitat of protected fauna.	None predicted
g <i>Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</i> The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air due to the limited scope of works for the proposed activities and the implementation of the safeguards given in Section 6 of this REF.	None predicted
h <i>Any long-term effects on the environment?</i> The proposal would have positive long-term effects on the environment for surrounding residences and road users due to improved safety and usability for road users and the SES. Safeguards provided in the REF aim to mitigate impacts where possible.	Positive - long-term
i <i>Any degradation of the quality of the environment?</i> Nil	None predicted

Factor	Impact
j <i>Any risk to the safety of the environment?</i> The proposal would have minimal risk to the safety of the environment due to the limited scope of works, and that potential impacts would be minimised with the implementation of the safeguards given in Section 6 in this REF. The outcome of the works would be that safety risks to pedestrians and motorists are alleviated in the long term.	None predicted
k <i>Any reduction in the range of beneficial uses of the environment?</i> Nil	None predicted
l <i>Any pollution of the environment?</i> The proposal would potentially cause pollution of the environment in the short term via additional emissions, however the potential impacts would be minimised with the implementation of the safeguards given in Section 6 of this REF.	Negative – short term
m <i>Any environmental problems associated with the disposal of waste?</i> The waste generated during the proposal would be contained and removed for disposal to approved recycling facilities or to licensed landfill in accordance with the safeguards in Section 3 of this REF. No environmental problems are anticipated for the disposal of waste.	None predicted
n <i>Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</i> Nil	None predicted
o <i>Any cumulative environmental effect with other existing or likely future activities?</i> The proposal has the potential to have cumulative environmental effects with other existing or likely future activities, however the effects would be minimal due to the limited scope of works for the activities covered in this REF, and potential impacts on the environment would be minimised with the implementation of the safeguards given in Section 6 in this REF.	Negative - long-term
p <i>Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</i> Nil	None predicted
q <i>Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,</i> The <i>North Coast Regional Plan 2041</i> includes the Lismore LGA; the proposal is not inconsistent with objectives in the Plan. Lismore City Council have prepared a Local Strategic Planning Statement ('Inspire Lismore 2040') that incorporates directions contained within the <i>North Coast Regional Plan 2041</i>. Overall the proposal is in line with principles in the above mentioned strategic plans, in the sense it will: • creates liveable, safe, connected, diverse and healthy living environments • supports the timely, cost effective and efficient provision of infrastructure • avoids putting people and property at risk from natural hazards.	Positive – long-term
r <i>Other relevant environmental factors.</i> No other impacts are expected as a result of the proposed works.	None predicted

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water .

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a Any impact on a World Heritage property?	Nil
b Any impact on a National Heritage place?	Nil
c Any impact on a wetland of international importance?	Nil
d Any impact on a listed threatened species or communities? No nationally threatened flora species or TECs were recorded in the works footprint. The site does not provide important habitat for any nationally threatened fauna species.	Nil
e Any impacts on listed migratory species?	Nil
f Any impact on a Commonwealth marine area?	Nil
g Does the proposal involve a nuclear action (including uranium mining)?	Nil
h Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix B - Strategic Options report

Crane Street

Alexandra Parade

Terania Street

Union Street



UGL Regional Linx

Lismore Railway Viaduct Underbridges

Stage 2: Strategic Options Report

Revision B

This report is in draft format. The contents including any opinions, conclusions or recommendations contained in, or which may be implied from this draft document must not be relied upon. Focus Bridge Engineering reserves the right at any time, without notice, to modify or retract any part or all of the draft report. To the maximum extent permitted by law, Focus Bridge Engineering disclaims any responsibility or liability arising from or in connection with this draft document.

July 2023

Executive Summary

Lismore Railway Viaduct Underbridges

The Lismore Railway Viaduct Underbridges were built as part of the Casino to Murwillumbah railway line which was opened in 1894 and closed in 2004. Overall, there are five underbridges comprising 70 spans, crossing 5 local roads, Leycester Creek and flood plain while the remaining is either track at grade railway or on built-up embankments.

The four (4) main viaduct structures under consideration include Alexandra Parade, Crane Street, Terania Street and Union Street Underbridges which are listed on State Heritage Register (SHR), listing number 01044. There is also a fifth underbridge over Winterton Parade which is not on the SHR.

Alexandra Parade, Terania Street, and Winterton Parade are typical timber girder transom top underbridges supported by typical timber trestle piers, while Crane Street comprises two main continuous metal spans of plate web girders supported by masonry piers. Union Street Underbridge Bridge comprises both timber girder spans over the flood plain and metal girder spans over the road.

Project background

UGL Regional Linx (UGLRL) manages the Country Regional Network (CRN), a network of operational and non-operational railway lines in regional NSW, as an agent for Transport for NSW (TfNSW) – Country Rail Contracts on a 10-year contract that commenced in January 2022.

Since the closure of the Casino to Murwillumbah line in 2004 there has been very little maintenance undertaken on the timber and metal spans, which has contributed to the viaducts current state of general disrepair. The timber elements are in poor condition which has raised safety concerns associated with the continued deterioration and potential loss in structural integrity leading to collapse. The metal span underbridges are in a better condition and appear to be structurally stable. They, however, contain loose ancillary metal elements and poor timber transoms which have a potential of falling from the bridge and as such pose a risk to the public.

The five underbridges have been identified as requiring immediate attention to resolve the following main critical concerns:

- Poor condition posing a risk to public safety and vehicular traffic.
- Limited bridge vertical and horizontal clearances causing network restrictions and a risk of ongoing bridge strikes.
- Inability to improve the current poor approach road alignments.
- Impediment to rescue and evacuation during flooding.

This report outlines the respective options available for each underbridge to resolve the existing site and project constraints and hazards.

General condition

The general condition has been assessed and summarised for four (4) underbridges based on previous inspections undertaken by Focus Bridge Engineering (FBE) in 2017, Cardno in 2020, Lindsay Dynan in 2021 and UGLRL in 2022. Although Winterton Parade is regularly inspected by UGLRL, there are no previous condition assessment records, and therefore a detail inspection is required to assess its current condition.

The summary of the condition assessments of the underbridges with timber spans is similar and predominantly poor while the metal spans at Crane Street Underbridge are generally in fair condition due to the better durability offered by the metal and masonry elements.

Underbridge	Estimated condition as a percentage (%)			
	As-built	Good	Fair	Poor
Alexandra Parade	0%	13%	32%	55%
Crane Street	8%	31%	42%	19%
Terania Street	0%	17%	33%	50%
Union Street	4%	23%	33%	40%
Winterton Parade ⁽¹⁾	n/a	n/a	n/a	n/a
Overall	3%	21%	35%	41%

(1) Detail inspection to be undertaken and completed by the end of July 2023

The poor condition timber spans and trestles present a considerable risk of further deterioration potentially resulting in partial or full collapse of the structures. Alexandra Parade, Terania Street and Union Street underbridges have also been affected by previous bridge strikes which highlights the risks caused by the substandard vertical and horizontal clearances.

Options assessment

This report examined seven options for each underbridge including (1) raising spans, (2) partial demolition, (3) complete demolition, (4) alternative route, (5) rehabilitation, (6) reconstruction, and (7) do nothing. Each underbridge has been assessed against the main project constraints covering flooding, road network restrictions, geometric clearances, safety, heritage and feasibility to arrive at a preferred option(s).

The assessment summarised in the table below presents scores against each assessment criteria to establish the preferred option for each underbridge.

Underbridge	Flooding impacts	Road network restrictions	Bridge clearances	Public Safety	Heritage impacts	Feasibility	Overall	Preferred outcome
Alexandra Parade	●	●	●	●	●	●	●	Option 4 – Alternative route
Crane Street	●	●	●	●	●	●	●	Option 5 – Rehabilitation
Terania Street	●	●	●	●	●	●	●	Option 3 – Entire demolition
Union Street	●	●	●	●	●	●	●	Option 3 – Entire demolition
Winterton Parade	●	●	●	●	●	●	●	Option 3 – Entire demolition

The preliminary plans by Lismore City Council (LCC) to provide a new alternate route for Alexandra Parade to avoid the existing timber underbridge removes most of the constraints including evacuation and rescue concerns during floods, limited height clearances, safety hazards and allows for retention and interpretation of the existing heritage structure.

Although Option 4 would require significant investment it provides additional benefits to LCC by resolving network restrictions and is therefore the preferred option for Alexandra Parade.

Crane Street Underbridge metal girder spans have very limited vertical clearance but there is a low daily traffic count and there is a short alternative detour route available. LCC have advised that there are no specific requirements or restrictions with regards to flood events. As such, rehabilitation, Option 5, was found to be the best outcome for this site and would involve removal of the rail, decayed timber transoms and loose metal elements as well as repair works if required to improve public safety.

Both Terania Street and Union Street Underbridges have limited vertical clearances and LCC have advised that both locations are currently significant constraints and hazards to rescue and evacuation efforts during flood events. Both bridges have high daily traffic counts and evidence of previous vehicle strikes and LCC have also advised that both underbridges cause a substantial road network restrictions for Lismore limiting future growth and urban planning. Raising the timber spans over Terania Street was found to be very difficult to construct, likely unfeasible and would not remove the limited horizontal clearances. Raising the metal spans to retain the structure over Union Street would provide some heritage benefits but would require significant amount of costly temporary works and would result in a rather unattractive bridge form and likely still significantly limit access during a flood. There are no obvious alternative routes for either Union Street or Terania Street, with the only remaining viable, economical and practical option appearing to be demolition. Option 2, partial demolition, would resolve most of the existing constraints but it would require stabilisation of the remaining spans and there would be residual risks from the poor condition of the existing structure. Consequently, complete demolition was preferred.

At Winterton Parade Underbridge the main concerns are the poor road alignment which has led in the past to crashes that have resulted in serious injuries and are likely to be related to the poor road geometry. The only feasible way to remove this road safety hazard is to realign the existing road. To facilitate a new alignment a significant portion of the bridge would have to be removed. Therefore, partial or full demolition appears to be the preferred option while the bridge is not listed on any heritage listings at present.

Next steps

TfNSW in conjunction with UGLRL to adopt the preferred option(s) for each underbridge based on the existing site constraints and overall project feasibility. The next steps appear to be:

1. Key stakeholders to review this report and agree on the preferred option(s) for each underbridge.
2. Site and desktop investigations including but not limited to flood studies, geotechnical, survey, utilities, hazardous material testing, etc.
3. Prepare a Statement of Heritage Impact (SOHI).
4. Complete a Review of Environmental Factors (REF).
5. Undertake project development and planning including for example demolition and heritage interpretation plans, cost estimates, etc.
6. Prepare tender and contract documentation.

This report is subject to, and must be read in conjunction with, the limitations set out in this report and the assumptions and qualification contained throughout the report.

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Appendix C – Project and site constraints

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Appendix F – Selected supplied information

1. Introduction

1.1 General

Focus Bridge Engineering (FBE) has been engaged by UGL Regional Linx (UGLRL) to prepare an options report to assess accessibility and possible safety improvements options for the five (5) non-operational rail underbridges in Lismore, NSW.

The purpose of this report is to consider and assess site and project constraints as well as feasibility to modify or remove existing underbridges to improve public safety, accessibility, and reduce maintenance cost of the disused timber structures. The report will be submitted to Transport for NSW (TfNSW) for consideration.

The Lismore Railway Viaduct Underbridges are located between 836.612 km and 839.091 km on the Casino to Murwillumbah railway line which was constructed in 1894 and closed in 2004. The scope of this project covers five of the non-operational underbridges Alexandra Parade, Terania Street, Crane Street, Union Street and Winterton Parade (see Figure 1-1 and 1-2).



Figure 1-1 Lismore railway viaduct underbridges (Source: UGLRL)



Figure 1-2 Lismore rail underbridge at Winterton Parade (Source: UGLRL)

1.2 Project background

ULGRL manages the Country Regional Network (CRN), a network of operational and non-operational railway lines in regional NSW, as an agent for TfNSW.

Prior to the current engagement FBE was involved by John Holland Rail (JHR), in 2017, to visually inspect some of the Lismore underbridges. JHR previously held the contract for the CRN and were thus responsible for managing non-operation rail network, including underbridges for TfNSW. The Lismore viaduct has thus been a concern for a minimum of 6 years with more recent assessments indicating the poor nature of the timber underbridges.

UGLRL and TfNSW consider five (5) underbridges to be high priority assets on the non-operational railway viaduct over Union Street, Crane Street, Terania Street, Alexandra Parade and Winterton Parade at Lismore.

All bridges have substandard height and width clearances and are in fair to poor condition. These underbridges were impacted by the recent 2022 floods and impeded emergency service personnel from accessing flooded areas due to insufficient clearance between the flood waters and the bridge structure.

Lismore City Council (LCC) have expressed a strong desire to remove these restrictions on their road network, especially during emergency and flood events, with new developments in non-flood prone areas now directly accessed by the roads affected by these assets, in particular Union Street, Alexandra Parade and Terania Street.

1.3 Project scope

The scope of works has been proposed based on our site inspections and meetings on 9 November 2022 and 9 March 2023 with UGLRL and LCC representatives (including strategic planning coordinator). Based on the discussions with UGLRL the following stage of work were proposed.

1.3.1 Stage 1 – Project implementation plan (completed)

A tool to define the risks, scope, programme, and expected development costs with the key stakeholders. This included the high-level next steps identified at an early stage of the project to include:

- Risk assessment
- Staging and scoping of the works
- Investigations
- Approvals
- Design and deliverables
- Programme
- Estimates

1.3.2 Stage 2 – Strategic options report (this document)

This report may only be used and relied on by UGLRL for the purpose agreed to between FBE and UGLRL.

FBE otherwise disclaims responsibility to any person other than UGLRL arising in connection with this report. The services undertaken are limited to those specifically detailed in the report and are subject to the scope and limitations set out herein.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. FBE has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared and issued.

FBE excludes and disclaims all liability for all claims, expenses, losses, damages and costs, including indirect, incidental or consequential loss, legal costs, special or exemplary damages and loss of profits, savings or economic benefit that UGLRL or its agents may incur as a direct or indirect result of this report for any reason being inaccurate.

To the extent permitted by law FBE excludes any warranty, condition, undertaking or term, whether express or implied, statutory or otherwise, as to the condition, quality, performance, merchantability or fitness for purpose of this report.

1.4 General assumptions

FBE has assumed that the bridge information supplied by UGLRL is accurate for existing viaduct details and condition states. This information forms the basis of FBE's options report.

FBE has prepared this report on the basis of information provided by UGLRL and others, including government authorities, which FBE has not independently verified or checked beyond the agreed scope of work. Consequently, FBE does not accept liability in connection with such unverified information including any resultant errors and omissions in the report.

The opinions, conclusions and any recommendations in this report are based on FBE's assumptions and FBE disclaims any liability arising from any of these assumptions being incorrect.

Where information provided was not sufficient, assumptions have been made to complete the assessment. These assumptions have been made based on discussions with UGLRL, historic information, and guidelines or limitations within current Australian Standards.

The following has not been included in this report:

- Site survey.
- Site condition investigation.
- Geotechnical investigations.
- Timber test boring, pile excavation for inspections below ground or elevated work platforms.
- Indigenous heritage.
- Heritage approvals.
- Community consultation and REF.
- Legislative requirements and planning approvals framework.
- Statutory approvals of any kind.
- Cost benefit analysis or ratio calculations.
- Detailed design.
- Utility relocation and/or consideration.
- Traffic management plans and staging.
- Detailed assessment of the heritage impacts of the make safe options.
- Preparation or input into contract documentation.
- The report will not include any detailed structural assessments including computer modelling, assessments, or evaluations to current design standards.
- Unknown issues not identified at this stage.
- Land acquisitions – property boundary outcomes do not impact on the make safe options.

1.5 Report team

The report team is shown in Table 1-1.

Table 1-1 Report team (Source: FBE)

Name	Position/role
Mark Tilley	Principal Engineer, Project Lead, Review
Filip Tomczak	Senior Bridge Engineer, Author
Gareth Swan	Bridge Engineer, Author
Clair Everett	Heritage Specialist, Review
James O'Connor	Senior Bridge Engineer, Review

1.6 Supplied information

The information supplied by UGLRL, FBE and LCC is shown in Table 1-2.

Table 1-2 Supplied information (Source: UGLRL and LCC)

Reference No.	Description	Supplier	Submission Date
1	Letter – Addressed to UGL Regional Linx from Lismore City Council	Lismore City Council	April 2023
2	Letter – Addressed to TfNSW – Removal of Railway Bridges in Lismore from Lismore City Council	Lismore City Council	March 2023
3	Road Safety Audit by Ardill Payne & Partners	Lismore City Council	November 2022
4	Inspection Report by UGLRL & Meysam Rad	UGLRL	November 2022
5	Flood Response by Lismore City Council	Lismore City Council	June 2022
6	Engineering Report – Underbridge Inspections by Lindsay Dynan	UGLRL	June 2021
7	Statement of Heritage Impact by John Holland Rail	UGLRL	June 2021
8	Alexandra Parade Alternate Route Plans by Lismore City Council	Lismore City Council	2021
9	Bridge Inspection Report – Alexandra Parade by Cardno	UGLRL	May 2020
10	Bridge Inspection Report – Terania Street by Cardno	UGLRL	May 2020
11	Bridge Inspection Report – Union Street by Cardno	UGLRL	May 2020
12	Bridge Visual Inspection Report – Alexandra Parade by FBE	FBE	June 2017
13	Bridge Visual Inspection Report – Terania Street by FBE	FBE	June 2017
14	Lismore Australian Soil Classification Map – eSPADE v2.2	NSW Environment & Heritage Division	May 2023

2. Bridge description

The Lismore Viaduct Railway Underbridges were built as part of the Casino to Murwillumbah railway line which was opened in 1894 and closed in 2004. Overall, there are 70 spans, crossing five (5) local roads, Leycester Creek and flood plains while the remaining is either track at grade railway or on built-up embankments. The five (5) underbridges being a part of this project are shown in Table 2-1 and bridge elements detailed in Appendix A.

Table 2-1 Lismore Viaduct Railway Underbridges (Source: UGLRL)

Underbridge	Number	No. of spans	Type
Alexandra Parade	UBN62837B	27	All transom top timber girder spans
Terania Street	UBN62837A	12	All transom top timber girder spans
Crane Street	UBN62836B	5	2 metal plate web girder spans 3 steel Pratt truss spans ⁽¹⁾
Union Street	UBN62836A	10	1 metal plate web girder spans 8 transom top timber girder spans
Winterton Parade	UBN62839A	16	All transom timber top girder spans

Note: (1) Truss spans over Leycester Creek are not considered in this report.

The Lismore Viaduct Railway Underbridges are typically timber girder transom top bridges supported on timber trestle piers, with the exceptions being Crane Street and Union Street which also have metal girders spans supported on masonry or concrete piers and/or abutments.

The four (4) underbridges on Casino to Murwillumbah railway line between km 836.12 (Union Street) and ending at Alexandra Parade at km 837.852 are listed on State Heritage Register, listing number 01044 (refer to Figure 3-1 for a plan layout). A fifth underbridge over Winterton Parade (UBN62839A) appears to be not present on any register.

2.1 Alexandra Parade Underbridge

Alexandra Parade is a 27-span transom topped timber girder underbridge that crosses the two lane local road and flood plain adjacent to the Wilson River. The western section of the underbridge comprises 16 spans over the flood plain while the eastern section has 11 spans over the flood plain and local road. There is a short embankment separating the west and east underbridges. The overall length of Alexandra Parade Underbridge is 245 m, comprising 119 m on the western bridge and 126 m of the eastern bridge.

The minimum vertical clearances at Alexandra Parade is 3.5 m over the local overheight bypass (span 22) and 2.8 m over the main road (span 23) while typical span lengths of the underbridge are 7.4 m.

The superstructures for both underbridges consist of three (3) square double timber girders with square transoms and is supported via square timber corbels on top of the timber trestles.

The timber trestle piers comprise 5 vertical circular embedded piles, diagonal braces and are seated on dual sill logs and support two capwales at the top.



Figure 2-1 Alexandra Parade Underbridge west and east plan views (Source: SIX Maps)



Figure 2-2 Alexandra Parade Underbridge north elevation (Source: FBE)

2.2 Crane Street Underbridge

Crane Street Underbridge over Crane Street has a timber transom top with a superstructure consisting of continuous two-span steel plate web girders. Each span is approximately 12 m long with a total length of the underbridge of 24 m. The bridge girders are supported on a concrete abutment and concrete piers with the south end of the approach spans sharing the pier support with the first Pratt Truss span crossing Leycester Creek. There is a substandard vertical clearance of 2.5 m between bridge superstructure soffit and the road.



Figure 2-3 Crane Street plan view and elevation (Source: SIX Maps / FBE)

2.3 Terania Street Underbridge

Terania Street Underbridge is a 12-span transom topped timber girder underbridge that crosses the two-lane local road and adjacent flood plains with an overall length of 88 m and with an average span length of 7.4 m (see Figure 2-4).

In addition to the main carriageway at span 6, there are two single lane overheight bypass roads under the adjacent spans 5 and 7 (see Figure 2-5).

The superstructures for both underbridges consist of three-square double timber girders topped with square transoms and is supported by square corbels on top of timber trestles. The timber trestle piers comprise 5 vertical circular embedded piles, diagonal braces and are seated on dual sill logs and supporting two capwales at the top.



Figure 2-4 Terania Street Underbridge aerial view and trestle support (Source: SIX Maps / FBE)



Figure 2-5 Terania Street Underbridge east elevation (Source: FBE)

There is evidence of temporary works supporting corbels at the pier on the north side of the main carriageway. There are no records of when this was implemented but it appears that the corbels and girders were in poor condition and were most likely damaged by a vehicle strike. This resulted in pier displacement which needed additional supports to ensure stability. There is also evidence of the central girder being missing over the main carriageway due to the damage likely caused by previous vehicle strike. Vertical clearance is limited to 3.8 m at the main carriageway and 4.0m at both overheight bypass spans.

2.4 Union Street Underbridge

Union Street Underbridge over Union Street and a local flood plain, is an eight-span transom top underbridge with an overall length of 65 m and average span length of 7.4 m.

The bridge superstructure over Union Street comprises of dual metal plate web girders that support the timber transom top. The girders rest on masonry wall type abutments. The superstructure of the underbridges on the remaining spans consists of three-square double timber girders per span which are supported by square corbels on top of timber trestles.

There is evidence of missing middle girders within spans 1 and 2, with span 2 being over the footpath.

Each trestle has a five-pile arrangement that are founded onto a concrete sill. It is assumed at this stage that the concrete sills are unreinforced and founded on driven timber piles (see Figure 2-6 and Figure 2-7).



Figure 2-6 Union Street Underbridge aerial view and metal span elevation (Source: FBE)



Figure 2-7 Union Street north timber approach spans (Source: FBE)

2.5 Winterton Parade Underbridge

Winterton Parade Underbridge is a 16-span timber transom topped timber girder underbridge that crosses the two lane local road and flood plain adjacent to the Wilson River (see Figure 2-8).



Figure 2-8 Winterton Parade aerial view and elevation (Source: FBE)

The minimum vertical clearance at Winterton Parade is 4.5 m over the road, while typical span length of the underbridge is 7.4 m. The superstructures for both underbridges consist of three (3) square double girders topped with square transoms and is supported via square corbels on top of timber trestles. The timber trestle piers comprise 5 vertical circular embedded piles, diagonal braces and are seated on dual sill logs and support two capwales at the top.

3. Heritage status

3.1 State Heritage Register

The Lismore Railway Viaduct is on the SHR item 01044 with the curtilage for the four (4) railway underbridges as shown in Figure 3-1.

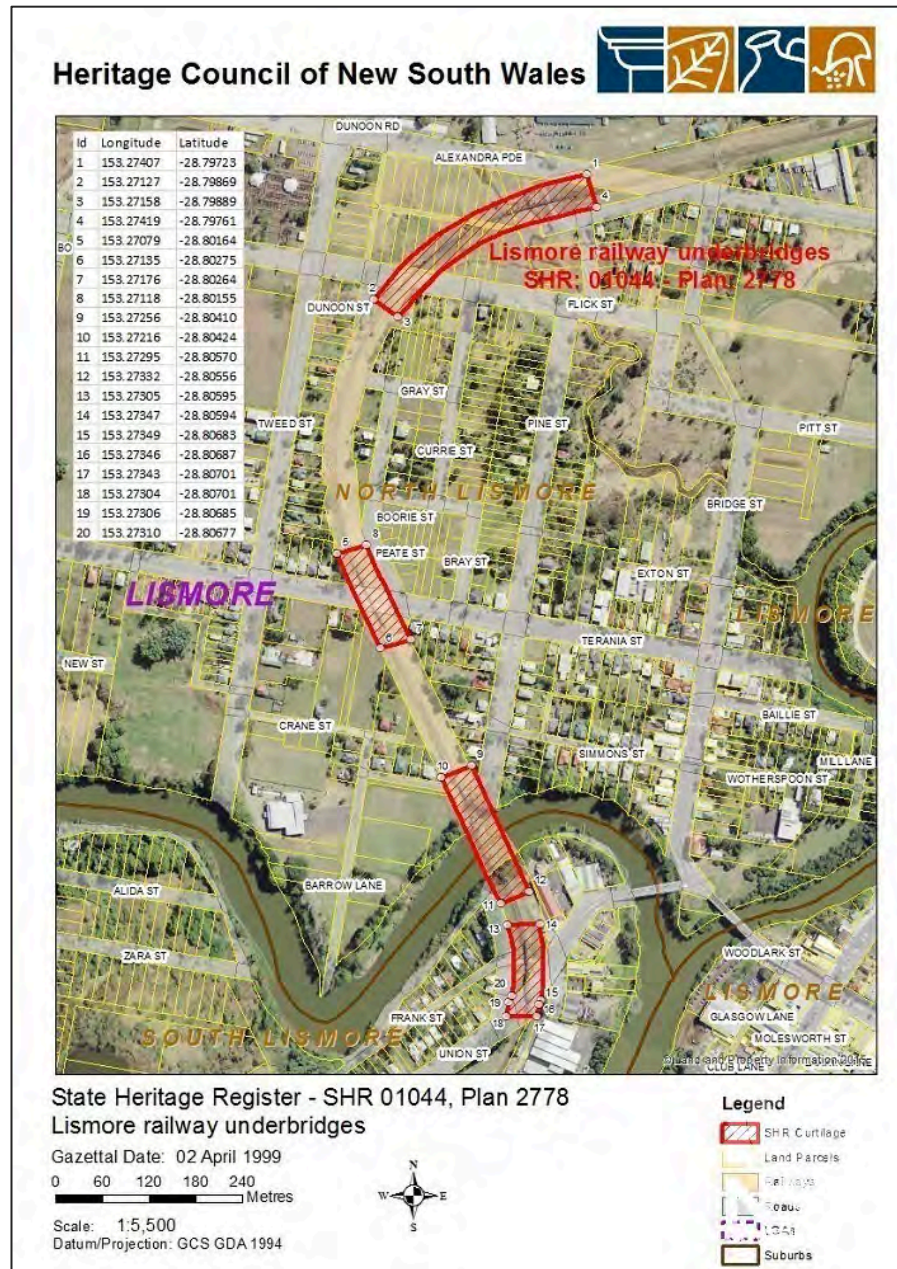


Figure 3-1 Lismore Railway Viaduct Underbridges (Source: NSW State Heritage Register)

There has not been an assessment of heritage significance undertaken to the as required by the Heritage NSW guidelines *Assessing Heritage Significance* and the *NSW Heritage Manual*. To undertake this at this stage is beyond the scope of this report as it is likely that considerable desktop and field research would be required to detail the history of the area, railway and viaduct to incorporate into the assessment of heritage significance and statement of significance.

3.2 Heritage listings

Searches of statutory and non-statutory local, State registers have been undertaken. The results of these are summarised in Table 3-1 and Table 3-2.

Table 3-1 Heritage listings for Alexandra Pd, Terania St, Crane Street and Union Street Underbridges (Source: see Table)

Heritage listing	Status
Heritage Act - State Heritage Register	01044
TAHE – CRN Section 170 Register	Statutory listing
Lismore Local Environmental Plan	Schedule 5, Items A13, A10, A8, A7

Table 3-2 Heritage listings for Winterton Parade Underbridge (Source: see Table)

Heritage listing	Status
Heritage Act - State Heritage Register	Not registered
TAHE – CRN Section 170 Register	Not registered
Lismore Local Environmental Plan	Not included

3.3 Statement of significance

The Statement of Significance for the Lismore Railway Viaduct Underbridges on the SHR:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

The local government listing for these bridges has the following Statement of Significance:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

They provide an intact and durable example of late 19th Century railway bridge technology and a solution to the problem of building the railway line across a river and large flood plain close to a populated area. The timber approach viaducts and plate web girders date back to the inception of the Murwillumbah Line (originally the Lismore to Murwillumbah Railway), providing an example of the use of different materials for bridge construction in the 1890s and the introduction of technically sophisticated methods for the time.

3.4 Heritage Act 1977

As these sites are listed on the SHR approval to carry out any works would need to be obtained from the Heritage Council of NSW. The scope and extent of the works is likely to be such that the Standard Exemptions would not apply and consequently a Section 60 application would need to be submitted for these works.

4. Condition

4.1 Inspections

Table 4-1 shows a summary of previous inspections and more detailed condition assessment information can be found in Appendix B.

Table 4-1 Summary of previous inspections (Source: see Table)

Underbridge	Inspection type	Date	Organisation
Alexandra Parade	Visual and condition assessment	Dec 2019	Cardno
	Visual	May 2021	Lindsay Dynan
	Level 2 visual inspection	June 2017	FBE
Crane Street	Visual	Sep 2022	UGLRL
Terania Street	Visual	Sep 2022	UGLRL
	Visual	May 2021	Lindsay Dynan
	Visual and condition assessment	Dec 2019	Cardno
	Level 2 visual inspection	June 2017	FBE
Union Street	Visual	Sep 2022	UGLRL
	Visual	May 2021	Lindsay Dynan
	Visual and condition assessment	Dec 2019	Cardno
Winterton Parade	Condition not assessed as no information on previous inspections		

4.2 General observations

The overall condition of the timber underbridges is generally found to be in a poor condition, recently exacerbated by the 2022 Lismore floods.



Figure 4-1 Alexandra Parade typical condition (Source: FBE)



Figure 4-2 Terania Street typical span and trestle support condition (Source: FBE)



Figure 4-3 Crane Street typical condition (Source: FBE)



Figure 4-4 Union Street metal and timber spans (Source: FBE)

4.3 Summary of the estimated conditions

The estimate of the condition for each underbridge was conducted to obtain the percentage of the underbridges that falls within one of four categories namely poor, fair, good and as-built condition.

Table 4-2 summaries the estimated condition for each underbridge.

Table 4-2 Summary of estimated condition for each underbridge (Source: FBE)

Underbridge	Condition as a percentage of each underbridge (%)			
	As-built	Good	Fair	Poor
Alexandra Parade	0%	13%	32%	55%
Crane Street	0%	39%	42%	19%
Terania Street	0%	17%	33%	50%
Union Street	0%	27%	33%	40%
Winterton Parade	n/a	n/a	n/a	n/a
Overall	0%	24%	35%	41%

It should be noted that four of the five underbridges have a percentage greater than 40% in poor condition.

The poor condition is in large part owing to rotting, split, termite infestation and damaged timber members. These members are typically transoms, trestle piles, trestle braces, corbels and girders. Connections and bracing elements are typically loose and for the transoms non-functional.

There is evidence of previous vehicle strikes with Terania Street and Union Street Underbridges. This resulted in timber elements being damaged or missing as follows:

- Missing central girders of span 6 at Terania Street Underbridge.
- Displaced trestle support 6 at Terania Street Underbridge.
- Missing central girders of Spans 1 and 2 at Union Street Underbridge.
- Partially damaged and displaced trestle support 7 at Union Street Underbridge.

5. Strategic options

5.1 Overview

The proposed strategic options have been discussed with UGLRL and LCC onsite, however, not all options are viable or applicable for each underbridge. The detailed descriptions of each proposed strategic option may be found in Appendix E and are summarised as follows.

5.1.1 Option 1 – Raise spans

This option considers raising existing spans to provide the minimum legal vertical clearance for general access traffic and lower the risk of oversized vehicles striking the superstructure whilst easing the current overheight restriction on the existing road network. This option would be viable for the metal spans only.

5.1.2 Option 2 – Partial demolition

Partial demolition involves removal of the road spans and adjacent spans, as required at each site, including stabilisations works to the remaining timber structure to maintain structural integrity and public safety. This option would be feasible for all bridge sites and would eliminate most of the existing site constraints with some residual risks associated with any remaining spans.

5.1.3 Option 3 – Complete demolition

Complete demolition of the underbridge assumes entire removal between the approach embankments, including the abutments where feasible. Demolition would be possible for all considered sites and removes all the existing constraints.

5.1.4 Option 4 – Alternative route

Investigation into an alternate route to bypass and close the existing road, while maintain and retaining the existing underbridge. It is only considered as practical and feasible for Alexandra Parade Underbridge and potentially for Crane Street Underbridge but probably not a project requirement from LCC or TfNSW.

5.1.5 Option 5 – Rehabilitation

This option considers undertaking extensive rehabilitation to the existing underbridges to improve their condition and thereby eliminate the risks of falling elements and objects or partial or full collapse (full or partial) onto road traffic. This option could be applied to all sites, but the feasibility would strongly depend on the condition of the underbridge.

5.1.6 Option 6 – Reconstruction

Complete like-for-like reconstruction or replacement with alternative materials for example steel. This option would be feasible for all sites, however, it would not resolve most of the existing constraints.

5.1.7 Option 7 – Do nothing

This option considers passive retention, namely do nothing. This option is mainly for comparison purposes only and is generally not considered acceptable in terms of not addressing the project and site constraints.

5.2 Summary of site and project constraints

Table 5-1 provides a summary of the site and project constraints with most of these assessed against each of the proposed options for each underbridge. Detailed consideration of the site and project constraints can be found in Appendix C.

Table 5-1 Summary of constraints for each rail underbridge (Source: FBE)

Site and project constraints	Lismore Railway Underbridges				
	Union Street	Crane Street	Terania Street	Alexandra Parade	Winterton Parade
Environmental ¹	Impacts to be investigated				
Land ownership ²	No	No	No	No	No
Geotechnical ³	No	No	No	Yes	No
Hydrology (flooding) ⁴	Yes	No	Yes	Yes	No
Utilities ⁵	Yes	Yes	Yes	Yes	Yes
Heritage ⁶	Yes	Yes	Yes	Yes	No
Statutory approval ⁷	Yes	Yes	Yes	Yes	No
Bridge clearances ⁸	Yes	Yes	Yes	Yes	Yes
Road network restriction ⁹	Yes	No	Yes	Yes	Yes

Note:

1. Potential environmental impacts have been identified and will have to be investigated further after the preferred option(s) for each underbridge is selected and approved.
2. No, means there are currently no land ownership constraints based on NSW SIX Maps. This will have to be confirmed during the next project stages.
3. Brown, grey or black soils having significant content of clays, or Vertosol in accordance with Australian Soil Classification (ASC) system.
4. Yes, means when underbridge prevents rescues and safe evacuation during flooding (source LCC).
5. Yes, means there are utilities present at the underbridge. Further investigations will be required to confirm if they are a constraint for any preferred option(s).
6. Yes, means bridge is on NSW SHR. No means the bridge is not on the SHR.
7. Yes, means approvals including S60 application and SOHI would be required.
8. Yes, means there are substandard bridge clearances including both vertical (overheight) and/or horizontal (overwidth).
9. Yes, means the existing underbridge restricts the current road network performance (source: LCC).

The following critical constraints are considered for options assessment in Sections 5 to 9:

- Flooding impacts.
- Road network restrictions.
- Bridge clearances.
- Heritage impacts.

5.3 Assessment criteria against constraints

The following assessment criteria have been used to evaluate the options for each underbridge.

Flooding impacts

- Poor ● Bridge prevents rescue and evacuation of residents during flooding.
- Average ● Bridge has moderate impact on residents during flooding.
- Good ● Bridge creates no restrictions during flooding.

Road network restrictions

- Poor ● Bridge is a restriction to traffic at its location.
- Average ● Bridge has moderate impact on local traffic.
- Good ● There are no traffic restrictions caused by the bridge.

Bridge clearances

- Poor ● Bridge vertical and horizontal clearance is a significant constraint and risk to oversized vehicles.
- Average ● Bridge clearances pose moderate restriction to oversized vehicles.
- Good ● Bridge does not pose a restriction to oversized vehicles.

Public safety

- Poor ● There are high risks to public safety at the bridge location.
- Average ● Risks are moderate to public safety.
- Good ● There are none or minimal risks to public safety caused by the bridge.

Heritage impacts

- Poor ● Significant negative impacts on heritage significance.
- Average ● Moderate negative impacts on heritage significance.
- Good ● Low, nil or potentially positive impacts on heritage significance.

Feasibility

- Poor ● Difficult or impossible to construct or implement.
- Average ● Medium level of difficulty.
- Good ● Construction or other intervention is easy to implement.

The options comparison is an unweighted criteria process where all factors have been considered equal. Costs have not been considered at this stage as this constraint is unlikely to favour one option over another and cost estimates do not form part of this stage of the project.

6. Alexandra Parade Underbridge

Alexandra Parade Underbridge is a timber transom top underbridge with low vertical and horizontal clearances. It spans over a two-way two-lane sealed road (east span) and one-way sealed local diversion road with a higher vertical clearance (see Figure 6-2).

6.1 Flooding impacts

There are the following impacts associated with flooding:

- **Events.** Lack of vertical clearance between the flood level and bridge soffit to enable rescue evacuation during 5% AEP (Average Exceedance Probability) and 10% AEP flood events, see Figure 6-1 where:
 - o Red line: 1% AEP – probability of flood event to occur 1 in 100 years.
 - o Orange line: 5% AEP – probability of flood event to occur 1 in 20 years.
 - o Yellow line: 10% AEP – probability of flood event to occur 1 in 10 years.
- **Risk.** Impossible to permanently relocate residents from flood prone areas due to the risks presented by the bridge to rescue boats. The bridge was identified by LCC as moderate impediment to rescues and evacuation during flooding.



Figure 6-1 Alexandra Parade Underbridge flood levels (Source: LCC)

6.2 Road network impacts

Alexandra Parade Underbridge has the following impacts on existing road network:

- **Access.** Substandard vertical and horizontal clearances restricts access to heavy and oversized vehicles.
- **Traffic.** Not possible to improve daily travelling experience and traffic capacity thorough carriageway widening.
- **Safety.** Improvements to visibility, road alignment and general safety are not feasible.

Construction of an alternative route was identified by FBE and LCC as a possible option to close access under Alexandra Parade Underbridge.

6.3 Bridge clearances

There are following restrictions caused by non-standard bridge clearances:

- **Height accessibility – Main Road.** Vertical clearance over 2 lane (two way) main sealed road of 2.8 m is lower than general access vehicle height requirement of 4.6 m.
- **Height accessibility – Overheight Bypass.** Vertical clearance of one-way side diversion road of 3.5 m is lower than general access vehicle height requirement of 4.6 m.
- **Width accessibility.** The sealed road width of 5.2 m has approximately 2.5 m wide lanes which is less than 3.5 m minimum width required by Austroads.



Figure 6-2 Alexandra Parade – Elevation view – Looking South (Source: FBE)

6.4 Public safety

Alexandra Parade Underbridge generates a number of impacts on public safety:

- **Safety - condition.** Poor condition of the underbridge poses a risk of bridge elements falling onto road traffic and the public.
- **Safety - vehicle strikes.** Lack of safety barriers and narrow carriageway limited by the short bridge spans increases the risk of vehicle strikes and public safety and potential bridge damage leading to partial or full span collapse.
- **Safety - clearances.** Substandard low vertical clearance is a risk to heavy and oversized vehicles striking the superstructure leading to damage to the bridge and reduced public safety (there is evidence of previous strikes).
- **Safety - overheight bypass.** A local overheight bypass under the west span without clear merging priorities has an adverse effect on the traffic safety at the bridge.
- **Safety - flooding.** Rescue and evacuation of the public during flooding events is moderately restricted.

6.5 Heritage impacts

As Lismore Railway Viaduct Underbridges including Alexandra Parade are on NSW State Heritage Register (item 01044) any modification option would require:

- **Approvals.** S60 application.
- **Documentation.** Statement of heritage impact (SOHI).

In addition, a conservation management plan (CMP) may be required.

6.6 Feasibility

Feasible options for Alexandra Parade Underbridge include Partial demolition (Option 2) and full removal (Option 3), alternative route (Option 4), rehabilitation (Option 5) and reconstruction (Option 6).

6.7 Assessment summary

Table 6-1 summarises the options assessment.

Table 6-1 Alexandra Parade Underbridge options assessment (Source: FBE)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Possible
Option 4 – Alternative route	●	●	●	●	●	●	●	Preferred
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not recommended
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not recommended
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Raising spans (Option 1) would be technically challenging and unpractical, would have a moderately negative impact on heritage and would not resolve the network restrictions and only partially improve public safety.

Partial demolition (Option 2) would be feasible, and it would resolve most of the constraints, but it would have significant negative impact on heritage and there would be some residual risks from the remaining structures.

Entire demolition (Option 3) would be feasible, and it would resolve most of the constraints, but it would have significant negative impact on heritage.

Alternative route (Option 4) would be possible and appears to be the best outcome as LCC have plans to build a new alternative road. Access to the existing bridge could be closed but the viaduct would remain which may provide a good heritage outcome.

Rehabilitation (Option 5) would involve costly, challenging and difficult construction, it would not resolve critical impacts like rescues and evacuations during flooding, clearance and network restrictions, however it would be a good heritage outcome.

Reconstruction (Option 6) would be feasible but would likely be very expensive and would not provide new function. It would not resolve the main constraints like rescue during flooding, limited clearances, network restrictions but it would be an acceptable outcome for heritage.

Do nothing (Option 7) would not be acceptable as it would not resolve any constraints and would not eliminate any existing high-risk hazards.

6.8 Proposed strategic concept for an alternate route

The proposed alternate route at Alexandra Parade is shown in Figure 6-3. This road layout is preferred over LCC proposal as it would reduce the length of the new road connection while addressing most or all of the project and site constraints. Appendix E, Section 4 details the alternate route options proposed independently by FBE and LCC.

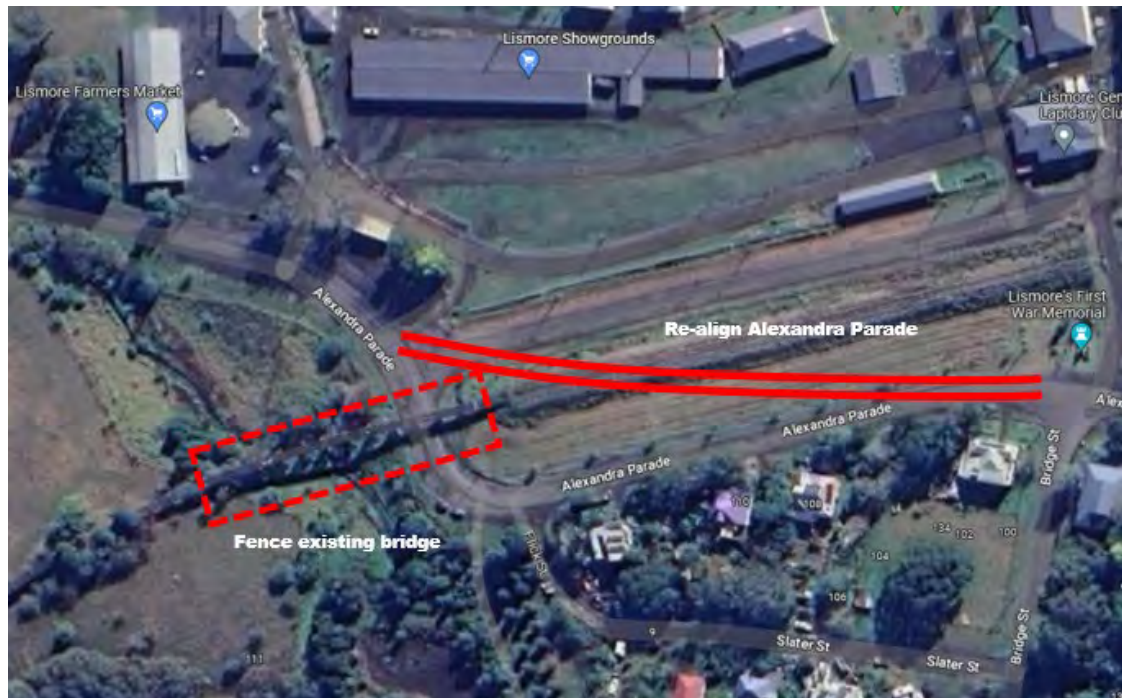


Figure 6-3 Alexandra Parade proposed alternate route (Source: FBE)

7. Crane Street Underbridge

Crane Street Underbridge is a two span continuous metal girder transom top bridge spanning over single lane Crane Street and Leycester Creek flood plain. Apart from low vertical clearance there are no known network restrictions or constraints associated with flooding.

7.1 Flooding impacts

There is no evidence that Crane Street Underbridge is posing any restrictions to rescue and evacuation operations during flooding.

7.2 Road network impacts

Although there is low vertical clearance under the bridge, there is no evidence of oversized vehicles using Crane Street.

7.3 Bridge clearances

There is substandard vertical clearance of 2.5 m under Crane Street Underbridge (see Figure 7-1).



Figure 7-1 Crane Street low clearance 2.5 m (Source: FBE)

7.4 Public safety

There are following public safety risks associated with Crane Street Underbridge:

- **Safety - condition.** Due to poor condition of the underbridge, there is a risk of bridge elements falling onto road traffic and the public.
- **Safety - clearances.** Substandard low vertical clearance is a risk to heavy and oversized vehicles striking the superstructure leading to damage to the bridge and reduced public safety.

7.5 Heritage impacts

As Lismore Railway Viaduct Underbridges, including Crane Street are on NSW State Heritage Register (item 01044) therefore any modification option is likely to require:

- **Approvals.** S60 application.
- **Documentation.** Statement of heritage impact (SOHI).

In addition, a conservation management plan (CMP) may be required.

7.6 Feasibility

Feasible options for Crane Street Underbridge include Partial (Option 2) and full (Option 3) demolition, rehabilitation (Option 5) and reconstruction (Option 6).

7.7 Assessment summary

Table 7-1 summarises the options assessment.

Table 7-1 Crane Street Underbridge options assessment (Source: FBE)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Possible
Option 4 – Alternative route	●	●	●	●	●	●	●	Possible
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Preferred
Option 6 – Reconstruction	●	●	●	●	●	●	●	Possible
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Raising spans (Option 1) would be technically challenging and unpractical, would have moderately negative impact on heritage and would not resolve bridge clearance constraints and would only partially improve public safety.

Partial demolition (Option 2) would assume removal of one span over Crane Street. As the girders are continuous there would be some constructability challenges associated with cutting and stabilising the girders following removal of one span. Option 2 would have a significant negative impact on heritage and approvals would be required.

Entire demolition (Option 3) would be feasible, and it would resolve all current constraints, but it would have significant negative impact on heritage.

Alternative route (Option 4) could be provided but there are no network restrictions that would justify this approach.

Rehabilitation (Option 5) would involve removal of loose and poor items, like transoms and bolts to eliminate the current safety hazards.

Reconstruction (Option 6) is not needed. Existing metal spans that are supported on solid masonry piers and abutment could be maintain in satisfactory and safe condition following rehabilitation works proposed by Option 5.

Do nothing (Option 7) would not resolve any constraints and would not eliminate any existing high-risk hazards, therefore is not acceptable.

8. Terania Street Underbridge

Terania Street Underbridge is a timber transom top underbridge spanning over two-way main road and two side roads to the east and the west side. All spans have limited vertical and horizontal clearance. This underbridge was identified by LCC as posing a high impediment for rescue operation during flooding.

8.1 Flooding impacts

There are following impacts associated with flooding:

- **Events.** Lack of vertical clearance between the flood level and bridge soffit to enable rescue evacuation during 1% AEP 5% AEP and 10% AEP flood events, where Figure 8-1 shows
 - o Red line: 1% AEP – probability of flood event to occur 1 in 100 years.
 - o Orange line: 5% AEP – probability of flood event to occur 1 in 20 years.
 - o Yellow line: 10% AEP – probability of flood event to occur 1 in 10 years.
- **Risk.** Impossible to permanently relocate residents from flood prone areas due to the risks presented by the bridge to rescue boats. The bridge was identified by LCC as a high impediment to rescues and evacuation during flooding.



Figure 8-1 Terania Street – Flood levels (Source: LCC)

8.2 Road network impacts

Terania Street Underbridge has the following impacts on existing road network:

- **Access.** Substandard vertical and horizontal clearance restricts access to heavy and oversized vehicles.
- **Traffic.** Not possible to improve daily travelling experience and traffic capacity thorough carriageway widening.
- **Safety.** Improvements to visibility and road safety are not feasible.

8.3 Bridge clearances

There are following impacts due to non-standard bridge clearances:

- **Height accessibility - Main road.** Vertical clearance over 2 lane (two way) main sealed road of 3.8 m is lower than general access vehicle height requirement of 4.6 m.
- **Height accessibility - Overheight Bypass.** Vertical clearance of one-way west and one-way east local diversion roads of 4.0 m is lower than general access vehicle height requirement of 4.6 m.
- **Width accessibility.** The sealed road width of 4.6 m has approximately 2.1 m wide lanes which is less than 3.5 m minimum width required by Austroads.



Figure 8-2 Terania Street – Elevation view looking south (Source: FBE)

8.4 Public safety

There are following public safety risks associated with Terania Street Underbridge:

- **Safety - condition.** Poor condition of the underbridge poses a risk of bridge elements falling onto road traffic and the public, including pedestrian traffic using the walkway under span 4.
- **Safety - vehicle strikes.** Lack of safety barriers at bypass roads and narrow carriageway limited by the short bridge spans increases the risk of vehicle strikes that would lead to accidents, injuries and potential bridge span collapse (there is evidence of previous strikes).
- **Safety - clearances.** Substandard low vertical clearance is a risk to heavy and oversized vehicles striking bridge superstructure leading to damage to the bridge and reduced public safety.
- **Safety - overheight bypasses.** The local overheight bypasses without clear merge priorities has an adverse effect on the traffic safety at the bridge.

8.5 Heritage impacts

As Lismore Railway Viaduct Underbridges, including Terania Street are on NSW State Heritage Register (item 01044) therefore any modification option is likely to require:

- **Approvals.** S60 application.
- **Documentation.** Statement of heritage impact (SOHI).

In addition, a conservation management plan (CMP) may be required.

8.6 Feasibility

Feasible options for Terania Street Underbridge include Partial (Option 2) and full (Option 3) demolition, rehabilitation (Option 5) and reconstruction (Option 6).

8.7 Assessment summary

Table 8-1 summaries the options assessment.

Table 8-1 Terania Street Underbridge options assessment (Source: FBE0)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Preferred
Option 4 – Alternative route	●	●	●	●	●	●	●	Not recommended
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not recommended
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not recommended
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Raising spans (Option 1) would be technically challenging and unpractical, would have a moderately negative impact on heritage and would not resolve network restrictions and would only partially improve public safety.

Partial demolition (Option 2) would be feasible, and it would resolve most of the restrictions but it would have significant negative impact on heritage and there would be some residual risks from the retained spans.

Entire demolition (Option 3) would be feasible, and it would resolve all current constraints, but it would have significant negative impact on heritage.

Alternative route (Option 4) would be possible, but it would require a long traffic diversion and would result in even further network restrictions. The remaining viaduct would still impede

rescue and evacuation operations during flooding and would retain residual safety risks to the public.

Rehabilitation (Option 5) would involve costly, lengthy and high-risk construction works. It would not resolve critical impacts like rescue and evacuation during flooding, clearance and network restrictions. It would, however, be a good heritage outcome.

Reconstruction (Option 6) would be feasible but very expensive and apart from some safety improvements and good heritage outcome, it would not remove any critical network restrictions and would not provide any additional benefits for the council and public.

Do nothing (Option 7) would not be acceptable as it would not resolve any constraints and would not eliminate any existing high-risk hazards.

9. Union Street Underbridge

The underbridge is primarily a timber transom top underbridge with a simply supported wrought iron span consisting of two plate girders over the Union Street. The underbridge experiences site specific constraints owing to the limited clearances, impact on road network as well as public safety. This underbridge was identified by LCC as posing a high impediment for rescue and evacuation during flooding.

9.1 Flooding impacts

There are following impacts associated with flooding:

- **Events.** Lack of vertical clearance between the flood level and bridge soffit to enable rescue evacuation during 1% AEP 5% AEP and 10% AEP flood events, see Figure 9-1 where:
 - o Red line: 1% AEP – probability of flood event to occur 1 in 100 years.
 - o Orange line: 5% AEP – probability of flood event to occur 1 in 20 years.
 - o Yellow line: 10% AEP – probability of flood event to occur 1 in 10 years.
- **Yellow.** Impossible to permanently relocate residents from flood prone areas due to the risks presented by the bridge to rescue boats. The bridge was identified by LCC as a high impediment to rescues and evacuation during flooding.



Figure 9-1 Union Street underbridge flood levels (Source: LCC)

9.2 Road network impacts

Union Street Underbridge has the following impacts on existing road network:

- **Access.** Substandard vertical clearance restricts access to heavy and oversized vehicles.
- **Traffic.** Not possible to improve daily travelling experience and traffic capacity thorough road realignment due to bridge piers.
- **Safety.** Improvements to visibility and road safety are not feasible.

9.3 Bridge clearances

There are following impacts due to non-standard bridge clearances:

- **Height accessibility - Main Road.** Low vertical clearance over 2 lane main sealed road of 3.4 m is lower than 4.6 m required for general access vehicles.
- **Height accessibility - Overheight Bypass.** Low vertical clearance of one-way bypass roads of 4.5 m is just below the requirement of 4.6 m for general access vehicles. The local bypass road is single lane and allows only one vehicle at the time to pass.



Figure 9-2 Union Street Underbridge road clearance over main road (Source: FBE)

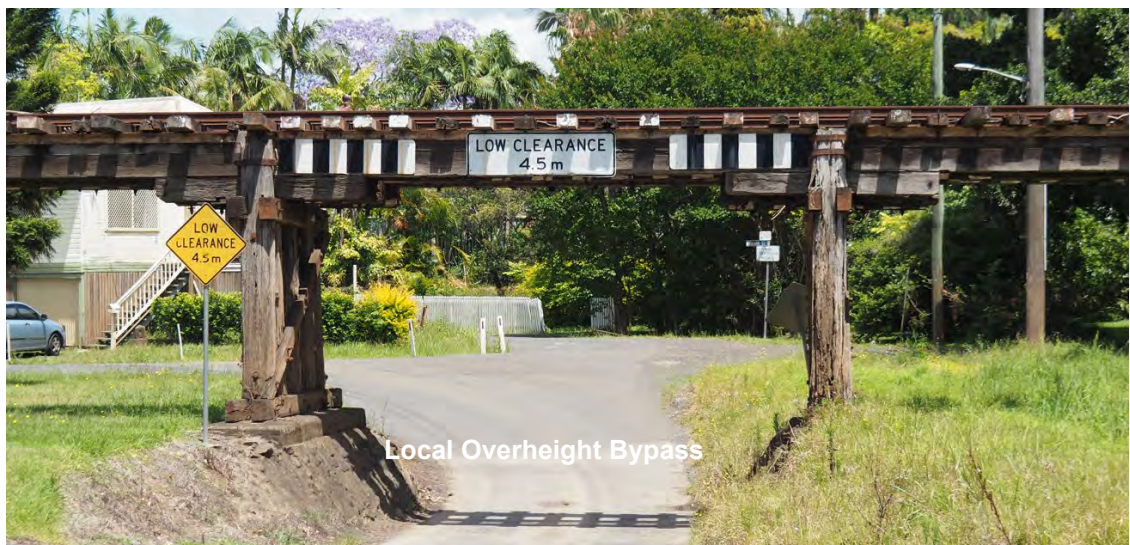


Figure 9-3 Union Street Underbridge road clearance over bypass road (Source: FBE)

9.4 Public safety

There are following public safety risks associated with Union Street Underbridge:

- **Safety - condition.** Poor condition of the underbridge poses a risk of bridge elements falling onto road traffic and the public, including pedestrian traffic using the walkway under span 2.
- **Safety - vehicle strikes.** Narrow carriageway and low vertical clearance limited by bridge spans and piers is a risk of vehicle strikes that would lead to accidents, injuries and

potential bridge span collapse. There is evidence of previous bridge strike with Trestle 7 piles (See Table 1-1, reference no. 3).

- **Safety – overheight bypass.** The local overheight bypass without clear merge priorities has an adverse effect on the traffic safety at the bridge.

9.5 Heritage impacts

As Lismore Railway Viaduct Underbridges including Union Street are on NSW State Heritage Register (item 01044), therefore any modification option is likely to require:

- **Approvals.** S60 application.
- **Documentation.** Statement of heritage impact (SOHI).

In addition, a conservation management plan (CMP) may be required.

9.6 Feasibility

Feasible options for Union Street Underbridge include Partial (Option 2) and full (Option 3) demolition, rehabilitation (Option 5) and reconstruction (Option 6).

9.7 Assessment summary

Table 9-1 summaries the options assessment.

Table 9-1 Union Street Underbridge options assessment (Source: FBE)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Preferred
Option 4 – Alternative route	●	●	●	●	●	●	●	Not acceptable
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not acceptable
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not acceptable
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Option 1, raising the superstructure of the metal span over Union Street would increase the vertical clearance for normal vehicle traffic but it would not resolve other impacts like rescue and evacuation during flooding and ongoing network restriction (road alignment, road safety, etc).

Partial demolition (Option 2) would assume removal of the timber spans. It would resolve some of the constraints but there would be some residual risks from the remaining structure. From a

heritage perspective the benefits of removing only the timber spans and keeping the remaining structure are probably limited resulting in a significant negative heritage impact overall.

Entire demolition (Option 3) would be feasible, and it would resolve all current constraints, but it would have a significant negative impact on heritage.

Alternative route (Option 4) would be possible. It would require a long traffic diversion and would result in even further network restrictions. The remaining viaduct would impede rescue and evacuation operations during flooding and would maintain residual safety risks to the public.

Rehabilitation (Option 5) would involve costly, lengthy and high-risk construction works. It would not resolve critical impacts like rescue evacuation during flooding, clearance and network restrictions. It would, however, be a good heritage outcome.

Reconstruction (Option 6) would be feasible but very expensive and apart from some safety improvements and good heritage outcome, it would not remove any critical network restrictions and would not provide any additional benefits for the public.

Do nothing (Option 7) would not resolve any constraints and would not eliminate any existing high-risk hazards, therefore is not acceptable.

10. Winterton Parade Underbridge

Winterton Parade Underbridge is a timber transom top underbridge with low bridge clearances. It spans over a two-way two-lane sealed road.

10.1 Flooding impacts

There is no evidence that Winterton Parade Underbridge is posing any restrictions to rescue operations during flooding.

10.2 Road network impacts

Winterton Parade underbridge has the following impacts on existing road network:

- **Access.** Substandard vertical and horizontal clearance restricts access to heavy and oversized vehicles.
- **Traffic.** Not possible to improve daily travelling experience and traffic capacity through carriageway widening.
- **Safety.** Improvements to visibility and road safety are not possible.

10.3 Bridge clearances

There are following impacts due to non-standard bridge clearances:

- **Height accessibility.** Low vertical clearance over 2 lane main sealed road of 4.5 m is lower than 4.6 m required for general access vehicle.
- **Width accessibility.** The sealed road width of 5.5 m to 3.0 m has approximately 3.0 m wide lanes which is less than 3.5m minimum width required by Austroads.

10.4 Public safety

Winterton Parade Underbridge generates a number of impacts on public safety:

- **Safety - condition.** Poor condition of the underbridge may result in bridge elements falling onto the road below posing a risk road users leading to vehicle damage, accidents and injuries.
- **Safety - vehicle strikes.** Lack of safety barriers and narrow carriageway limited by bridge spans poses a risk of vehicle strikes with supports leading to accidents, fatal injuries and potential bridge span collapse.
- **Safety - clearances.** Substandard low vertical clearance is a risk to heavy and oversized vehicles striking bridge superstructure leading to accidents, injuries and disruptions.
- **Safety - traffic.** A 90 deg bends at both approaches to the underbridge are generating traffic safety risks. There is evidence of previous incidents in this location.

10.5 Heritage impacts

Winterton Parade Underbridge is not on NSW SHR. As such, it may not require approvals to be modified or removed.

10.6 Feasibility

Feasible options for Winterton Parade Underbridge would include Partial removal (Option 2) and full demolition (Option 3), rehabilitation (Option 5) and reconstruction (Option 6).

10.7 Assessment summary

Table 10-1 summarises the options assessment.

Table 10-1 Winterton Parade Underbridge options assessment (Source: FBE)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Not recommended
Option 3 – Entire demolition	●	●	●	●	●	●	●	Preferred
Option 4 – Alternative route	●	●	●	●	●	●	●	Not acceptable
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not recommended
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not recommended
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Raising spans (Option 1) would be technically challenging and unpractical, would have moderately negative impact on heritage and would not resolve network restrictions and would only partially improve public safety.

Partial demolition (Option 2) would be feasible and would resolve most of the constraints, but it would have significant negative impact on heritage and there would be residual risks from the remaining spans.

Entire demolition (Option 3) would be feasible and would resolve all constraints, but it would have significant negative impact on heritage.

Alternative route (Option 4) would be feasible as there is no available diversion.

Rehabilitation (Option 5) would involve costly, lengthy and high-risk construction works. It would not resolve critical impacts like limited clearances and network restrictions. It would, however, be a good heritage outcome.

Reconstruction (Option 6) would be feasible but very expensive and apart from some safety improvements and good heritage outcome, it would not remove any critical constraints and would not provide any additional benefits for the council and public.

Do nothing (Option 7) would not be acceptable as it would not resolve any constraints and would not eliminate any existing high-risk hazards.

11. Options assessment summary and discussion

11.1 Options assessment summary

Table 11-1 summarises the assessment results for the preferred option for each underbridge.

Table 11-1 Options assessment summary Lismore Railway Viaduct Underbridges (Source: FBE)

Underbridge	Flooding impacts	Road network restrictions	Bridge clearances	Public Safety	Heritage impacts	Feasibility	Overall	Best outcome
Alexandra Parade	●	●	●	●	●	●	●	Option 4 – Alternative route
Crane Street	●	●	●	●	●	●	●	Option 5 – Rehabilitation
Terania Street	●	●	●	●	●	●	●	Option 3 – Entire demolition
Union Street	●	●	●	●	●	●	●	Option 3 – Entire demolition
Winterton Parade	●	●	●	●	●	●	●	Option 3 – Entire demolition

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

11.2 Discussion

Each underbridge has been assessed against the main project constraints of flooding, road network restrictions, geometric clearances, safety, heritage and feasibility to arrive at a preferred option(s).

LCC has preliminary plans to provide an alternative route (Option 4) at Alexandra Parade to bypass the existing timber underbridge which satisfies all the project constraints. This option potentially provides an opportunity to retain Alexandra Parade Underbridge as an example of a typical timber girder and timber trestle railway underbridge forming the viaduct while Terania Street and Union Street Underbridges are removed. Although Option 4 would require substantial investment it provides further benefits to LCC by facilitating urban development outside of the floodplain.

Crane Street Underbridge has low vertical clearance but low daily traffic count and does not cause significant network restrictions. Crane Street is used by local residential traffic only and there is a short alternative route available. In addition, the location does not appear to be critical for evacuation and rescue during flooding. As such, rehabilitation (Option 5) limited to removal

of the rail, timber transoms, loose metalwork and poor timber elements, appears to be the preferred and most feasible option.

It appears that complete removal, Option 3, of Terania Street and Union Street Underbridges is the preferred option. However, this has a significant negative heritage outcome, but it would satisfy all the other project and site constraints by removing the network restrictions, removing the limited height and width clearances and would eliminate all the safety and flood evacuation and rescue concerns. Partial demolition, Option 2, of Union Street and Terania Street Underbridges would not fully resolve the ongoing maintenance and safety concerns for the remaining spans including flood evacuation and rescue risks and is therefore not recommended. Consequently, complete demolition was found to be the preferred option for Terania and Union Street Underbridges.

At Winterton Parade Underbridge the main concerns are the poor road alignment which has two reverse 90-degree bends on the approaches under the bridge. There is evidence of previous crashes that resulted in serious injuries and are likely to be related to the poor road geometry. Partial demolition, although a viable option, is not recommended as it would not resolve the remaining risks associated with the poor timber structure, would most likely require stabilisation or temporary works and would provide marginal heritage benefits as it is not on any heritage listings. As such, the preferred option for Winterton Parade is Option 3, full demolition. It would enable road realignment to improve public safety, remove the low vertical clearances and eliminate the risks associated with the poor condition.

Appendices

Appendix A – Bridge elements

Appendix A – Bridge elements

1. Timber girder underbridges

Figure A1 shows the typical timber girder transom top underbridge elements and their numbering. Table A-1 provides a description of each bridge element including their material and typical section size.

Table A-1 List of elements, materials and sizes (Source: FBE)

Mark	Bridge element	Material	Section size (typical not measured)
Timber girder spans			
1	Girder	Timber	2x 300 mm x 300 mm beams
2	Transoms	Timber	300 mm x 200 mm
3	Ties & Connections	Wrought iron	Bolts, ties, base plates & braces
Timber trestle pier			
i	Corbel	Timber	300 mm x 300 mm x 2800 mm
ii	Headstock	Timber	300 mm x 300 mm
iii	Raking pile	Timber	450 mm diameter
iv	Vertical pile	Timber	450 mm diameter
v	Bracing	Timber	200 mm x 100 mm
vi	Ties & connections	Wrought iron	Bolts, ties, base plates & braces
vii	Wale	Timber	300 mm x 200 mm
Foundations			
a	Concrete sill	Un-reinforced	1500 mm width
b	Timber pile		Same as above
c	Ties & connections	Wrought iron	Bolts, ties, base plates & braces

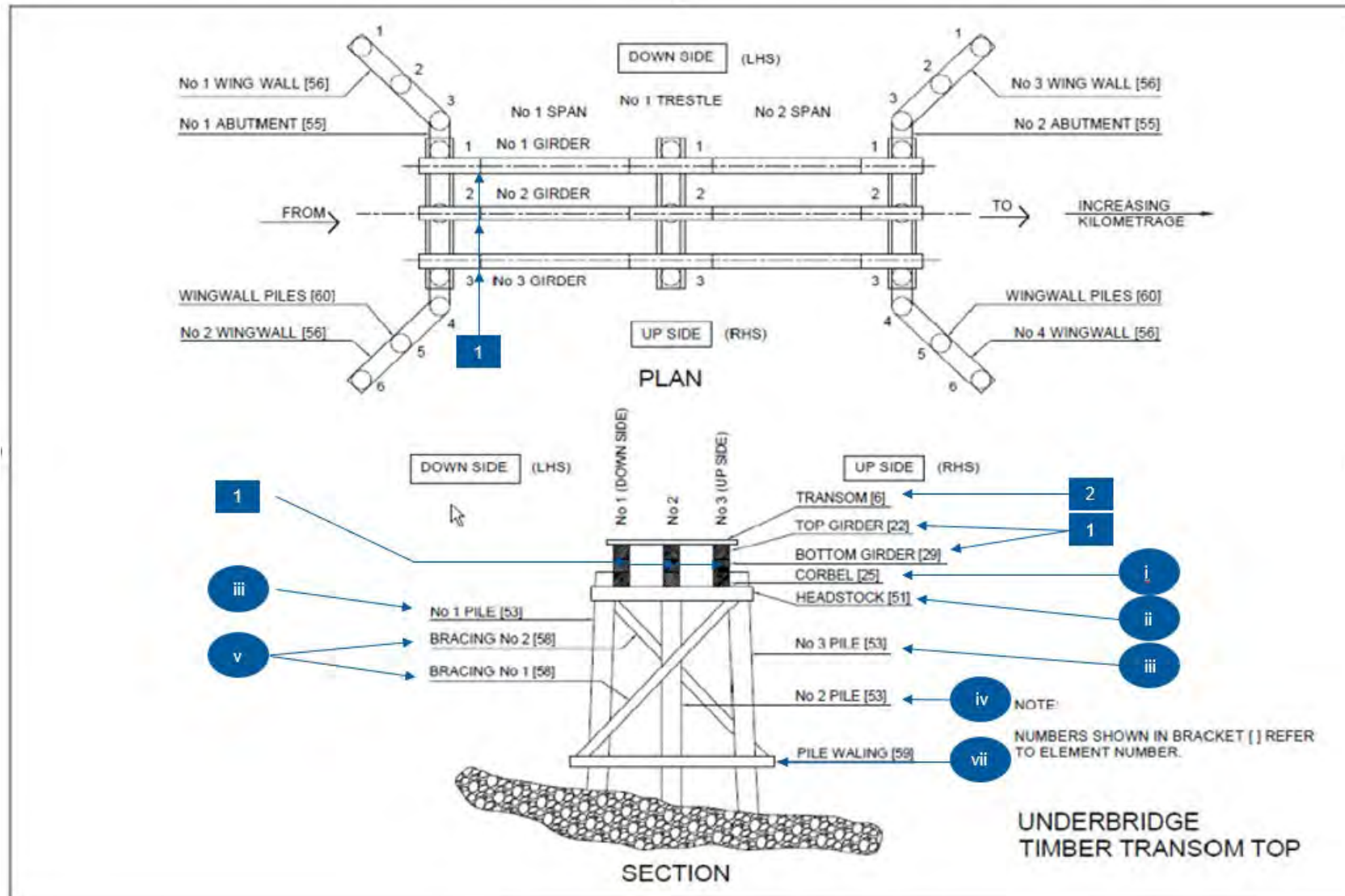


Figure A-2 Typical timber girder bridge elements (Source: ARTC)

2. Metal girder underbridges

2.1. Union Street Underbridge

Union Street Underbridge element numbering can be found in Figure A-2. Elements, their description and materials are shown in Table A-2.

Table A-2 List of elements and materials (Source: FBE)

Mark	Bridge element	Material	Description
1	Main girder	Wrought iron	Riveted plate girder
2	Cross beam	Wrought iron	PFC beam
3	Stringer	Wrought iron	I-beam
4	Transoms	Timber	Square or rectangular section
5	Horizontal restraint	Wrought iron	Flat plates
6	Web stiffener	Wrought iron	Plates and angles
7	Pier	Masonry	Brick wall
8	Pilaster	Masonry	Bricks



Figure A-2 Union Street metal span elements (Source: FBE)

2.2. Crane Street Underbridge

Crane Street Underbridge element numbering can be found in Figure A-3. Elements, their description and materials are shown in Table A-3.

Table A-3 List of elements and materials (Source: FBE)

Mark	Bridge element	Material	Description
1	Main girder	Wrought iron	Riveted plate girder
2	Cross frame	Wrought iron	Angles
3	Transoms	Timber	Square or rectangular section
4	Rail	Wrought iron	Rail section
5	Pier	Concrete	Concrete wall
6	Pilaster	Concrete	Concrete capping
7	Abutment	Concrete	Concrete wall



Figure A-3 Crane Street Underbridge elements (Source: FBE)

Appendix B – Condition assessment

Appendix B – Condition assessment

1. General estimated condition state

The conditions of the underbridges were estimated using information made available from UGLRL and LCC as well as from a visual inspection conducted by FBE. Winterton Parade Underbridge does not have any condition inspection reports completed.

Table B-1 through to Table B-4 assign an estimated percentage against each condition state for each of the main typical bridge elements identified in Appendix A for each underbridge.

1.1 Alexandra Parade Underbridge

Alexandra Parade Underbridge consists of a timber transom top supported by timber trestle piers founded on unreinforced concrete sills with timber piles.

Table B-1 shows the estimated condition of the underbridge.

Table B-1 Alexandra Parade Underbridge estimated condition assessment (Source: FBE)

Mark	Bridge Element	Condition as percentage of total amount of element			
		As-built	Good	Fair	Poor
Timber girder spans					
1	No. 1 girder	0	12	36	52
1	No. 2 girder	0	12	36	52
1	No. 3 girder	0	12	36	52
2	Transoms	0	8	17	75
3	Ties & connections	0	9	19	72
Timber trestle piers					
i	Corbels	0	10	38	52
ii	Headstock	0	14	27	59
iii	Raking pile 1	0	14	41	45
iii	Raking pile 2	0	14	41	45
iv	Vertical pile 1	0	6	25	69
iv	Vertical pile 2	0	6	25	69
iv	Vertical pile 3	0	6	25	69
v	Bracing 1	0	9	40	51
v	Bracing 2	0	9	40	51
vi	Ties & connections	0	17	35	48
vii	Wale	0	6	41	53
Foundations					
a	Concrete sill	0	42	45	13
b	Timber piles	0	Unknown	Unknown	Unknown
c	Ties & connections	0	36	47	17

1.2 Crane Street Underbridge

Crane Street Underbridge consists primarily of two separate bridge structures. The first is a two span, continuous dual wrought iron plate girder underbridge going over Crane Street. The second bridge is the three span, wrought iron, Pratt Truss type bridge over Leicester Creek. The continuous plate girders are supported by concrete wall piers and abutment. The truss type bridge has two wall type masonry abutments with two intermediate piers each consisting of two cast iron piers, infilled with concrete, and connected with cross beams and bracing. The condition of the truss spans is not known.

Table B-2 shows the estimated condition state for each bridge element.

Table B-2 Crane Street Underbridge estimated condition (Source: FBE)

Mark	Bridge Element	Condition as percentage of total amount of element			
		As-built	Good	Fair	Poor
Superstructure					
1	Main girder 1	0	31	54	15
1	Main girder 2	0	31	54	15
2	Cross frame	0	28	54	18
3	Transoms	0	12	27	61
4	Rail	0	31	41	28
Substructure					
7	Abutment 1	0	72	28	0
7	Abutment 2	0	72	28	0
5	Pier	0	72	28	0
6	Pilaster - general	0	55	40	5
8	Foundations - general	Unknown	Unknown	Unknown	Unknown

1.3 Terania Street Underbridge

Terania Street Underbridge consists of a timber transom top supported by timber trestle piers founded on an unreinforced concrete sill with timber piles. Refer to Table B-3 for an estimate of the condition of the underbridge and refer to Appendix A for the typical numbering of the elements.

Table B-3 Terania Street Underbridge estimated condition assessment (Source: FBE)

Mark	Bridge Element	Condition as percentage of total amount of element			
		As-built	Good	Fair	Poor
Timber girder spans					
1	No. 1 Girder	0	22	35	43
1	No. 2 Girder	0	22	35	43
1	No. 3 Girder	0	22	35	43
2	Transoms	0	7	20	73
3	Ties & Connections	0	11	20	69
Timber trestle piers					
i	Corbels	0	10	38	52
ii	Headstock	0	14	27	59
iii	Raking Pile 1	0	14	41	45
iii	Raking Pile 2	0	14	41	45
iv	Vertical Pile 1	0	7	30	63
iv	Vertical Pile 2	0	7	33	60
iv	Vertical Pile 3	0	7	32	61
v	Bracing 1	0	14	46	40
v	Bracing 2	0	14	46	40
vi	Ties & Connections	0	28	41	31
vii	Wale	0	19	41	40
Foundations					
a	Concrete Sill	0	50	38	12
b	Timber Piles	0	Unknown	Unknown	Unknown
c	Ties & Connections	0	37	45	18

1.4 Union Street Underbridge

Union Street Underbridge consists of multiple spans typically with a timber girder spans and timber trestle piers, however, the span over Union Street consists of dual wrought iron plate web girders supported by masonry piers.

Table B-4 shows the estimated condition states for each element.

Table B-4 Union Street Underbridge estimated condition assessment (Source: FBE)

Mark	Bridge Element	Condition as percentage of total amount of element			
		As-built	Good	Fair	Poor
Timber girder spans					
1	No. 1 Girder	0	25	43	32
1	No. 2 Girder	0	25	43	32
1	No. 3 Girder	0	25	43	32
2	Transoms	0	8	17	75
3	Ties & Connections	0	12	15	73
Metal girder spans					
1	Main girder 1	0	50	40	10
1	Main girder 2	0	50	40	10
2	Cross beams – general	0	65	30	5
3	Stringer 1	0	60	30	10
3	Stringer 2	0	60	30	10
4	Transoms	0	8	17	75
5	Horizontal restraints	0	30	40	30
6	Web stiffeners	0	75	15	10
Substructure					
i	Corbels	0	9	31	60
ii	Headstock	0	20	45	35
iii	Raking pile 1	0	15	42	43
iii	Raking pile 2	0	14	40	46
iv	Vertical pile 1	0	8	31	61
iv	Vertical pile 2	0	7	34	59
iv	Vertical pile 3	0	12	33	55
v	Bracing 1	0	15	48	37
v	Bracing 2	0	17	46	37
vi	Ties & connections	0	30	42	28
vii	Pile waling	0	28	54	18
7	Pier 1	0	90	10	0
7	Pier 2	0	90	10	0
8	Pilaster - general	0	90	10	0
Foundations					
a	Concrete sill	0	47	41	12

Mark	Bridge Element	Condition as percentage of total amount of element			
		As-built	Good	Fair	Poor
b	Timber piles	0	Unknown	Unknown	Unknown
c	Ties & connections	0	28	45	27

While this assessment is somewhat subjective it provides an estimated and quick indicative visual assessment of the bridge in its current condition. However, it should be noted it is likely that the timber deterioration is significantly advanced, and the structure may potentially be in even worse condition than visually assessed from a distance.

2. Summary of condition and preliminary risk assessment

Overall, the underbridges are in fair to poor condition. Consequently, a preliminary risk assessment has been undertaken against the estimated condition for each main bridge element and assessed as follows:

- Low – Unlikely to occur.
- Medium – Likely to occur at some time.
- High – Very likely to occur soon.

2.1 Alexandra Parade Underbridge

For the general conditions of Alexandra Parade Underbridge refer to Table B-5

Table B-5 Alexandra Parade Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As-built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	10	27	62	Girders	Med. - High	Flexure – Midspan
					Girders	Medium	Shear – Support
					Transom Ties	High	Flexure
						High	Section Loss
Substructure	0	10	34	56	Corbel	Med – High	Flexure – Ends
					Corbel & H/stock	Medium	Shear – At Support
					Trestle	Med. - High	Splitting/ Crushing
Foundations	0	36	42	22	b	Low	Crushing
Overall Condition	0	13	32	55			

The superstructure is in a predominantly poor condition and has a high risk of transoms falling off along with bolted connections. The main girders are also a medium to high risk of failure primarily due to rot and termite infestation.

The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The piles are typically split or splitting with many having rotten or are infested with termites. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. The foundations are typically seen and estimated to be in a good to fair condition.

Please refer to Figure B-1 through to Figure B-5 for photographs of the typical condition of the underbridge.



Figure B-1 Alexandra Parade – North elevation (Source: FBE)



Figure B-2 Alexandra Parade – Pier 23 (Source: FBE)



Figure B-3 Alexandra Parade – Rotten/Infested pile & whaling at Pier 23 (Source: FBE)



Figure B-4 Alexandra Parade – Rotten/Infested corbel, typical condition (Source: FBE)



Figure B-5 Alexandra Parade – Decayed and infested transoms at Span 27 (Source: FBE)

2.2 Crane Street Underbridge

For the general conditions of Crane Street Underbridge refer to Table B-6.

Table B-6 Crane Street Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As-built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	27	46	27	Girder	Low	Flexure – Midspan
					Transom	Med. - High	Flexure – Midspan
					Ties	Med - High	Section Loss
Substructure	0	68	31	1	NA	NA	NA
Overall Condition	0	39	42	19			

The superstructure is in a predominantly fair condition however the transoms are severely rotten and are a risk to pedestrians below and the environment. The substructure is in a good to fair condition with wall type piers and abutments in predominantly good to fair condition. The river bridge piers are estimated to be in a good to fair condition as no rust or pitting is visible and there is no settlement noted by prior inspections. The foundations are found to be in a good to fair condition. Please refer to Figure B-6 through to Figure B-11 for photographs of the bridge presenting typical conditions.



Figure B-6 Crane Street – Pratt truss east elevation, typical condition (Source: FBE)



Figure B-7 Crane Street – East elevation, typical condition (Source: FBE)



Figure B-8 Crane Street – Superstructure view from underside, Span 2 (Source: FBE)



Figure B-9 Crane Street – Decayed transoms at Span 1, typical condition (Source: FBE)



Figure B-10 Crane Street – Decayed transoms at Span 1 (Source: FBE)



Figure B-11 Crane Street – View over looking south (Source: FBE)

2.3 Terania Street Underbridge

For the general overall conditions of Terania Street Underbridge refer to Table B-7.

Table B-7 Terania Street Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As-built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	15	28	57	Girder	Med. - High	Flexure – Midspan
					Girder	Medium	Shear – Support
					Transom Ties	High High	Flexure Section Loss
Substructure	0	12	37	51	Corbel	Med – High	Flexure – Ends
					Corbel	Medium	Shear – At Support
					Trestle	Med. - High	Splitting/ Crushing
Foundations	0	39	40	20	Pile	Low	Crushing
Overall Condition	0	17	33	50			

The superstructure is in a predominantly poor condition and has a high risk of transoms falling off along with bolted connections. The main girders are also a medium to high risk of failure primarily owing to rotting and termite infestation. The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The piles are typically split or splitting with many having rotten or are infested with termites. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. The foundations are typically seen and estimated to be in a good to fair condition.

Please refer to Figure B-12 through to Figure B-17 for photographs of the typical condition of the underbridge.



Figure B-12 Terania Street – West elevation view (Source: FBE)



Figure B-13 Terania Street – Evidence of global rotation of Pier 6 together with failed pile (Source: FBE)



Figure B-14 Terania Street – Rotten and damaged east corbel at Pier 6 (Source: FBE)



Figure B-15 Terania Street – Splitting & weathering of piles at Pier 11 (Source: FBE)



Figure B-16 Terania Street – Loose connections & weathered beams (Source: FBE)



Figure B-17 Terania Street – View over looking south (Source: FBE)

2.4 Union Street Underbridge

For the general overall conditions of Union Street Underbridge refer to Table B-9.

Table B-9 Union Street Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As- built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	23	32	45	Girder	Medium	Flexure – Midspan
					Girder	Medium	Shear – Support
					Transom	High	Flexure
Substructure	0	32	34	34	Corbel	Med – High	Flexure – Ends
					Corbel	Medium	Shear – At Support
					Trestle	Med - High	Crushing
Foundations	0	43	42	15	Pile	Low	Crushing
Overall Condition	0	27	33	40			

The superstructure is in a fair to poor condition and has a high risk of transoms falling off along with bolted connections. The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. Please refer to Figure B-18 through to Figure B-21 for photographs presenting the typical condition of the underbridge.



Figure B-18 Union Street – View looking west, typical condition of timber span (Source: FBE)



Figure B-19 Union Street – Metal span west elevation, typical condition (Source: FBE)



Figure B-20 Union Street – West elevation, typical timber girder condition (Source: FBE)



Figure B-21 Union Street – View overlooking south, typical condition (Source: FBE)

2.5 Winterton Parade Underbridge

The condition of Winterton Parade Underbridge has not been estimated as there are no inspection records available.

Appendix C – Project and site constraints

Appendix C – Project & Site Constraints

1. Environmental

FBE has made no allowance during this early stage for the following potential environmental impacts:

- Aquatic and terrestrial flora and fauna, in particular bat habitat and fish passage
- Aboriginal and non-Aboriginal heritage
- Acid sulphate soils and land contamination issues
- Soils and water quality
- Changes to hydrology and flooding
- Noise and vibration
- Visual.

2. Land ownership

The underbridges are surrounded by the following private properties as shown in Figure C-1 to Figure C-5 which are sourced from SIX Maps (<http://maps.six.nsw.gov.au>).



Figure C-1 Union Street – Landownership information (Source: SIX Maps)



Figure C-2 Crane Street – Landownership information (Source: SIX Maps)



Figure C-3 Terania Street – Landownership information (Source: SIX Maps)



Figure C-4 Alexandra Parade – Landownership information (Source: SIX Maps)



Figure C-5 Winterton Parade – Landownership information (Source: SIX Maps)

3. Geotechnical site conditions

There is currently no geotechnical information available for the underbridges. There is however generic information available from NSW Environment and Heritage Division. The following information is obtained from the interactive eSPADE 2.2 website.

The associated soils in the area are classified as “Vertosols” under the Australian Soil Classification. Figure C-6 provides indicative soil classifications along the rail corridor. Vertosols are brown, grey or black soils typically consist of 35% or more clay and as such do not possess high bearing capacities.

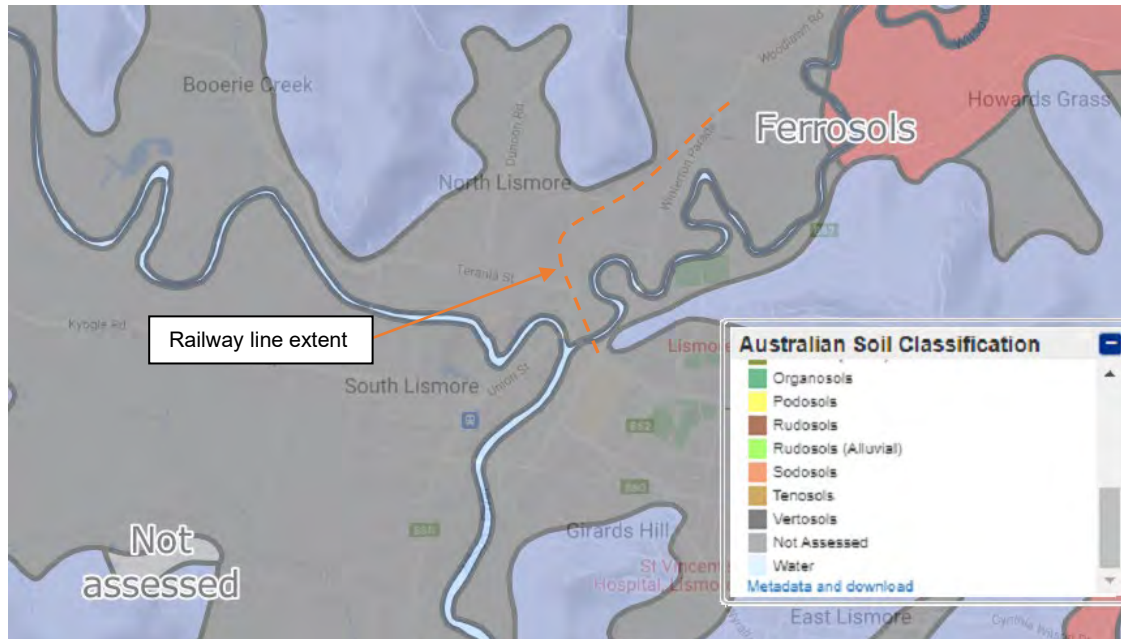


Figure C-6 Lismore City – Australian Soil Classification – Vertosol (Source: eSPADE 2.2)

4. Hydrology

Lismore has experienced flood events since it was founded in the mid 1800s, with the recent floods in 2022 being the most catastrophic in living memory. The floods were due to the rising of the Leycester Creek and Wilsons River and subsequent flooding over the floodplains. The floods in February and March 2022 tragically caused the loss of 5 lives, caused major damage to 1400 houses and impacted approximately 3000 businesses which in turn affected an estimated 180,000 jobs. It is presently estimated that the cost to rebuild Lismore is approximately \$1 billion. This information has been obtained from the Flood Response document authored by LCC (Reference No. 5 in Table 1-2 of the main report).

Wilsons River flows from the Northeast whilst Leycester Creek flows from the West and they converge in the centre of Lismore. After they converge Wilsons River continues south.

The Lismore Railway Viaduct Underbridges are constructed in the respective floodplains. Crane Street underbridge also traverses Leycester Creek. The underbridges skirt the western and northern perimeter of the Lismore City centre and suburbs.

LCC sent a letter dated 14 March 2023 to TfNSW where they requested the removal of Union Street, Terania Street and Alexandra Parade Underbridges which are preventing evacuation and rescue operations during flood events. The request is made from past and recent experience and required to mitigate future risks.

In the letter to UGLRL, dated 12 April 2023, LCC provided the 1%, 5% and 10% Average Exceedance Probability (AEP) flood levels for each underbridge shown in Figures C-7 to C-9.

Note that 1% AEP equates to 1 in 100 year flood event, 5% equates to 1 in 20 year flood event and 10% AEP equates to 1 in 10 year flood event.

In the same letter LCC identified that it would require a vertical clearance of 1.6 m to 1.8 m to allow a standard rescue boat to pass under the bridge during a flood event. For example, with 3.0 m flood level of 1% AEP a vertical clearance above the road level of 4.8 m (1.8 m + 3.0 m) would be required at Union Street Underbridge. With the current low clearance of 3.4 m this requirement is seen as a significant obstacle for rescue operations during a flood.



Figure C-7 Union Street – Flood levels (Source: LCC)



Figure C-8 Terania Street – Flood levels (Source: LCC)



Figure C-9 Alexandra Parade – Flood levels (Source: LCC)

As may be seen in the Figures C-7 to C-9 and as summarised below in Table C-1 the required freeboard of 1.8 m is not obtainable during most flooding events. It should also be noted that superstructure levels may also be an obstacle for rescue boats to traverse when flood levels are above the deck. It is therefore recommended that the removal of the underbridges should be considered a necessity in order to mitigate severe and catastrophic risks in the future. Whilst flood levels for Crane Street and Winterton Parade have not been provided it is foreseen that similar levels will prevail owing to the extent of the flooding.

Table C-1 Summary of flood level clearances for underbridges (Source: FBE).

	Vertical clearance (m) between flood event & bridge soffit ⁽⁴⁾		
Bridge Name	10% AEP ⁽¹⁾	5% AEP ⁽²⁾	1% AEP ⁽³⁾
Alexandra Parade	0 ⁽⁴⁾	-0.7	-2
Terania Street	0.7	0.5	-0.3
Crane Street	Unknown	Unknown	Unknown
Union Street	1.6	1.3	0.4
Winterton Parade	Unknown	Unknown	Unknown

(1) Average Exceedance Probability (AEP) for a one in ten-year flood event.

(2) Average Exceedance Probability (AEP) for a one in twenty-year flood event.

(3) Average Exceedance Probability (AEP) for a one in one-hundred-year flood event.

(4) Calculated as vertical clearance (m) – against flood event, refer to section 8.1 for bridge clearances.

5. Public utilities

Enquiries were made to the public utilities and other authorities via a Dial-Before-You-Dig request job references 34170762, 34170937, 34171009, 34171040 and 34171075. Table C-2 summarises the public utilities at each respective site.

Table C-2 Dial-before-you-dig summary (Source: FBE)

Underbridge Name	Presence of utilities on site					
	LCC ⁽¹⁾ Infrastructure	Essential Energy	NBN Co	NextGen NCC	Telstra	Optus
Union Street	Yes	Yes	Yes	Yes	Yes	No
Crane Street	Yes	Yes	Yes	Yes	Yes	No
Terania Street	Yes	Yes	Yes	Yes	Yes	Yes
Alexandra Parade	Yes	No	Yes	Yes	Yes	No
Winterton Parade	Yes	Yes	Yes	No	Yes	No

(1) LCC - Water and Sewer Infrastructure

Whilst public utilities may be present on site, they may not necessarily impact the proposed options for each individual underbridge. Appendix D provides further details on the status and position of each utility for each site. These utilities and their respective impacts on the proposed options for each underbridge have been summarised and will be discussed, where applicable, under the feasibility section for each option in Appendix E.

6. Heritage listings

Refer to Section 3 in the main body of the report.

7. Statutory approvals

Lismore Railway Viaduct Underbridges include Alexandra Parade, Crane Street, Union Street, and Terania Street Underbridges are registered on the SHR and would require a S60 application for any works to the structures.

8. Bridge clearances and traffic

The underbridges were originally constructed prior to the roads that pass underneath them and consequently the resulting bridge clearances are sub-standard.

TfNSW has set the vertical clearance limits for the dimensions of general access vehicles as being a maximum of 4.3 m high with exceptions being made to a height of 4.6 m. These dimensions are stipulated in the Road Transport (Vehicle Registration) Registration 2017 document authored by TfNSW. In accordance with AS 1742.2 all bridges with vertical clearances of less than 5.3 m must be sign posted. The vertical clearances of the railway underbridges are signposted, however they still receive vehicle strikes.

8.1 Bridge clearances

The underbridges have poor vertical and horizontal clearances at the road crossings. These substandard clearances increase risks to road users and to the safety of the underbridges. The risks include damage to trestle piers as well as to the girders. Severe damage to these elements risks structural collapse over the roads.

Table C-3 details the vertical clearances at each underbridge where it is evident clearances restrict access for general access vehicles to use the road.

Table C-3 Summary of vertical clearances for underbridge over roads (Source: FBE)

Reference Span*	Minimum road clearance to bridge soffit (m)				
	Union Street 2 spans	Crane Street 1 span	Terania Street 3 spans	Alexandra Parade 2 span	Winterton Parade 1 spans
Span 1	3.4	2.5	4	2.8	4.5
Span 2	4.5	NA	3.8	3.5	NA
Span 3	NA	NA	4	NA	NA

* Number of spans over road

After the recent floods TfNSW has implemented the Lismore Flood Recovery Planning Package. Homes are to be relocated as a part of this package to demarcated zones on higher ground. Homes are currently prevented from being relocated because of the abnormal load requirements and current clearance limitations at the bridges.

8.2 Accidents and traffic information

Traffic information for the following rail underbridges at Union Street, Terania Street, Alexandra Parade and Winterton Parade was provided by LCC to Ardill Payne & Partners who conducted a Road Safety Audit which can be found in Appendix F. Table C-4 summarises the traffic information.

Table C-4 Summary of traffic for underbridges (Source: Ardill Payne & Partners)

Traffic Characteristic	Union Street	Terania Street	Alexandra Parade	Winterton Parade
Average Daily Traffic (ADT) [veh/day]	5759 (Counted in 2022)	3468 (Counted in 2013)	1227 (Counted in 2013)	1227 (Counted in 2022)
Heavy Vehicle % of ADT [%]	10.3	8.2	3.7	9.1
85 th Percentile Speed [km/h]	52.9	58.7	58.3	63
95 th Percentile Speed [km/h]	100	64.1	NA	92

Crash data for the Road Safety Audit was obtained from TfNSW Road Safety Centre and is summarised in Table C-5.

Table C-5 Summary of crash data for underbridges (Source: Ardill Payne & Partners)

Accident Characterisitcs	Union Street	Terania Street	Alexandra Parade	Winterton Parade
Recent Accidents between 2017 - 2021	1 Accident. Vehicle collided with object in roadway.	4 Accidents Vehicles collided with underbridge during the day. Severe damage to underbridge pier.	None	2 Accidents. Vehicles crashed during night time 30m South of underbridge. Intersection geometry may play a role.
Severity	Low	Severe	Unknown	Severe
Accidents between 2000 - 2021	8 – 9 Accidents	Unknown	Unknown	5 -6 Accidents

Table C-4 shows that Union Street and Terania Street convey the most traffic. These underbridges have also experienced bridge strikes as detailed in Table C - 5. These accidents are likely to be a result of the poor vertical and horizontal clearances and poor signage as suggested by the authors of the Road Safety Audit.

The audit indicates that Alexandra Parade has not experienced any accidents or bridge strikes, and this may in part be owing to the low ADT and lower percentage of heavy vehicles. However, the inspection report completed by Cardno (Ref. No. 9, Table 2-1 of option report) provides evidence of previous vehicle strikes on the superstructure at Alexandra Parade Underbridge.

Winterton Parade has a similar ADT to Alexandra Parade, however it has a higher percentage of heavy vehicles. Winterton Parade has experienced comparable amounts of accidents to that of Union Street and Terania Street, however there are no records of vehicle strikes. It is concluded by the authors of the Road Safety Audit that accidents are likely due to the poor road geometry caused by the underbridge.

It is recommended that options be considered to mitigate the number of accidents at the underbridges. Alexandra Parade, Union Street and Terania Street have restrictive geometric clearances and the only way to rectify this would be to bypass or remove the spans over and adjacent to the road. Improving signage may limit the likelihood of accidents as well but would not eliminate the constraints. Winterton Parade Underbridge has not experienced any vehicle strikes however the geometric constraints it imposes appears substandard and introduce driving hazards. If the underbridge were removed the road alignment could be improved.

9. Summary of project and site constraints

Table C-6 provides a summary of the constraints at each underbridge.

Table C-6 Summary of constraints for each rail underbridge (Source: FBE)

Project and site constraints	Lismore Railway Underbridges				
	Union Street	Crane Street	Terania Street	Alexandra Parade	Winterton Parade
Environmental	Impacts to be investigated				
Land ownership	No	No	No	No	No
Geotechnical	No	No	No	No	No
Hydrology (flooding)	Yes	Yes	Yes	Yes	Yes
Utilities	Yes	Yes	Yes	Yes	Yes
Heritage	Yes	Yes	Yes	Yes	No
Statutory approval	Yes	Yes	Yes	Yes	No
Bridge clearances and traffic	Yes	Yes	Yes	Yes	Yes
Road network restriction	Yes	No	Yes	Yes	Yes

The proposed strategic options are required to address the project and site constraints while also addressing LCC concerns detailed in their supporting letters.

Appendix D – Utilities and services

Appendix D – Utilities and Services

Summary

Table D-1 summarises the dial-before-you dig findings.

Table D-1 Summary of potentially affected public utilities (Source: FBE)

Public Utility	Status
Alexandra Parade Underbridge – DBYD Job reference no. – 34171040	
Lismore City Council	Sewerage and water infrastructure on site and in direct vicinity of the bridge.
Essential Energy	No applicable infrastructure on erf
NBN Co NSWAct	NBN cable present in the erf and in direct vicinity of the bridge.
Nextgen NCC	Underground cables on the erf but may or may not be in direct vicinity of the bridge.
Telstra NSW North	Fibre optic infrastructure present in the vicinity of the bridge.
Crane Street Underbridge – DBYD Job reference no. – 34170937	
Lismore City Council	Sewerage and water infrastructure on site
Essential Energy	Electrical infrastructure near erf but not in direct vicinity of the bridge
NBN Co NSWAct	NBN cable present in the erf but may not be in direct vicinity of the bridge.
Nextgen NCC	NBN cable present in the erf and may or may not be in direct vicinity of the bridge.
Telstra NSW North	Fibre optic infrastructure present in the vicinity of the site.
Terania Street Underbridge – DBYD Job reference no. – 34171009	
Lismore City Council	Both active and abandoned water infrastructure in direct vicinity of the bridge.
Essential Energy	Both HV and LV underground cables in direct vicinity of the bridge.
NBN Co NSWAct	Underground cable in direct vicinity of the bridge.
Nextgen NCC	Underground cables on the erf but may or may not be in direct vicinity of the bridge.
Telstra NSW North	Underground mains cable and infrastructure present in direct vicinity of bridge.
Optus and/or Uecomm NSW	Underground optic cable present in direct vicinity of the bridge

Public Utility	Status
Union Street Underbridge – DBYD Job reference no. – 34170762	
Lismore City Council	Sewerage and water infrastructure on site and in direct vicinity of the bridge.
Essential Energy	Overhead lines crossing the site.
NBN Co NSWAct	NBN cable present in the erf and crossing the site.
Nextgen NCC	NBN cable present in the erf but may not be in direct vicinity of the bridge
Telstra NSW North	Fibre optic infrastructure present in the direct vicinity of the bridge.
Winterton Parade Underbridge – DBYD Job reference no. – 34171075	
Lismore City Council	Sewerage and water infrastructure on site and in direct vicinity of the bridge.
Essential Energy	Overhead lines traversing site
NBN Co NSWAct	NBN cable present in the direct vicinity of the bridge.
Nextgen NCC	NBN cable present in the erf and may or may not be in direct vicinity of the bridge.
Telstra NSW North	Fibre optic infrastructure present in the direct vicinity of the bridge.

Appendix E – Strategic options

Appendix E – Strategic options

The following strategic options have been identified and are discussed in detail.

1. Option 1 – Raise spans
2. Option 2 – Partial demolition
3. Option 3 – Complete demolition
4. Option 4 – Alternative route
5. Option 5 – Rehabilitation
6. Option 6 – Reconstruction
7. Option 7 – Do nothing

1. Option 1 – Raise spans

This option mainly applies to the metal spans at Crane Street and Union Street Underbridges.

1.1.1 Metal spans

Raising the spans over the road is proposed to alleviate the vertical clearance issues during daily use as well as during flood events.

The minimum vertical clearances are mostly substandard and ranges from 2.5 m at Crane Street Underbridge to 4.5 m at Winterton Parade Underbridge. Table C-3 in Appendix C provides a summary of clearances at all underbridges. To meet the minimum requirements of AS 5100.1:2017 Clause 13.7 the vertical clearance would need to be 5.4 m but could be reduced to 4.6 m if alternate overheight vehicle access is possible.

LCC have advised in recent letters dated the 14 March 2023 and 12 April 2023 to TfNSW and UGLRL that the existing underbridges at Alexandra Parade, Terania Street and Union Street are an obstacle for evacuation and rescue operations during flooding as they do not provide minimum freeboard between deck soffit and flood level of 1.6 m to 1.8 m for a standard rescue boat to pass under those bridges to enable rescue operation during flooding. Refer to Appendix C, Section 4 Hydrology for flooding information.

Raising spans would be applicable to the metal girder spans over Union Street. The metal girders currently support the timber girders which would need to be cut and partially demolished in order to facilitate the raising of the metal spans. Consequently, the end of the timber girder span would need to be propped and stabilised permanently for this option. A new support and steel bracing tie would be introduced to the soffit of the deck, for either end of the timber superstructure to stabilise it. The new supports and ties would be introduced prior to the partial demolition of the timber deck (see Figure E-2 and Figure E-3).

Option 1 would also likely be feasible for the Crane Street underbridge and it could involve raising both spans of the continuous metal plate girders together. An alternative variant would be raising only one span over Crane Street with associated metal cutting works to split the continuous girders over the pier. As part of this variant strengthening of the separated spans would probably be needed to provide structural integrity to the modified structure. As Crane Street has low traffic, heavy vehicles do not use the road and there is a short alternative route available, raising spans is not most likely not a preferred option for this site.

Methodology

The main girders would be supported by a fully designed and certified temporary support works and frame which shall then be lifted via crane. The crane shall have respective outriggers placed on support pads for stabilisation. Figure E-1 through to Figure E-3 shows the proposed methodology before, during and after raising the metal span. The temporary falsework and frame would be designed for the dead load of the span and its own self weight.

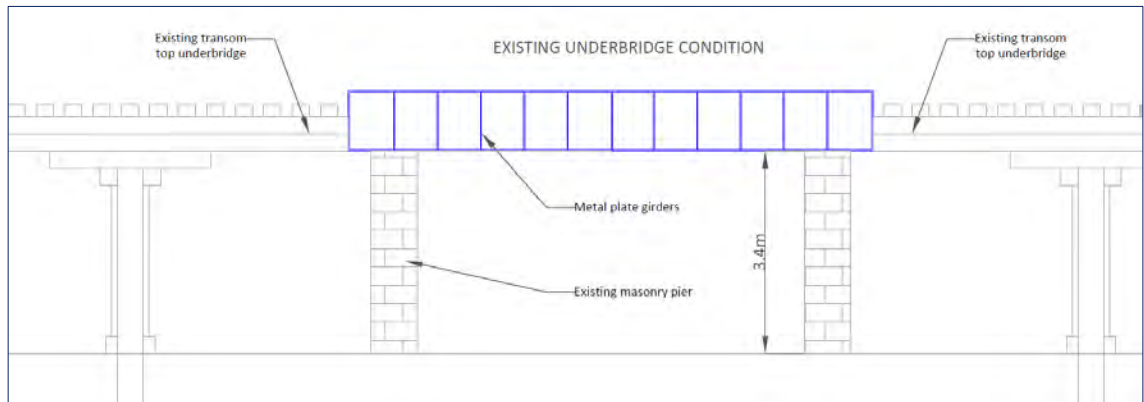


Figure E-1 Option 1 – Existing underbridge condition (Source: FBE)

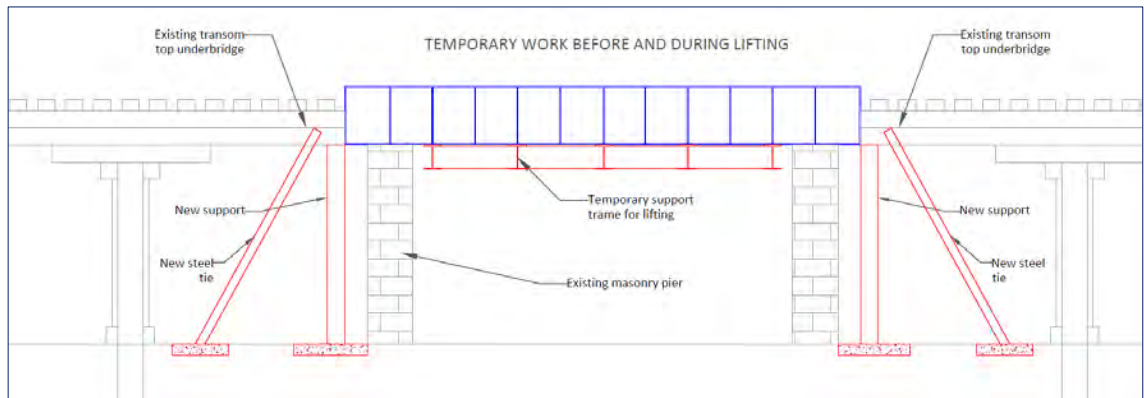


Figure E-2 Option 1 – Proposed temporary works (Source: FBE)

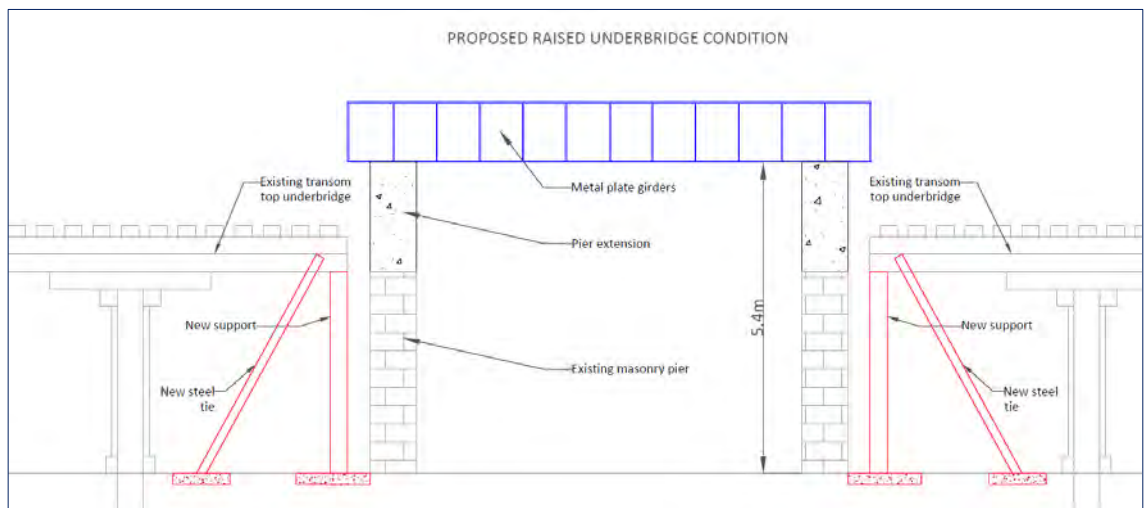


Figure E-3 Option 1 – Proposed raised underbridge condition (Source: FBE)

The steps to raise the span, particularly over Union Street, may be seen below:

- Close existing road.
- Installation of temporary works and frame.

- Shorten adjacent timber spans and support free ends with new supports.
- Lift girders using the support frame and crane, and place safely elsewhere on site.
- Clean existing piers and extend them to required heights.
- Prepare and install elastomeric bearings.
- Lift and lower girders onto bearings leaving bridge with a minimum vertical clearance of 5.4 m.
- Remove temporary works and reinstate the road below.

Advantages

- Less likelihood of damage to the environment.
- Heritage of the underbridge fabric is retained.
- Increased clearance would alleviate constraints on the road network as well as vehicular damage to the wrought iron span of the bridge.
- The vertical clearance shall be sufficient for vehicles and during daily usage and flood events.

Disadvantages

- It requires closure of the existing road under the bridge for about 2 weeks.
- A considerable amount of the work would be required at heights.
- Expensive and constrained timeline.
- Foundation improvements may be required for increased pier weight.
- Geotechnical investigations required for temporary works.
- Risk of vehicle impact with piers is not removed.
- Form of the viaduct is changed affecting heritage aesthetic values.
- Poor aesthetical outcome.
- Risk associated with adjacent remaining timber spans is not removed.
- Continued maintenance of the bridge would be still required.

Safety during construction

Installation of temporary works under existing underbridge would be highly technical but possible, however it would require mitigation of construction risks for building up piers and potentially installation of bearings.

Public safety

The risk to public safety, once completed, would be improved thanks to superstructure being raised and loose metal or deteriorated timber element being removed. The significant improvements would be from the increased vertical clearance. The improved clearance for the wrought iron girders will allow for emergency staff to access said areas during flood events as well as reduce risks associated with vehicular strikes with the bridge.

Feasibility

This option is considered feasible for Union Street underbridge. The heritage fabric value would remain, however at a high financial and aesthetic costs. There are underground utilities that cross the site at Union Street underbridge and these would need to be carefully explored for.

The utilities include: LCC infrastructure, Telstra cables and an NBN cable. Nearby utilities include an overhead line for Essential Energy and a nearby underground cable for Nextgen. The presence of the utilities increase the engineering effort required and thus the feasibility is therefore more complex but nonetheless feasible with sufficient planning.

Maintenance

Regular inspections and maintenance of the existing superstructure would still be required. Continual maintenance of the timber underbridge either side of the wrought iron span, for Union Street, would be required.

1.1.1 Timber girder spans

The timber girder spans are generally found to be in a poor condition as reflected in Appendix B, Section 2. The poor condition of the timber spans indicates that personnel would be risking their safety by working at heights close to rotten or decayed timber elements.

A phased approach will be required in order to raise the timber spans and extend trestle piers. Each phase would require a minimum of two spans to be raised in order to extend or replace one trestle pier. Complex temporary support works would be required to install below the deck to raise spans to enable extension or replacement of the trestle piers. The timber elements may be brittle and fail while being raised despite the complex support works. Temporary support works would be required to stabilise the remainder of the timber girder spans during each phase and would need to be adjusted after each phase as the structural configuration of the underbridge changes.

In order to make this option feasible construction process would to be very complex and expensive with long very programme and safety risks difficult to be eliminated. Consequently, raising spans is not recommended for timber girder underbridges.

2. Option 2 – Partial demolition

Partial demolition involves removal of the road spans and adjacent spans including stabilisations works to the remaining timber girder spans to maintain their structural integrity and ensure public safety. This option would be feasible for all bridge sites and would eliminate most of the existing site constraints with some residual risks associated with the remaining spans. Partial demolition is considered possible for all the rail underbridges except for Crane Street Underbridge due to continuous spans arrangement. The extent of demolition would vary at each site and the extent at each site is illustrated in the following figures. Partial demolition of Alexandra Parade would involve removal of spans 22 to 25 (see Figure E-4).



Figure E-4 Alexandra Parade – Demolition extent, spans 22 to 25 (Source: FBE)

Partial demolition of Terania Street underbridge would involve the removal of the spans 4 to 8 (See Figure E-5)



Figure E-5 Terania Street – Demolition extent, spans 4 to 8 (Source: FBE)

Union Street Underbridge would have spans 2 through to 5 demolished (see Figure E-6).



Figure E-6 Union Street Bridge – Demolition extent, spans 2 to 5 (Source: FBE)

For Winterton Parade underbridge it is proposed that spans 8 to 14 are demolished for this option to allow for a proposed road re-alignment (see Figure E-7).

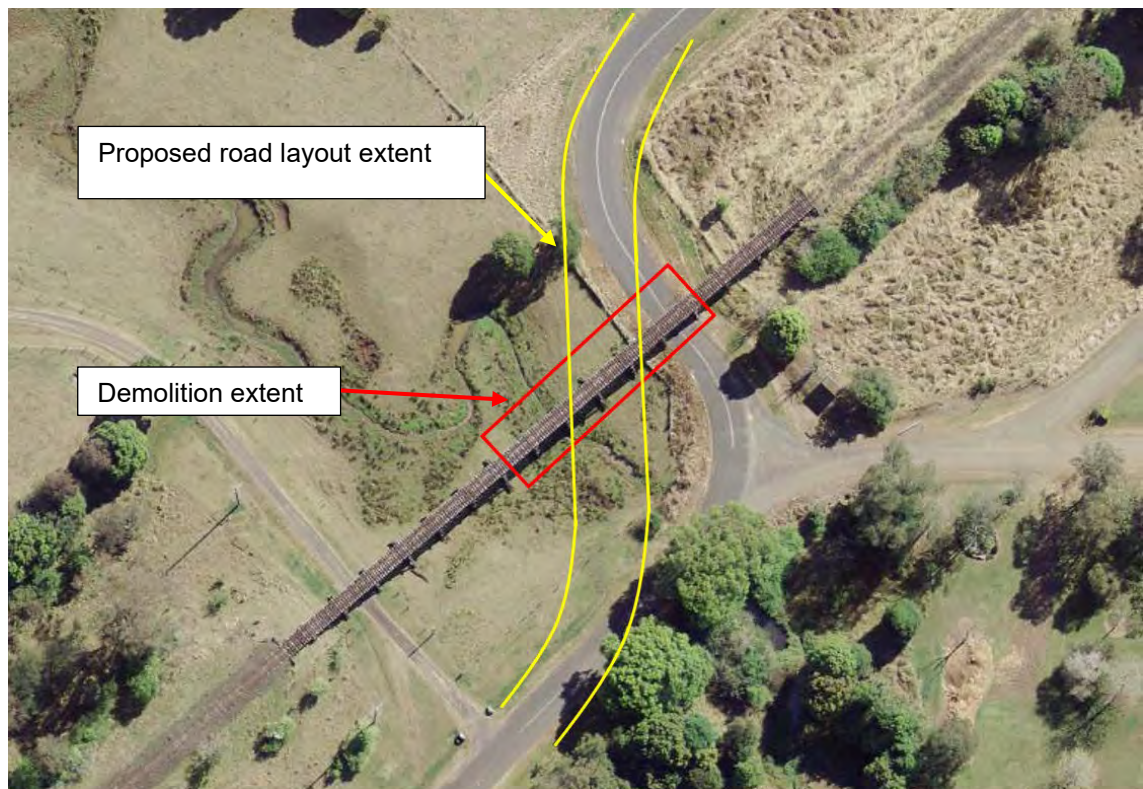


Figure E-7 Winterton Parade – Demolition extent, spans 8 to 14 (Source: FBE)

Methodology

It is proposed that at each site that the road would be temporarily closed in order to demolish the extent of each bridge as shown in Figure E-4 to Figure E-7. The remaining portions of the bridges after partial demolition would be propped by new supports as required and restrained by ties. Figure E-8 shows an idealised sketch of the proposed stabilisation works and the layout of the underbridge following partial demolition.

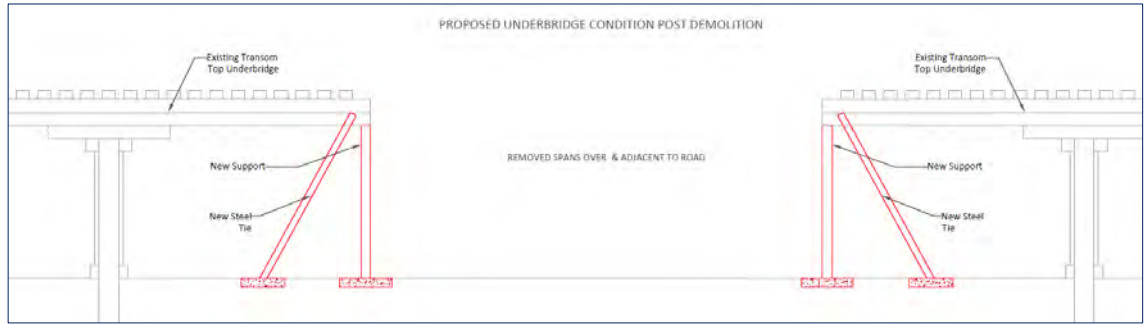


Figure E-8 Proposed layout of the underbridges post partial demolition (Source: FBE)

The methodology proposed is as follows:

- Construction of stabilisation works to retained spans.
- Temporarily close the road and establish exclusion zone for the demolition works.
- Partially demolish underbridges as per extents.
- Removal and recycle demolished fabric.
- Reinstatement of the road as required.
- Reopen the road to traffic.

Advantages

- Provides a permanent solution to the vertical and horizontal clearance restrictions.
- No further safety risks for motorists owing to accidental impact damage.
- Emergency and rescue access is facilitated during flooding events.
- Facilitates moving houses as part of the Lismore Flood Recovery Package.
- Demolition sequence may be scheduled consecutively to minimise impacts to the community.

Disadvantages

- Working at heights.
- Road would need to be closed temporarily for the demolition works.
- Partial removal of the structure would fundamentally reduce the heritage significance of Lismore Railway Viaduct.
- Partial removal of structure will fundamentally alter the heritage value of the underbridge.
- Environmental issues from falling debris is not eliminated in remaining spans.
- Maintenance and inspections would still be required for remaining spans.
- Poor road geometry at Winterton Parade Underbridge would not be resolved with partial demolition.

Safety during construction

Demolition may entail working at heights for a short duration. Safe work practices would need to be incorporated into the methodology.

Public safety

On completion of the partial demolition the public would be mostly protected against any hazards associated with the underbridge within the extent of the demolished and retained

structure. There would be some residual risks associated with the remaining sections of the underbridge. This may include public passing under, climbing on and walking over existing structures being in poor condition but maybe mitigated to some extent by permanent fencing.

Feasibility

Partial demolition options for the purpose of this report is considered without detailed demolition planning. However, based on previous experience on similar or larger projects demolish is considered feasible. The main constructability challenges are expected to be associated with the stabilisation works of the remaining spans.

There are no overhead electricity lines within the proposed demolition extent of underbridges apart from the overhead line present at Union Street Underbridge that would need to be isolated during the works.

There are underground cables and other underground infrastructure within the demolition extents for the underbridges passing over Alexandra Parade, Terania Street and Union Street (refer to Appendix D for details). The underground utilities and services would need to be located and confirmed on site to establish whether they can be retained, require protection or relocation.

The utilities component would increase the complexity of this option but is still considered feasible with additional costs and planning.

Maintenance

The partial demolition of the underbridges would not remove the need ongoing regular inspection and maintenance for the retained spans.

3. Option 3 – Complete demolition

Option 3 proposes to complete demolition. Based on previous similar projects the complete removal of the timber girder spans as well as the metal plate web girder spans is feasible. This option could be applied to all sites if required.

Methodology

It is proposed that the road for each underbridge be temporarily closed to allow for the demolition of the bridge. The demolition would require traffic to use alternate routes for a short duration.

The brief methodology is proposed as follows:

- Temporarily close the road and establish exclusion zone for the demolition works.
- Demolish underbridge spans over the road.
- Remove and recycle demolished fabric.
- Reinstatement of the road as required.
- Continue demolition for the remainder of the spans over the flood plain.
- Reopen the road to traffic.

Advantages

- Provides a permanent solution to the vertical and horizontal clearance restrictions.
- No further safety risks for motorists owing to accidental impact damage.
- Emergency and rescue access is facilitated during flooding events.
- Facilitates houses being moved as part of the Lismore Flood Recovery Package.
- Environmental issues from falling debris is eliminated.
- Demolition sequence may be scheduled consecutively to minimise impacts to the community.
- No further maintenance or inspections required.
- Geometric road realignment to improve road safety is possible now where required.

Disadvantages

- Working at heights.
- Temporary closure of existing roads to enable demolition.
- Total removal of the structure would fundamentally reduce the heritage significance of Lismore Railway Viaduct.

Safety during construction

Demolition may entail working at heights for a short duration. Safe work practices would need to be incorporated into the methodology.

Public safety

All current hazards associated with existing underbridges are fully eliminated.

Feasibility

Complete demolition options for the purpose of this report is considered without analysis and detailed calculations. However, based on previous experience on similar or larger projects demolish is considered feasible. The main constructability challenges are expected to be associated with safe demolition methodology working around road and in a residential area.

Provided that no excavation will be done as part of option, the only type of utility that would be affected are the overhead lines at Union Street and Winterton Parade Underbridges and in the vicinity of the Crane Street Underbridge. Isolation of the power lines and detail methodology of heavy machinery operations would likely be required for the demolition works.

Maintenance

The complete demolition would result in no further inspections or maintenance being required.

4. Option 4 – Alternative route

Whilst this option is primarily applicable for Alexandra Parade it is also possible for the Crane Street Underbridge, however, this is probably not a project requirement from LCC or TfNSW. The alternate route for Alexandra Parade shall only therefore be discussed. The option for an alternate route around the bridge was proposed by FBE and has been preliminarily developed by LCC.

4.1.1 Option 4A – Short route

FBE proposed to realign the road by cutting through the non-operational railway line directly east of the bridge road crossing. This would improve the level of service for road users by improving sight distances and road geometry (see Figure E-9).

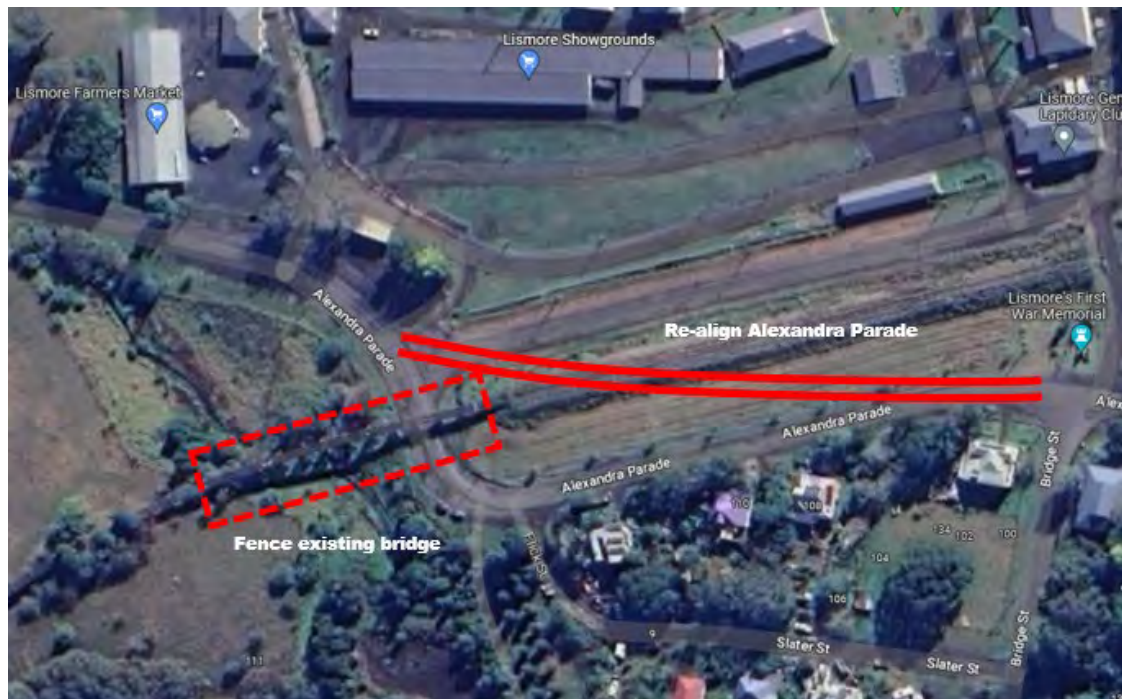


Figure E-9 Option 4A – FBE proposed alternate route at Alexandra Parade (Source: FBE)

4.1.2 Option 4B – Longer route

The LCC proposed alternate road route would encompass the realignment of the existing Alexandra Parade and provision for construction of a new portion of road. The new portion of road would bypass the existing underbridge by following the proposed or similar alignment from the Alexandra Parade and Bridge Street intersection, through to the proposed roundabout at the intersection of Dunoon Road and Alexandra Parade (see Figure E-10).



Figure E-10 Option 4 – LCC proposed alternate route at Alexandra Parade (Source: LCC)

Methodology

The underbridge would be closed after the re-alignment and construction of the new Alexandra Parade route. The following scope of works is anticipated:

- Removal of at grade rail line including sleepers and connections.
- Clearing and grubbing.
- Make safe of eastern abutment.
- Excavation of embankment.
- Construction of road.
- Close off Alexandra Parade Underbridge.

Advantages

- Retains heritage value without being restored and high capital spend.
- Vertical and horizontal clearances are resolved by providing an alternate route.
- Allows for emergency access during flood events via alternate route.
- An upgraded and more efficient arterial is provided.
- Facilitates moving houses as part of the Lismore Flood Recovery Package.
- No work is done on the structure thus safety, directly related to the underbridge, is of nominal concern during construction.

Disadvantages

- High cost.
- No structural or condition improvement to the underbridge.
- Continued inspections and maintenance required.
- Closure of existing Alexandra Parade below the underbridge restricts access.
- Rotting transoms and loose bolted connections still pose a falling risk to pedestrians below and fencing off the bridge would be required.

Safety during construction

Safety during construction would be similar to that involved in typical roadworks. Additional safety risks may be associated with the demolition of the railway line for the proposed alternate route however this is likely to be nominal.

Public safety

On completion of the alternate route the safety risks to the public would be largely removed. The public would no longer be able to travel underneath the existing underbridge and the risks posed by falling debris, poor horizontal and vertical clearances and associated impacts and damage are removed.

Feasibility

The option appears feasible but is likely to be expensive. The cost for the realignment and construction of the alternate route may possibly be shared between LCC and TfNSW.

Maintenance

The structure would likely require ongoing regular inspections and maintenance after construction of the alternate route. Regular maintenance would be required to extend the life and prevent deterioration and collapsing in the long term.

5. Option 5 – Rehabilitation

This option proposes to undertake extensive rehabilitation to the existing underbridges to improve their condition and thereby eliminate the risks of falling elements and prevent partial or full collapse. This option assumes that rehabilitation would be undertaken to the full extent of the existing underbridges to retain as much current fabric and maintain their heritage value.

The scope of works for each underbridge would vary depending on type of the superstructure, type of supports and condition of timber and metal elements.

It should be noted that the condition of timber spans is generally poor, therefore it is very likely that extent of rehabilitation works would be close to full reconstruction. If this would be the case, rehabilitation becomes very costly and potentially unfeasible.

It is expected that Option 5 would be mostly applicable to the metal spans which are generally in better condition therefore the extent of any repairs and maintenance would be justifiable.

Table E-1 shows the anticipated scope of works for each underbridge.

Table E-1 Option 5 – Anticipated scope of work for each underbridge

	Anticipated scope of works	
Bridge name	Superstructure	Substructure
Union Street	• Provide access • Remove rails and transoms • Remove loose metal elements • Repair damaged metal elements • Re-paint the girders	• Local repairs to existing piers
Crane Street	• Provide access • Remove rails and transoms • Remove loose metal elements • Repair metalwork as required • Re-paint the girders	• Local repairs to piers and abutments
Terania Street Alexandra Parade Winterton Parade	• Provide access • Replace damaged and decayed timber elements • Repair/replace connections	• Replace damaged and decayed timber elements • Repair/replace connections • Construct new foundations

Methodology

The expected methodology for metal girder underbridges:

- Establish site and access.
- Implement traffic management and road closure(s).
- Isolate or divert utilities and services if required.
- Provide temporary works for access and safety during construction.
- Remove rails and timber transoms.
- Remove any debris and loose items from the superstructure.

- Complete minor repairs to damaged or deteriorate metal elements.
- Encapsulate main girders and carry out painting works.
- Undertake repairs to piers and abutments.
- Remove temporary works.
- Demobilise
- Reopen the road.

The expected methodology for timber girder underbridges:

- Establish access and site.
- Implement traffic management and road closure.
- Isolate or divert utilities and services if required.
- Provide temporary works for access and safety during construction.
- Remove and recycle decayed timber and install replacement elements.
- Repair connections between timber elements.
- Construct new foundations where required.
- Remove temporary works.
- Demobilise.
- Reopen the road.

An example of temporary works for timber span rehabilitation is shown in Figure E-11.

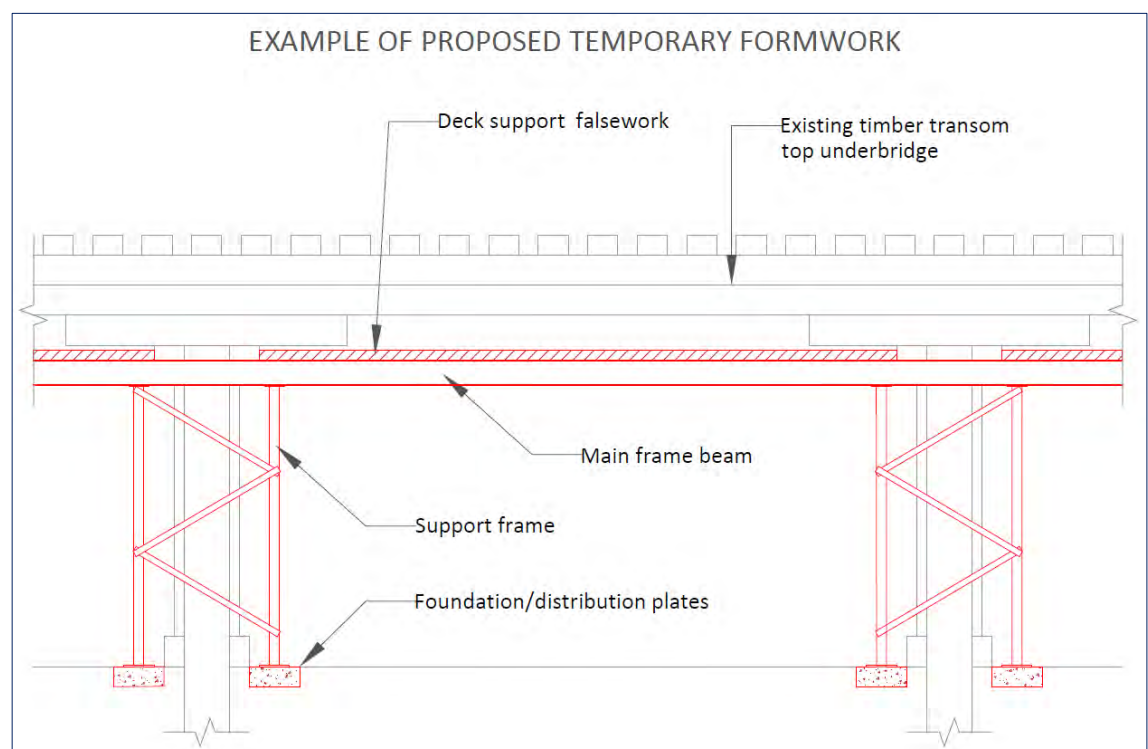


Figure E-11 Example of proposed temporary falsework (Source: FBE)

Advantages

- Existing aesthetic of the underbridges is maintained.
- Heritage significance of the underbridge is left largely intact.
- Improved condition and safety.
- Structural integrity of the underbridges is restored.

Disadvantages

- Limited height and width clearances imposed by underbridges would not be resolved.
- Work undertaken would be at heights and undertaken on poor condition timber spans and trestles.
- Vertical and horizontal clearances may be reduced even further during rehabilitation by the temporary works.
- Road may be closed for the construction of the temporary works and rehabilitation.
- Does not resolve access issues during flooding.

Safety during construction

There are considerable safety risks including working at heights and around an asset in poor condition. There are also associated safety risks working around live traffic and potential vehicle impacts to any proposed temporary works.

Public safety

This option would restore the structural integrity of the existing underbridge and thereby reduce the risks to the public and the environment from falling elements (transoms, connections, etc) and remove risks from partial or full collapse of the currently poor condition timber girder spans.

Feasibility

Although this option is maybe feasible, it would have significant challenges associated with working on and around poor condition structures. It is very likely that some sections of the existing underbridges may be deteriorate to such an extent that rehabilitation would not be feasible, and replacement would be the only alternative. This option would likely be the most expensive with a protracted programme of works and would not resolve many of the project and site constraints.

Maintenance

Regular inspections and associated planned annual maintenance works would be required.

6. Option 6 – Reconstruction

This option involves the complete like-for-like reconstruction or replacement with alternative materials, for example steel. This option would be feasible for all sites, however, it would not resolve most of the existing constraints. This option would involve their demolition and their subsequent reconstruction. The scope of works for this option would be the largest out of all the options and therefore would have the highest degree of technical expertise required as well as the most risk and associated cost.

Methodology

It is proposed that the road for each underbridge be closed to allow for the demolition of each underbridge. The demolition would require traffic to use alternate routes during this time.

Thereafter construction may be scheduled to prioritise spans away from the road with spans over roads requiring that roads be temporarily closed.

The brief methodology is proposed as follows:

- Temporarily close the road and establish exclusion zones.
- Demolish underbridge spans over road.
- Remove and recycle demolished fabric.
- Reinstatement of road as required.
- Continue demolition for the remainder of the spans over the flood plain.
- Remove and recycle demolished fabric for spans over flood plain.
- Construct underbridge spans over the flood plain.
- Temporarily close the road.
- Construct spans over the roads and connect with adjacent spans.
- Remove all temporary works on/near the road.
- Reopen the road to traffic.

Advantages

- Facilitates moving houses as part of the Lismore Flood Recovery Package between demolition and construction phases.
- Environmental issues from falling debris is eliminated.
- Demolition may be scheduled consecutively to minimise impacts to the community.
- The heritage value would be retained.

Disadvantages

- Working at heights for demolition and construction.
- Road would need to be closed temporarily.
- The heritage value found in the original fabric of the underbridges would not be retained.
- No improvement to substandard bridge clearances.
- No improvement to access for emergency and rescue personnel during floods.
- Long term maintenance would be required.
- Road network restrictions would remain.
- Public safety may be at risk in the future if maintenance is not conducted and the bridges condition is allowed to deteriorate.

Safety during construction

This option entails working at heights for a long duration. Site personnel would need to develop safe procedures for working at heights and around poor condition spans to demolish. The reconstruction of the bridges would require well designed and planned safety and construction procedures to mitigate risks and unexpected costs.

Public safety

The public safety would not be improved during floods, from reduced vertical and horizontal clearances but the overall risks posed by the poor condition timber bridges would be removed.

Feasibility

Demolition and reconstruction is largely feasible but costly. The demolition feasibility is the same as Option 3. Any like-for-like reconstruction would require large volumes of old growth Australian timber which are difficult and costly to source. However, alternative materials could be investigated as sustainable, less costly and require less ongoing maintenance.

Maintenance

The reconstruction of the underbridges would result in ongoing regular inspections and maintenance being required.

7. Option 7 – Do nothing

The do nothing option would require managing the viaduct as a ruin which is not feasible. This option is mainly for comparison purposes only and is not considered acceptable as it does not address the project and site constraints.

The bridges are generally in poor condition and do nothing is not favourable even from a heritage perspective.

Methodology

- Leave structures as-is.
- Establish comprehensive condition states of each bridge.

Advantages

- Minimal cost.
- Heritage significance of the structures may not be affected in the short term.

Disadvantages

- Structure remains in existing condition.
- Structure would continue to deteriorate with spans and trestles collapsing seen as inevitable.
- Vertical clearance issues not addressed.
- Horizontal clearances not addressed thus increasing risk of structural damage and failure to trestle piers.
- Access not provided for emergency and rescue services during floods.
- Risks from falling debris onto pedestrians and vehicles below from deteriorating elements would increase.
- Heritage fabric allowed to deteriorate and fail.

Public safety

Public safety risks would continue to increase as the bridges condition is allowed to deteriorate. The risks to public safety from flooding and substandard geometric clearances remain.

Feasibility

This option is not considered feasible from a public safety perspective or addressing any of the project or site constraints.

Maintenance

Minimal to no maintenance would be undertaken and the bridges would be treated as a ruin.

Appendix F – Selected supplied information

Appendix F – Selected supplied information

The following key documents from Table 1-2 are provided as follows:

- Reference No.1 - Letter addressed to UGLRL from LCC dated April 2023
- Reference No. 2 - Letter addressed to TfNSW from LCC dated March 2023
- Reference No. 3 - Road Safety Audit by Ardill Payne and Partners dated November 2022
- Reference No. 8 - Alexandra Parade Proposed Road Realignment plans by LCC dated 2021

Letter addressed to UGLRL by LCC (Ref. No. 1)

12 April 2023

Luke Cunningham
Head of Asset and Engineering
UGL Regional Linx

By Email: luke.cunningham@uglregionallinx.com.au

Removal of Railway Bridges in Lismore

Dear Mr Cunningham,

In response to previous correspondence in relation to the removal of three timber railway bridges in Lismore and a request for information received from Bojan Hadzic received on March 16, 2023, please find below the following information:

Recommendation of the Floodplain Risk Management Committee

Lismore Council's Floodplain Risk Management Committee resolved on March 6, 2023 to send a letter to UGL and Transport for NSW requesting information on the process for the removal of three disused railway bridges. The impetus for this was their impediment to boat rescues of stranded residents in the February 2022 flood. The letter was sent on March 14 and is included as an attachment.

There is now a sense of urgency about the removal of these bridges to facilitate the relocation of houses out of high flood risk areas of North Lismore. The Northern Rivers Reconstruction Corporation is actively looking for suitable residential land so that Lismore residents offered a buy-back of their property have an option to relocate their existing house to higher ground. At present the disused railway bridges discussed here prohibit the movement of houses out of the North Lismore area.

Safety Issues & Traffic Accident Damage History

The following documents have been included as attachments addressing safety issues and structural integrity etc.

- Road Safety Audit (November 2022), conducted by Ardill Payne & Partners. This includes traffic and crash data at Section 1.3.
- Engineering Report (June 2021) prepared by Lindsay Dunn for John Holland Rail.

Flood Information – Union Street

Please refer to Figure 1 below that approximately shows the height of each flood event in relation to the current bridge structure. We have assumed that a standard aluminium boat (tinnie) that was commonly used during the 2022 flood rescues to require between 1.6 to 1.8m of clear space as being the minimum vessel appropriate for flood rescues. When considering this it appears that the Union Street rail bridge is problematic for all flood events from 10% AEP (1 in 10yr) up to the 1% AEP (1 in 100yr) as clear space for the boats cannot be achieved under the structure. It must also be noted that whilst the aluminium boat has been chosen as the

typical vessel there are many variants and larger boats that are used to perform rescues which require a greater clearance. The removal of this bridge back to the embankments would provide approximately 60m of clear space for boats to get through during rescue operations to service a significant proportion of South Lismore.



Figure 1: Union Street Bridge with Flood Depths

Flood Information – Terania Street

Please refer to Figure 2 below which approximately shows the height of each flood event in relation to the current bridge structure. Similarly, to the assessment above when considering the smallest vessel used for flood rescues this bridge does not have adequate clearance in any flood event. The removal of this bridge back to the embankments would provide approximately 80m of clear space for boats to get through during rescue operations to service a significant portion of the population in North Lismore.



Figure 2: Terania Street Bridge with Flood Depths

Flood Information – Alexandra Parade

Please refer to Figure 3 below which approximately shows the height of each flood event in relation to the current bridge structure. This structure is again problematic when looking at clearance especially for the 10% and 5% flood events. It does appear however that during a 1% AEP flood event a vessel may be able to travel over the top of the structure as there could be approximately 1.0m of clear space (depending on type of vessel and actual height of bridge).



Figure 3: Alexandra Parade Bridge with Flood Depths

As detailed above all 3 bridges pose safety risks when trying to evacuate residents and businesses from North and South Lismore during a variety of flood events and thus it is requested that they be removed to ensure future flood evacuations can occur safely and effectively.

Preferred Outcome – Union Street

Lismore Council's preferred outcome for this site is that:

- The bridge is completely removed between the embankments (approximately 60m span)
- The section of Frank/Union Street shown below in Figure 4 to be removed and the natural ground level reinstated.
- Council would support the future Rail Trail being at ground level through this area which then utilises the existing or slightly modified embankments to get back to existing raised track levels.
- Establishment of an appropriate pedestrian/cyclist crossing on Union Street to service the Rail Trail. Council envisages that given the traffic volumes of Union Street this crossing may become quite busy in the future and additional traffic calming and signage may be required.

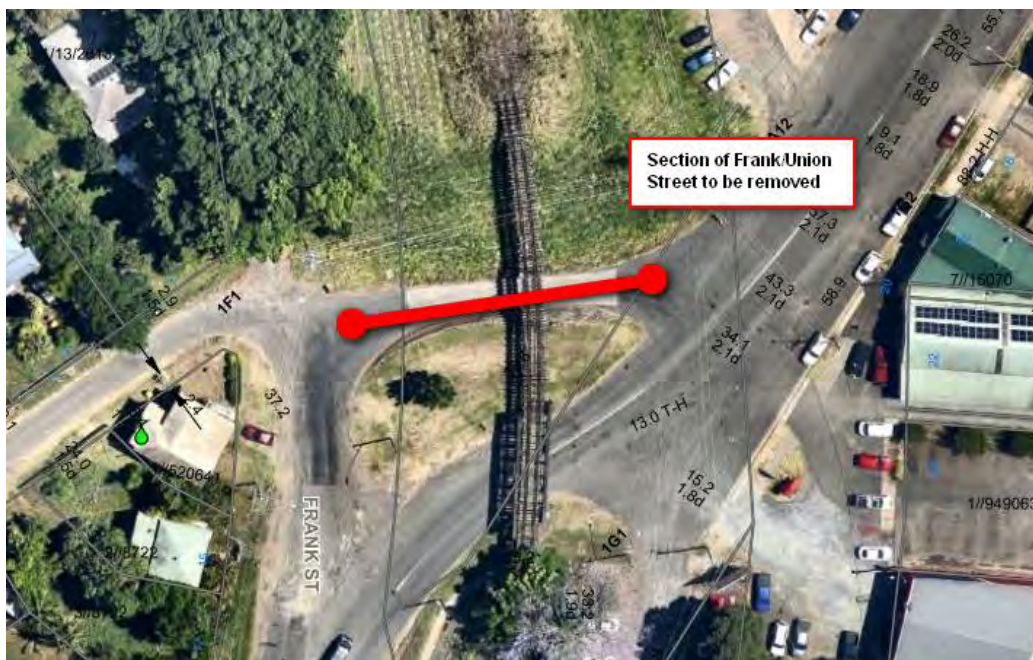


Figure 4: Section of Frank/Union Street to be removed

Preferred Outcome – Terania Street

Lismore Council's preferred outcome for this site is that:

- Bridge to be completely removed between the embankments (approximately 80m span)
- Establishment of an appropriate pedestrian/cyclist crossing on Terania Street to service the future Rail Trail.

Preferred Outcome – Alexandra Parade

The Alexandra Parade is a lower priority for Council in terms of its hinderance to residential properties during a flood event. In this regard if there was a desire from Heritage NSW to maintain a portion in the North/South Lismore rail bridge corridor in situ then Council would prefer that it be this bridge. Council would however request that if this bridge is left to preserve

heritage values that the Alexandra Parade realignment project be considered for funding instead. See sketch of the potential realignment at Figure 5.



Figure 5: Potential realignment of Alexandra Parade to preserve railway bridge.

Preserving Heritage Values

Council understand that these three bridges, along with the steel bridge across Leycester Creek, make up Item #1044 on the State Heritage Register. The Statement of Significance for this item states:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

It is Council's view that there are other examples of this type of timber bridge within the area, notably the bridge crossing Woodlawn Road opposite the entrance to the Lismore Turf Club and the bridge crossing the creek near St John's College, Woodlawn.

The heritage value of the steel bridge over Leycester Creek is in a class and category of its own and should be preserved as part of the future Rail Trail route.

For the three timber bridges that Council is seeking to have removed, there are other ways in which the heritage values can be preserved, in particular the adaptive reuse of bridge materials and signage. As an example, Council is currently in the early stages of planning a pedestrian and cycling bridge linking South Lismore Railway Station to the CBD. It is envisaged that salvaged timbers from the removed bridges could be used in the abutments or as decorative features.

Yours faithfully

Andy Parks

Andy Parks
Coordinator Strategic Planning

Letter addressed to TfNSW by LCC (Ref. No. 2)

14 March 2023

Vicki Oszko
Director Regional Property and Asset Renewal
Network & Assets
Regional and Outer Metropolitan
Transport for NSW

By Email: vicki.oszko@transport.nsw.gov.au
CC: lucio.favotto@uglregionallinx.com.au
CC: marktilley@focusbridges.com

Removal of railway bridges in Lismore

Dear Ms Oszko,

Lismore City Council's Floodplain Risk Management Committee (FRMC) is responsible for the development and implementation of a Floodplain Risk Management Plan.

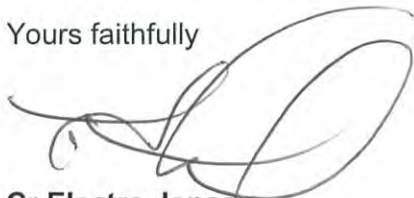
One of the issues that has been raised continuously since the devastating floods of February and March 2022 is that the disused railway bridges crossing Union Street and Terania Street were a serious impediment to rescue operations. Boats were unable to safely navigate across these structures, effectively isolating residents in parts of North and South Lismore from rescue efforts. The railway bridge across Alexandra Parade has also been identified as a hazard, but to a lesser extent.

Removal of these bridges is an important part of making Lismore safer in terms of an emergency management response in the event of future floods.

On behalf of the Council's FRMC we are seeking information on the process that would need to be undertaken in order to have these bridges removed. It is understood that the bridges are assets owned by Transport for NSW and are under a maintenance and management contract with UGL Regional Linx. It is also understood that all three bridges are listed on the State Heritage Register (Listing No. 01044).

Your assistance in understanding the processes that need to be undertaken would be greatly appreciated so that Council can take a pro-active approach on this matter.

Yours faithfully



Cr Electra Jensen
Chair Lismore City Council Floodplain Risk Management Committee

Road Safety Audit by Ardill Payne & Partners
(Ref. No. 3)



ROAD SAFETY AUDIT

EXISTING ROAD

Lismore Railway Viaducts at:

- Union Street, South Lismore
- Terania Street, North Lismore
- Winterton Parade, North Lismore
- Alexandra Parade, North Lismore

for:



November 2022

(Revision 1)



Document Control Sheet

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0	1/12/22	H. Collins	<i>HA Collins</i>	T Cromack	<i>T. Cromack</i>
1	6/12/22	H. Collins	<i>HA Collins</i>	T Cromack	<i>T. Cromack</i>
2					

Revision No:	Description
0	Original Issue
1	Alexandra Parade viaduct added
2	

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1. Project Information

1.1 Introduction

Lismore City Council (Council) has engaged Ardill Payne & Partners (APP) to undertake a Road Safety Audit (RSA) of four (4) railway viaducts in Lismore at:

- Site 1: Union Street, South Lismore
- Site 2: Terania Street, North Lismore
- Site 3: Winterton Parade, North Lismore
- Site 4: Alexandra Parade, North Lismore

The viaducts are on the disused Murwillumbah to Casino (via Lismore) railway line. Services on this line ceased in May 2004.

A locality plan is shown in **Figure 1**. An aerial photo (courtesy of SIX Maps) of each of the sites is shown in **Figures 2, 3, 4, and 5**.

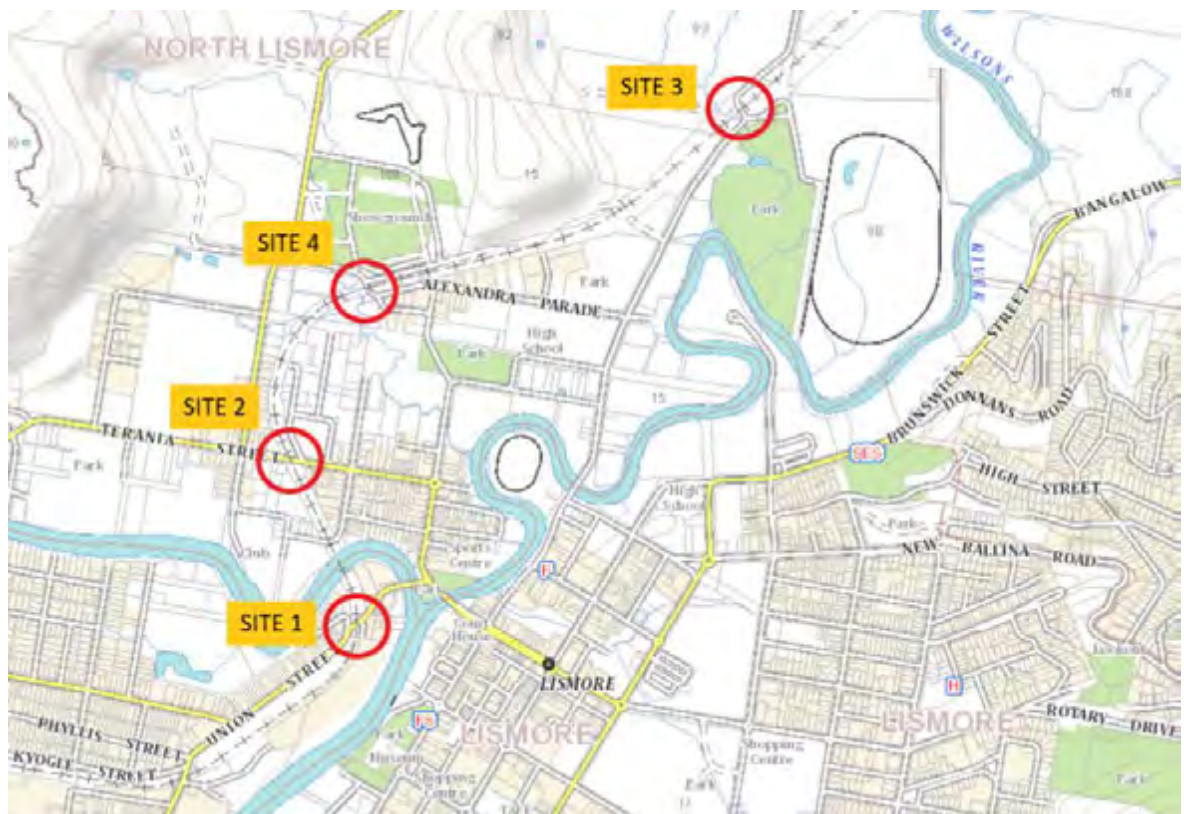


Figure 1: Locality Plan



Figure 2: Aerial Photo Site 1 – Union Street, South Lismore



Figure 3: Aerial Photo Site 2 – Terania Street, North Lismore



Figure 4: Aerial Photo Site 3 – Winterton Parade, North Lismore



Figure 5: Aerial Photo Site 4 – Alexandra Parade, North Lismore

1.2 Description of the Sites

1.2.1 Site 1: Union Street, South Lismore

Union Street is an important link road in South Lismore, connecting the Bruxner Highway to Kyogle Road and Nimbin Road. The area near the viaduct is a mix of light industrial and residential premises. There are intersections and driveways both sides of the viaduct.

The road approaches to the viaduct are a series of reverse curves. The sealed road width is approx. 7m. The minimum clearance between edge of road and pylon is approx. 1m. The vertical clearance is 3.4m.

Approx. 25m north of the Union Street viaduct is the Frank Street viaduct. The sealed road width beneath this viaduct is approx. 4m, with a minimum edge clearance to the pylon of approx. 0.5m. The vertical clearance is 4.5m.

Union Street is sealed, and centreline marked, and the posted speed limit is 50 km/h.

1.2.2 Site 2: Terania Street, North Lismore

Terania Street is the main road to Nimbin. The immediate area surrounding the viaduct is mainly residential.

The road approach to the viaduct is straight. The viaduct comprises 3 separate spans over the road. The centre span is over a two-way road with a sealed road width of approx. 4.5m, and minimum clearance to the pylons of approx. 0.5m. The vertical clearance is 3.8m.

The outer 2 spans are over one-way roads. The westbound span has a sealed road width of approx. 4m, with a minimum clearance to the pylons of approx. 0.5m. The vertical clearance is 4.0m. The eastbound span has a sealed road width of approx. 3.5m, with a minimum clearance to the pylons of approx. 0.5m. The vertical clearance is 4.0m.

Terania Street is sealed, and centreline marked, and the posted speed limit is 50 km/h.

1.2.3 Site 3: Winterton Parade, North Lismore

Winterton Parade is the main road to St Johns College, Woodlawn, and the Lismore Turf Club. The immediate area surrounding the viaduct is rural.

The road approach to the viaduct is two reverse 90° bends. The access road to the Lismore Turf Club intersects with the southern bend. The sealed road width is approx. 5.5-6.0m, with a minimum clearance to the pylons of approx. 0.3m. The vertical clearance is 4.5m.

Winterton Parade is sealed, and centreline marked, and the posted speed limit is 80 km/h.

1.2.4 Site 4: Alexandra Parade, North Lismore

Alexandra Parade is a link road between Dunoon Road and Winterton Parade. The Lismore Showground is on the northern side of the road, north of the viaduct. South of the viaduct are some residential properties and vacant land.

The road approach to the viaduct is two reverse (approx.) 90° bends. A showground access road intersects the bend north of the viaduct.

The viaduct comprises 2 separate spans over the road. The main (eastern) span is over a two-way road with a sealed road width of approx. 5.2m, and minimum clearance to the pylons of approx. 0.6m. The vertical clearance is 2.8m. The western span is over a one-way road with a sealed width of approx. 4.0m, and a minimum clearance to the pylons of approx. 1.0m. The vertical clearance is 3.5m.

Alexandra Parade is sealed, and centreline marked, and the posted speed limit is 50 km/h.

1.3 Traffic and Crash Data

Council has provided the following traffic volume data:

- Site 1: Union Street, South Lismore (outside #27, south of viaduct) – weekday ADT 5759 (2022), 10.3% HV. (Note: 85th percentile speed 52.9km/h; maximum speed 100km/h)
- Site 2: Terania Street, North Lismore (west of viaduct) – ADT 3468 (2013), 8.2% HV (Note: 85th percentile speed 58.7km/h; 95th percentile speed 64.1km/h)
- Site 3: Winterton Parade, North Lismore (outside #57, south of viaduct) – weekday ADT 1227 (2022), 9.1% HV. (Note: 85th percentile speed 63km/h; maximum speed 92km/h)
- Site 4: Alexandra Parade, North Lismore (west of viaduct) – ADT 1280 (2013), 3.7% HV. (Note: 85th percentile speed 58.3km/h).

Crash data has been obtained from the ‘Transport for NSW, Centre for Road Safety’ website. Between 2017 and 2021, there has been a total of 7 crashes recorded within the audit sections:

- Site 1: One occurred at the Union Street viaduct. Non-casualty crash in daylight. Vehicle collided with object in its path. No further details available. Historically there has been approx. 8-9 recorded crashes between 2000 and 2021.
- Site 2: Four crashes occurred at Terania Street viaduct. All were either non-casualty or minor injury crashes. In 3 of the crashes, a vehicle collided with some part of the viaduct. All occurred in daylight.
- Site 3: Two crashes occurred at the Winterton Parade/Lismore Turf Club intersection, approx. 30m south of the viaduct. Both crashes occurred at night and resulted in a serious injury. The crashes are possibly related to the road/intersection geometry. Historically there has been approx. 5-6 recorded crashes between 2000 and 2021.
- Site 4: No recorded crashes at the site.

Note: traffic and crash data was not reviewed until after the RSA findings were documented.

1.4 Audit Scope and Objective

This RSA of four (4) railway viaducts in Lismore has been undertaken in accordance with the prescribed methods in Austroads '*Guide to Road Safety, Part 6: Road Safety Audit*' (2022), with consideration of the NSW TfNSW '*Guidelines for Road Safety Audit Practices, Part 1: Road Safety Audit*' (2011).

The objective of the RSA is to identify any potential road safety risks/hazards associated with the existing arrangements from the perspective of all road users, during daylight and night conditions, that may need to be investigated and rectified. Risks/hazards identified will be described and given a risk rating. Positive aspects of the road environment have not been recorded.

The TfNSW Guide does not permit the inclusion of recommendations in a RSA. However, the Austroads Guide does permit the inclusion of recommendations, if requested by the client. We have included a supplement to the RSA documenting our 'Suggested Mitigation Measures' to improve road safety to enable Council to make informed decisions for future upgrade works. The suggested mitigation measures indicate the nature or direction of a solution rather than precise details. Responsibility for that will rest with Council.

1.5 Audit Team

The RSA has been carried out by Tony Cromack (APP) and Hayley Collins (Council). Tony Cromack is the lead auditor.

Lead Auditor – Tony Cromack

- Senior Civil Engineer and Principal at Ardill Payne & Partners, with over 35 years' experience in urban and rural road design
- Bachelor of Technology (Engineering) – University of Southern Queensland (1999)
- Technologist Member – Engineers Australia
- Member – Institute of Public Works Engineering Australasia (IPWEA)
- NSW SafeWork accreditation to Prepare Work Zone Traffic Management Plans (valid 2020)
- Road Safety Audit Course (IPWEA) (2014)
- Lead Road Safety Audit Course (IPWEA) (2017)
- Registered Level 3 Road Safety Auditor (NSW) – Auditor # RSA-02-0414

Auditor – Hayley Collins

- Design Officer at Lismore City Council, with 11 years' experience in urban and rural road design (Richmond Valley Council and Lismore City Council)
- Certificate IV in Surveying – Brisbane North Institute of TAFE (2011)
- Diploma Civil Construction Design – TAFE NSW Riverina Institute – Leeton Campus (2013)
- Prepare a Work Zone Traffic Management Plan

- Implement Traffic Control Plans – RMS
- Designing for Pedestrians and Bicycle Riders – RMS (2016)
- Conduct Road Safety Audits (RSACRS002A) – IPWEA (2017)
- Registered Level 2 Road Safety Auditor (NSW) – Auditor # RSA-02-1277

2. Road Safety Audit Program

2.1 Commencement Meeting

The commencement meeting was held via teleconference on 28 November 2022. Barry Goodwin represented the Council (the client) and Tony Cromack represented the audit team.

A summary of the meeting is as follows:

- Mr. Goodwin confirmed that Council is investigating the possibility of removing 4 viaducts in the LGA area including Union Street, Terania Street, Winterton Parade, and Alexandra Parade. The viaducts are on the Murwillumbah to Casino railway line, which ceased operations in 2004.
- There are no existing or previous Road Safety Audits for the sites.
- Council's main concerns are:
 - lane widths and horizontal clearances
 - vertical clearances
 - road alignment in approaches (Site 1, 3, and 4).
- Council has advised that there may be resistance from relevant authorities and the community to the removal of the structures (potentially heritage listed structures).
- Council has advised that all sites experience flooding issues in major flood events. Fog can be an issue at the Winterton Parade site.
- Further detail and specifics of any Council concerns were not raised or discussed to ensure the audit team could undertake an unbiased RSA.
- Mr. Cromack explained the audit process, reiterating that it is not a compliance or design check, and advised that recommendations are only provided if requested. Mr. Goodwin requested that recommendations for improvements identified by the team be provided. 'Suggested Mitigation Measures' will be included as a supplement to the final report.
- Mr. Goodwin was advised that it is the audit teams' task to identify and document safety issues, and the Council's task to respond and act on those issues
- Council will provide road traffic volume data, where available.

2.2 Field Audit

The field audit for Sites 1-3 was carried out by the audit team on the afternoon and evening of Monday 21 November 2022. The field audit for Site 4 was carried out on Monday 5 December 2022. The team drove through the sites in each direction and filmed the drive from the dashboard of the vehicle.

The daylight audits for Sites 1-3 took place between 5:00 and 6:00pm AEDT, and the evening audits between 7:45 and 8:15pm AEDT. The daylight audit for Site 4 took place between 10:00 and 10:30am AEDT, and the night audit between 5:15 and 5:30am AEDT.

The weather during the inspection of Sites 1, 2 and 4 was fine. The road was dry. A storm hit just prior to the inspection of Site 3. It was raining during this inspection, and the road was wet.

Photographs of any risks/hazards found were taken and notes were made. Site photographs are provided in **Attachment 1**.

Some key physical and observed features of the viaducts and approaches are:

Site 1:

- Inadequate advance warning signs for the viaduct
- No edge lines
- Minimal clearance from edge of road to pylons
- Vertical clearance less than 4.6m
- Frank Street viaduct – width, priorities unclear, no intersection controls
- Poor condition of some signs and lines
- Concealed driveways either side of the viaduct.

Site 2:

- Inadequate advance warning signs for the viaduct
- Narrow road width in two-way centre span
- Inadequate edge lines
- Minimal clearance from edge of road to pylons
- Vertical clearance less than 4.6m
- Lane priorities unclear (merge)
- Poor condition of some signs and lines.

Site 3:

- Inadequate advance warning signs for the viaduct and bends
- No edge lines
- Minimal clearance from edge of road to pylons
- Vertical clearance less than 4.6m
- Roadside hazards
- Damage to the pavement edges/shoulders.
- Poor condition of some signs and lines.

Site 4:

- Inadequate advance warning signs for the viaduct
- No edge lines
- Minimal clearance from edge of road to pylons
- Vertical clearance considerably less than 4.6m (main span only 2.8m)
- Side viaduct – width, priorities unclear, no intersection controls
- Lane priorities unclear (merge)
- Poor condition of road
- Missing width markers
- Poor condition of some signs and lines.

2.3 Completion Meeting

A completion meeting generally involves the auditor and the client and is an opportunity for clarification of aspects of the audit. A completion meeting has not been held at the time of preparing this report.

3. Risk Level Determination

Risks/hazards raised in relation to the audit have been given a risk level based on the associated safety priority, as categorised using Error! Reference source not found. to **Table 3**. The risk tables below are reproduced from Austroads 'Guide to Road Safety, Part 6: Road Safety Audit' (2022).

Table 1: Austroads RSA Risk Matrix

			Severity*				
			Insignificant	Minor	Moderate	Serious	Fatal
			Property damage	Minor first aid	Major first aid and/or presents to hospital (not admitted)	Admitted to hospital	Death within 30 days of the crash
Likelihood (includes exposure)	Almost Certain	One per quarter	Medium	High	High	Extreme (FSI)	Extreme (FSI)
	Likely	Quarter to 1 year	Medium	Medium	High	Extreme (FSI)	Extreme (FSI)
	Possible	1 to 3 Years	Low	Medium	High	High (FSI)	Extreme (FSI)
	Unlikely	3 to 7 Years	Negligible	Low	Medium	High (FSI)	Extreme (FSI)
	Rare	7 years+	Negligible	Negligible	Low	Medium (FSI)	High (FSI)

*see Severity Guidance Sheet

Safe System crash outcome threshold

Table 2: Austroads Severity Guidance Sheet

		Crash Speed (km/h)										
		< 10	10	20	30	40	50	60	70	80	90	100
Crash Type	Pedestrian (vs HV)	Minor Injury Moderate Injury Serious Injury Fatal										
	Cyclist (vs HV)											
	Motorcyclists (vs HV)											
	Pedestrian (vs car)											
	Cyclist (vs car)											
	Pole/Tree Impact (car)											
	Motorcyclists (vs car)											
	Side Impact (HV vs car)											
	Side Impact (car vs car)											
	Head On (HV vs car)											
	Head On (car vs car)											

Table 3: Treatment

Level of Risk	Treatment Approach
Negligible	No action required.
Low	Should be corrected or the risk reduced if the treatment cost is low.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
High	Should be corrected or the risk significantly reduced, even if the treatment cost is high.
Extreme	Must be corrected regardless of cost

4. Road Safety Audit Findings

The following audit findings were identified during the RSA inspection. Audit findings are a listing of identified safety risks/hazards: what is potentially dangerous about the road or what could lead to crashes occurring or injury resulting. Relevant photographs of the findings are provided in **Attachment 1**.

Table 4: Audit Findings

Number	Description	Risk Rating	
Site 1	Union Street, South Lismore		
1	No Advance Warning Sign for the Low Clearance (Northbound) There is no advance warning sign ('Low Bridge Ahead, High Vehicle Detour') northbound. There is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low	
2	Minimal Vertical Clearance The vertical clearance at the viaduct is less than 4.6m, which is the typical minimum for clearance over a roadway (5.4m for main and arterial roads). Without adequate advance warning, and suitable high vehicle detour routes in place, there is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low	
3	No Outer Lane Delineation There are no edge lines on Union Street beneath the viaduct. Edge lines help to delineate the path of travel through the viaduct. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 1</i>	Likelihood: Possible Severity: Serious Risk: High	
4	Edge Clearances There is minimal clearance from edge of the road carriageway to the pylons. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 2</i>	Likelihood: Possible Severity: Serious Risk: High	
5	Missing Width Marker There is no width marker on the pylon, southbound, left-hand side. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 3</i>	Likelihood: Rare Severity: Serious Risk: Medium	

6	Frank Street Viaduct The width of the roadway is only suitable for one way traffic – priorities are not defined. There is a risk of a head-on or rear-end collision in the viaduct. There is a further risk of stopped vehicles queuing onto Union Street. <i>Refer to Photo 4</i>	Likelihood: Rare Severity: Serious Risk: Medium
7	Frank Street Intersections There are no intersection controls ('Stop/Give Way' signs; hold lines; lane or edge lines) at either of the Frank Street/Union Street intersections. Vehicles entering or leaving Frank Street do not have a clearly defined travel path. There is a risk of a collision at the intersections. <i>Refer to Photo 5</i>	Likelihood: Rare Severity: Serious Risk: Medium
8	Condition of Signs and Lines Some signs are in poor condition (not reflective; damaged; vandalised). The line marking generally is badly worn in places. There are no raised retro-reflective pavement markers (RRPM's). Without adequate delineation, there is a risk that drivers could be confused by the road alignment, particularly at night, increasing the risk of a crash. <i>Refer to Photo 6</i>	Likelihood: Rare Severity: Moderate Risk: Low
9	Industrial Driveways Northern Side of Viaduct There is a large area of bitumen providing access to multiple industrial buildings on the northern side of the viaduct (river side of Union Street). Uncontrolled access/egress from this area was observed during the site inspection. Sight distance for vehicles exiting this area to travel north is compromised by the viaduct pylons. There is a risk that vehicles egressing from this area onto Union Street may collide with through traffic. <i>Refer to Photo 7</i>	Likelihood: Rare Severity: Serious Risk: Medium
Site 2	Terania Street, North Lismore	
10	No Advance Warning Signs for the Low Clearance (Westbound) There is no advance warning sign ('Low Clearance' or 'Low Bridge Ahead, High Vehicle Detour') westbound. There is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low

11	Minimal Vertical Clearance The vertical clearance at the viaduct is less than 4.6m, which is the typical minimum for clearance over a roadway (5.4m for main and arterial roads). Without adequate advance warning, and suitable high vehicle detour routes in place, there is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low
12	Narrow Road Width in Centre Span Recent works to support and protect the northern pylon of the centre span has substantially reduced the road width. The road is two-way and has a sealed width of only 4.5m. If two vehicles try to pass in the centre span, there is a risk of a head-on crash, or a crash into the pylons. <i>Refer to Photo 8</i>	Likelihood: Possible Severity: Serious Risk: High
13	Inadequate Outer Lane Delineation There are no outer edge lines on Terania Street beneath the viaduct. There are some edge lines around the centre pylons, but these are inadequate. Edge lines help to delineate the path of travel through the viaduct. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 9</i>	Likelihood: Possible Severity: Serious Risk: High
14	Edge Clearances There is minimal clearance from edge of the road carriageway to the pylons. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 10</i>	Likelihood: Possible Severity: Serious Risk: High
15	Ends of Safety Barrier Recent works have been undertaken to support and protect the northern pylon of the centre span. This has included the placement of a New Jersey style concrete barrier around the pylon. The leading ends are protected by large sand-filled bags (one of which is broken). Delineation and protection of the ends is inadequate. There is a risk that an approaching driver may not adequately perceive the barrier ends and collide with the barrier. <i>Refer to Photo 11, 12</i>	Likelihood: Possible Severity: Serious Risk: High

16	Lane Merge Priorities Unclear On approach to the viaduct (from either direction), a driver can opt to pass through either the centre or outer span. On departure, merge priorities are unclear. There are no lines or signs to guide drivers. There is a risk of a collision when vehicles merge. <i>Refer to Photo 13</i>	Likelihood: Rare Severity: Serious Risk: Medium
17	Condition of Signs and Lines Some signs are in poor condition (not reflective; damaged). The line marking generally is badly worn in places. There are no painted chevrons in the traffic islands. The traffic island edge lines are under the concrete barriers. There are no RRPM's. Without adequate delineation, there is a risk that drivers could be confused by the road alignment, particularly at night, increasing the risk of a crash. <i>Refer to Photo 14</i>	Likelihood: Rare Severity: Moderate Risk: Low
Site 3	Winterton Parade, North Lismore	
18	No Advance Warning Sign for the Low Clearance (Northbound) There is no advance warning sign ('Low Clearance') northbound. There is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low
19	Minimal Vertical Clearance The vertical clearance at the viaduct is less than 4.6m, which is the typical minimum for clearance over a roadway (5.4m for main and arterial roads). Without adequate advance warning, and suitable high vehicle detour routes in place, there is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low
20	No Outer Lane Delineation There are no edge lines on Winterton Parade beneath the viaduct. Edge lines help to delineate the path of travel through the viaduct. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 15</i>	Likelihood: Possible Severity: Serious Risk: High

21	Edge Clearances There is minimal clearance from edge of the road carriageway to the pylons. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 15</i>	Likelihood: Possible Severity: Serious Risk: High
22	No Advance Warning Signs or Advisory Speed for the 90° Bends in Approaches There are no advance warning signs or advisory speed signs for the bends (both approaches). Without adequate advance warning and advice, there is a risk that motorists will not correctly anticipate the road's alignment, particularly at night, resulting in a collision with an oncoming vehicle, a roadside hazard, or a viaduct pylon.	Likelihood: Possible Severity: Serious Risk: High
23	Inadequate Definition of Curve Alignments There are some alignment delineation devices on the southern bend, none on the northern bend. The devices on the southern bend are obscured by vegetation (northbound) and the viaduct pylons (southbound). These alignments could be considered hazardous without adequate delineation devices. Without adequate delineation, there is a risk that motorists may not correctly anticipate the road's alignment, particularly at night, resulting in a collision with an oncoming vehicle, a roadside hazard, or a viaduct pylon. <i>Refer to Photo 16, 17</i>	Likelihood: Possible Severity: Serious Risk: High
24	No Advance Warning of Intersection There are no advance warning signs ('Side Road Intersection on Curve') in either approach to the Lismore Turf Club intersection. This intersection could be considered busy on race days. There is a risk of rear-end collisions if a vehicle is slowing to turn at this intersection and other drivers are not anticipating vehicles stopping ahead.	Likelihood: Possible Severity: Serious Risk: High
25	Lismore Turf Club Intersection There is no line marking in the intersection, or 'Stop' or 'Give Way' signs. Sight distance to the north from the intersection (through the viaduct) is limited. There is a risk that vehicles exiting the Lismore Turf Club could collide with through traffic. <i>Refer to Photo 18</i>	Likelihood: Possible Severity: Serious Risk: High

26	Roadside Hazards There are numerous roadside hazards at Site 3 – steep embankments, drains, and trees (and the viaduct pylons). An impact with any of these roadside hazards may increase the severity of a run-off-road crash. There is a risk that an errant vehicle could leave the roadway, resulting in a collision with a roadside hazard. <i>Refer to Photo 19, 20</i>	Likelihood: Possible Severity: Serious Risk: High
27	Road Condition On the inside of the bend opposite the Lismore Turf Club intersection, the pavement and bitumen surface are uneven and badly damaged. There is a risk that vehicles will lose control on the damaged surface, resulting in a collision with a roadside hazard or another vehicle. There is a further risk to cyclists using the road. <i>Refer to Photo 21</i>	Likelihood: Possible Severity: Serious Risk: High
28	Roadside Drainage The road shoulders are ponding water on the roadway in the approaches to and beneath the viaduct. This can lead to increased damage to pavement edges. There is a risk that vehicles may hit the water or damaged edges and lose control, resulting in a collision with a roadside hazard or another vehicle. There is a further risk to cyclists using the road. <i>Refer to Photo 22</i>	Likelihood: Unlikely Severity: Serious Risk: High
29	Condition of Signs and Lines Some signs are in poor condition (not reflective; damaged, vandalised). The line marking generally is badly worn in places. There are no RRPM's. Without adequate delineation, there is a risk that drivers could be confused by the road alignment, particularly at night, increasing the risk of a crash. <i>Refer to Photo 23</i>	Likelihood: Rare Severity: Moderate Risk: Low
30	Night Visibility of Bends and Viaduct The bends and the viaduct are poorly delineated at night. The line marking, guideposts, and delineation are inadequate. There are no RRPM's. Without adequate delineation, particularly at night, there is the potential for a crash on the bends or at the viaduct. <i>Refer to Photo 24</i>	Likelihood: Rare Severity: Serious Risk: Medium

Site 4	Alexandra Parade, North Lismore	
31	Inadequate Advance Warning Signs for the Low Clearance It is considered that the existing advance warning signs for the viaduct ('Low Clearance') are inadequate. There is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low
32	Minimal Vertical Clearance The vertical clearance at the viaduct is considerably less than 4.6m, which is the typical minimum for clearance over a roadway (5.4m for main and arterial roads). Without adequate advance warning, and suitable high vehicle detour routes in place, there is a risk that a high vehicle could collide with the viaduct.	Likelihood: Rare Severity: Moderate Risk: Low
33	No Outer Lane Delineation There are no edge lines on Alexandra Parade or the bypass road beneath the viaduct. Edge lines help to delineate the path of travel through the viaduct. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 25</i>	Likelihood: Possible Severity: Serious Risk: High
34	Edge Clearances There is minimal clearance from edge of the road carriageway to the pylons, particularly in the main carriageway. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 25</i>	Likelihood: Possible Severity: Serious Risk: High
35	Missing Signs There are no width markers on the western pylons (outer pylon on 3.5m clearance lane), either direction. A 'Low Clearance' sign is missing on the central pylon, eastbound. There is a risk that a vehicle could collide with a viaduct pylon. <i>Refer to Photo 26</i>	Likelihood: Rare Severity: Serious Risk: Medium
36	Bypass Viaduct Width The roadway width of the bypass viaduct is only suitable for one way traffic – priorities are not defined. There is a risk of a head-on or rear-end collision in the bypass viaduct. <i>Refer to Photo 27</i>	Likelihood: Rare Severity: Serious Risk: Medium

37	Access/Egress Bypass Viaduct To access the bypass viaduct (eastbound), a driver must cross double barrier lines on a bend, with sight distance obstructed by the viaduct and embankments. On departure from the bypass viaduct (westbound), merge priorities are unclear. There are no lines or signs to guide drivers. There is a risk of a collision when vehicles use the bypass viaduct. <i>Refer to Photo 28</i>	Likelihood: Rare Severity: Serious Risk: Medium
38	Narrow Road Width in Centre Span The two-way road under the main span has a sealed width of only 5.2m. This is less than Councils minimum standards. If two vehicles try to pass, there is a risk that these vehicles may collide with each other or into a pylon.	Likelihood: Possible Severity: Serious Risk: High
39	Advance Warning of Intersection There is no advance warning sign ('Side Road Intersection on Curve') in the westbound approach to the Showground access road. This intersection could be considered busy on days or nights when the showground is in use. The intersection is obscured by the viaduct. There is a risk of rear-end collisions if a vehicle is slowing to turn at this intersection and other drivers are not anticipating vehicles stopping ahead.	Likelihood: Rare Severity: Serious Risk: Medium
40	Showground Access Road Intersection There is no line marking in the intersection, or 'Stop' or 'Give Way' signs. Sight distance to the south from the intersection (through the viaduct) is limited. (It is noted that this is probably a private road). There is a risk that vehicles exiting the Showground access road could collide with through traffic. <i>Refer to Photo 29</i>	Likelihood: Rare Severity: Serious Risk: Medium
41	Road Condition There are some potholes in the eastbound lane. There is a risk of a crash if vehicles try to avoid the potholes. There is a further risk to cyclists using the road. <i>Refer to Photo 30</i>	Likelihood: Possible Severity: Serious Risk: High

42	Roadside Drainage Eastbound lane, inside of curve, on south side of viaduct – roadside drainage is inadequate. Water flows on the road edge. This can lead to increased damage to pavement edges. There is a risk that vehicles may hit the water or damaged edges and lose control, resulting in a collision with a roadside hazard or another vehicle. There is a further risk to cyclists using the road. <i>Refer to Photo 31</i>	Likelihood: Rare Severity: Moderate Risk: Low
43	Condition of Signs and Lines Some signs are in poor condition (not reflective; damaged). The line marking generally is badly worn in places. There are no RRPM's. Without adequate delineation, there is a risk that drivers could be confused by the road alignment, particularly at night, increasing the risk of a crash. <i>Refer to Photo 32</i>	Likelihood: Rare Severity: Moderate Risk: Low
44	Night Visibility of Bends and Viaduct The bends and the viaduct are poorly delineated at night, in particular eastbound. The line marking, guideposts, and delineation are inadequate. There are no RRPM's. Without adequate delineation, particularly at night, there is the potential for a crash on the bends or at the viaduct. <i>Refer to Photo 33</i>	Likelihood: Rare Severity: Serious Risk: Medium

5. Concluding Statement

We, the audit team, declare that we are independent of the project and have appropriate experience and training.

The audit has been carried out for the sole purpose of identifying any features of the railway viaducts and road approaches which could compromise road safety at the site. The identified issues have been noted in this report in **Table 4**. The accompanying 'Suggested Mitigation Measures' (**Attachment 2**) are put forward for consideration by Council for implementation. The suggested mitigation measures indicate the nature or direction of a solution rather than precise details. Responsibility for that will rest with Council. APP does not take any responsibility for any suggested design changes made in this report.

It should be noted that while every effort has been made to identify potential safety risks/hazards, there is no guarantee that every risk/hazard has been identified.

No 'extreme' risks were identified during the audit. As per **Table 3**:

- risks with a 'high' ranking '*should be corrected or the risk significantly reduced, even if the treatment cost is high*'
- risks with a 'medium' ranking '*should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.*'

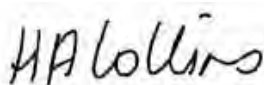
It is recommended that audit findings be investigated with satisfactory corrective actions identified and implemented.



6/12/2022

Tony Cromack

AUDIT TEAM LEADER # RSA-02-0414



6/12/2022

Hayley Collins

AUDIT TEAM MEMBER # RSA-02-1277

6. Attachments

Attachment 1	Site Photographs
Attachment 2	Suggested Mitigation Measures

ATTACHMENT 1



Photo 1: No edge lines - Union Street viaduct



Photo 2: Minimal edge clearance - Union Street viaduct



Photo 3: Missing width marker on pylon - Union Street viaduct



Photo 4: Road width - Frank Street viaduct



Photo 5: Lack of intersection controls - Frank St/Union St intersection



Photo 6: Damaged signs - Union Street viaduct



Photo 7: Industrial driveways north of Union Street viaduct



Photo 8: Narrow road width centre span - Terania Street viaduct



Photo 9: No edge lines - Terania Street viaduct



Photo 10: Minimal edge clearance - Terania Street viaduct



Photo 11: End of safety barrier (eastbound) - Terania Street viaduct



Photo 12: End of safety barrier (westbound) - Terania Street viaduct



Photo 13: Lane merge priorities unclear (westbound) - Terania Street viaduct



Photo 14: Poor condition and placement of lines - Terania Street viaduct



Photo 15: No edge lines and minimal edge clearance - Winterton Parade viaduct



Photo 16: Inadequate definition of curve alignment – northbound approach to Winterton Parade viaduct



Photo 17: Inadequate definition of curve alignment – southbound approach to Winterton Parade viaduct



Photo 18: No signs and lines – Lismore Turf Club intersection



Photo 19: Roadside hazards – drain and trees on outside of bend (northbound) – Winterton Parade



Photo 20: Roadside hazards – embankment on inside of bend (northbound) – Winterton Parade



Photo 21: Damaged road pavement - inside of bend (northbound) – Winterton Parade



Photo 22: Roadside drainage at Winterton Parade viaduct



Photo 23: Vandalised signs – Winterton Parade viaduct

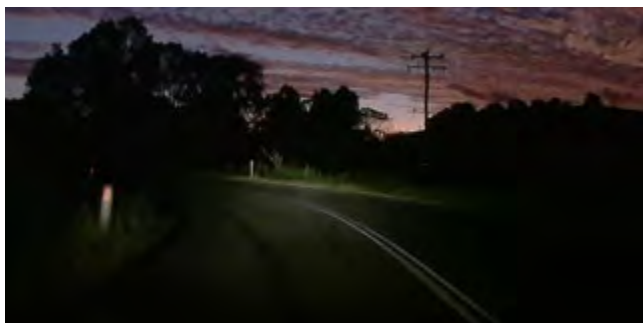


Photo 24: Night visibility - southbound approach to Winterton Parade viaduct



Photo 25: No edge lines and minimal edge clearance – Alexandra Parade viaduct



Photo 26: Missing width marker and Low Clearance sign – Winterton Parade viaduct eastbound



Photo 27: Missing width marker – Winterton Parade viaduct eastbound



Photo 28: Road width – Alexandra Parade bypass viaduct



Photo 29: Eastbound approach to bypass viaduct – Alexandra Parade. Driver must cross BB lines



Photo 30: Sight distance from Showground access road through Alexandra Parade viaduct (courtesy Google Street View)



Potholes – heading north on rhs

Photo 31: Road condition – Alexandra Parade eastbound



Photo 32: Lack of roadside drainage – Alexandra Parade eastbound, south of viaduct



Photo 33: Night visibility - eastbound approach to Alexandra Parade viaduct

ATTACHMENT 2

Suggested Mitigation Measures

Following is a list of suggested mitigation measures which may be of some use to Council. It should be noted that while every effort has been made to identify potential safety risks/hazards, there is no guarantee that every hazard has been identified, therefore the list of suggested mitigation measures may not be exhaustive.

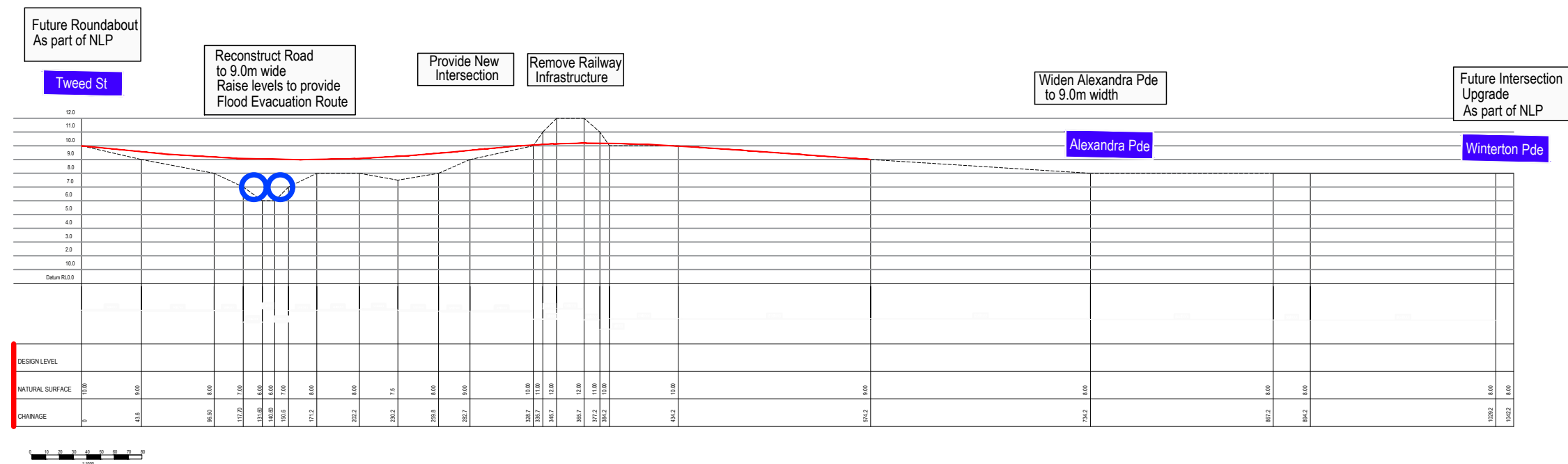
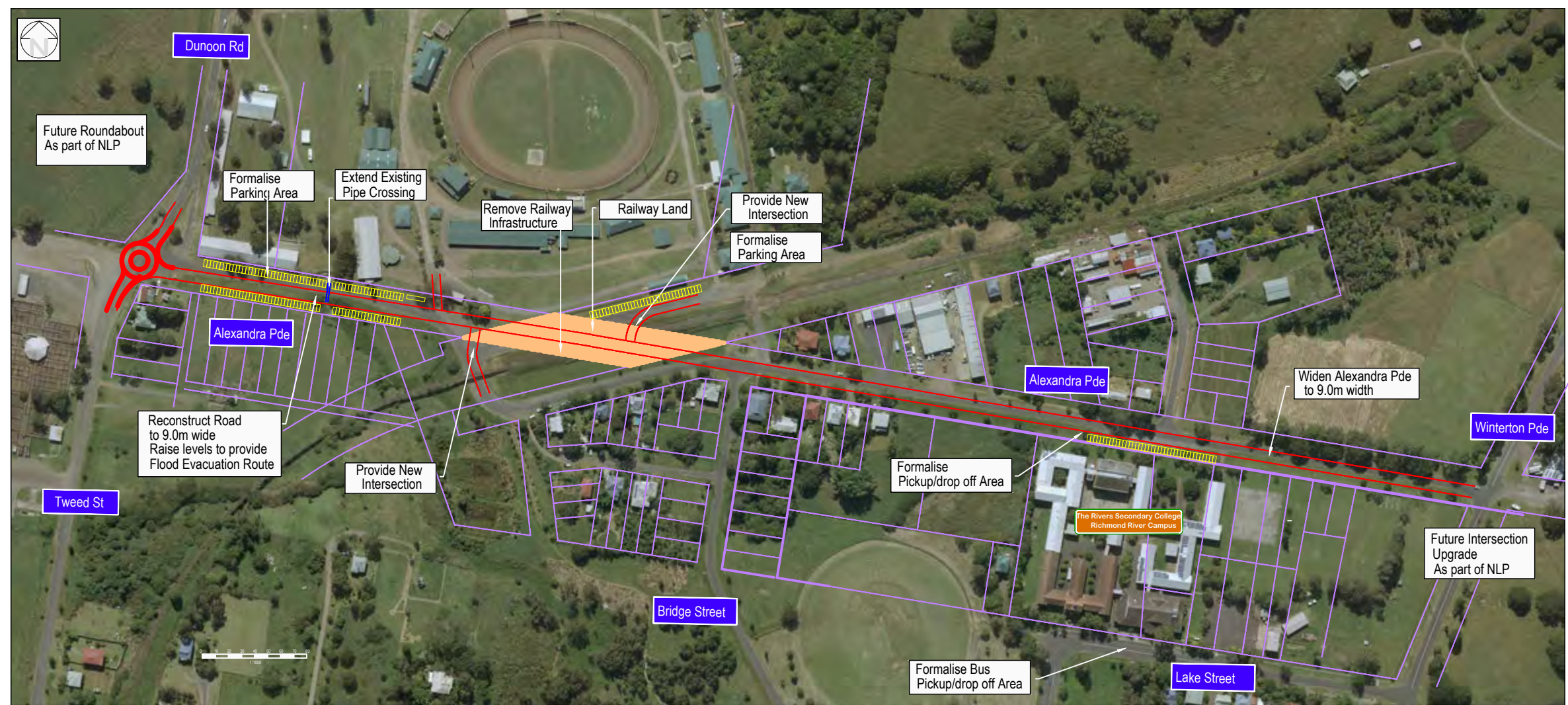
The measures indicate the nature or direction of a solution rather than precise details. Responsibility for that will rest with Council.

The measures do not take into consideration future project budgets, community objectives, project constraints, political agendas, or possible competing interests from other project needs (e.g., landscaping, utilities, etc.).

- Ensure that suitable high vehicles detours/bypasses are available (where necessary) and adequately signposted.
- Provide adequate advance warning signs for low clearances in the approaches to all viaducts.
- Improve centre line marking at all sites. Provide edge lines if possible and if width allows.
- If compliant lane widths and clearances are not (and cannot be) provided at viaducts, consider providing 'Road Narrows' signs (or similar) in the approaches.
- Replace all damaged, vandalised, or non-reflective signs.
- At the Union Street viaduct:
 - Replace missing width marker (southbound, left-hand side).
 - Establish priority direction for one-way viaduct on Frank Street. Priority should be given to southbound traffic to reduce risk of southbound vehicles having to queue onto Union Street. Install appropriate line marking and signs to indicate priority.
 - Provide line marking in the Frank Street intersections. This may include edge and centre lines. Check warrants and provide either a 'Stop' or 'Give Way' sign, and the relevant hold line.
- At the Terania Street viaduct:
 - the width of the centre span is too narrow for a two-way road. Consider closing the centre span completely and directing all traffic to the outer spans. Provide suitable line marking and signs to direct traffic
 - check lane widths and clearances of outer spans. Provide edge lines if possible and if width allows
 - if the centre span is not closed, provide suitable line marking and signage on departure side of viaduct (in each direction) to establish lane merge priorities
 - if the centre span is not closed, provide compliant line marking around centre pylons/safety barriers.

- Provide compliant end treatments or crash attenuators on the safety barriers around the pylons. This should include provision of all necessary signs, line marking, and reflectors (as required)
- At the Winterton Parade viaduct:
 - Provide advance warning signs and advisory speeds for the 90° bends in the approaches to the viaduct.
 - Assess warrants for the provision of curve delineation devices on the 90° bends in Winterton Parade, such as CAMs and guideposts. Provide additional devices as warranted. RRPM's may also be warranted to delineate bends and intersections at night.
 - Provide advance warning signs (both directions) for the Lismore Turf Club intersection.
 - Provide line marking in the Lismore Turf Club intersection. This may include edge and centre lines. This may also include RRPM's.
 - At the Lismore Turf Club intersection, provide either a 'Stop' or 'Give Way' sign (depending on warrants), and the relevant hold line.
 - Roadside hazards (trees, embankments, drains) have been identified at the Winterton Parade viaduct. Assess if the hazard can be removed. If not, assess warrants for safety barriers and consider installation as required.
 - The damaged section of Winterton Parade opposite the Lismore Turf Club intersection is a hazard to drivers and cyclists, as noted in the Findings. Determine the reasons for damage and rectify. Recommend undertaking pavement reconstruction for this area. Any upgrade should consider including wider shoulders.
 - Measures to improve roadside drainage should be investigated, to ensure surface water flows away from the road surface.
- At the Alexandra Parade viaduct:
 - Replace missing width markers and Low Clearance sign.
 - Establish priority direction for one-way bypass viaduct. Priority should be given to westbound traffic. Install appropriate line marking and signs to indicate priority. Check that legal access is available for eastbound traffic – consider removing a section of the BB line if appropriate.
 - Provide line marking in the Showground access road intersection. This may include edge and centre lines. Check warrants and provide either a 'Stop' or 'Give Way' sign, and the relevant hold line.
 - Provide advance warning sign (westbound) for the Showground access road intersection.
 - The damaged section of Alexandra Parade is a hazard to drivers and cyclists, as noted in the Findings. Determine the reasons for damage and rectify. Recommend undertaking pavement reconstruction for this area. Any upgrade should consider including wider shoulders.
 - Measures to improve roadside drainage should be investigated, to ensure surface water flows away from the road surface.

Alexandra Parade alternate route plans by LCC
(Ref. No. 8)





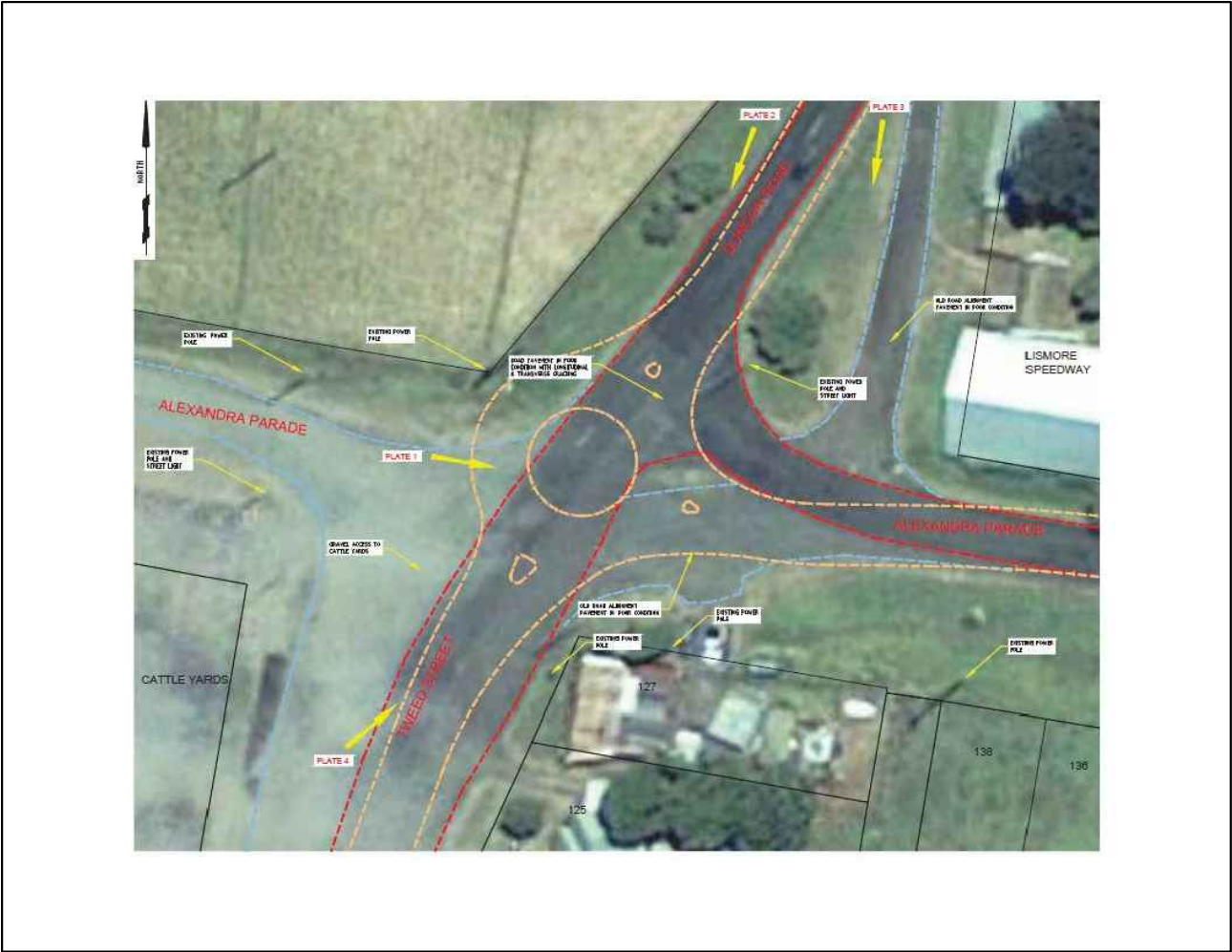
Future Roundabout
As part of NLP



Alexandra Pde

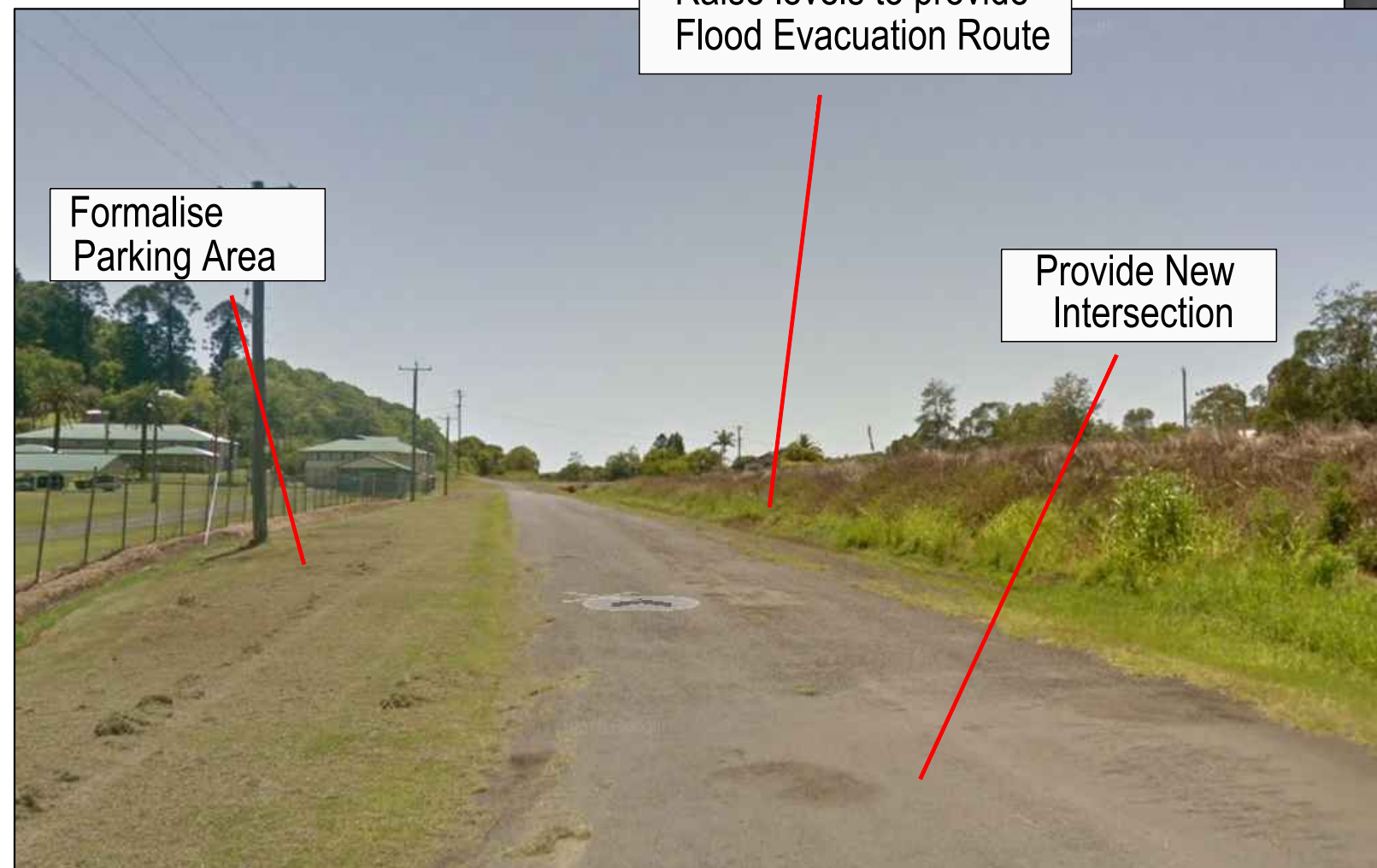
Tweed St

VIEW TO NORTH FROM TWEED STREET



PROPOSED ROUNDABOUT TWEED STREET AND ALEXANDRA PARADE

	LISMORE CITY COUNCIL		SHEET 3 of 7
	Proposed Road Realignment		AUTOCAD 2021-077.DWG
	Alexandra Parade		DRAWN B.V.G.
	North Lismore		PLAN No.
	Site Photos and Details		2021-077



Formalise
Parking Area

Reconstruct Road
to 9.0m wide
Raise levels to provide
Flood Evacuation Route

Provide New
Intersection

VIEW TO SOUTH FROM ALEXANDRA PARADE (WEST)



Retain Service
Road

Provide New
Intersection

Alexandra Pde

VIEW TO SOUTH FROM ALEXANDRA PARADE (WEST)



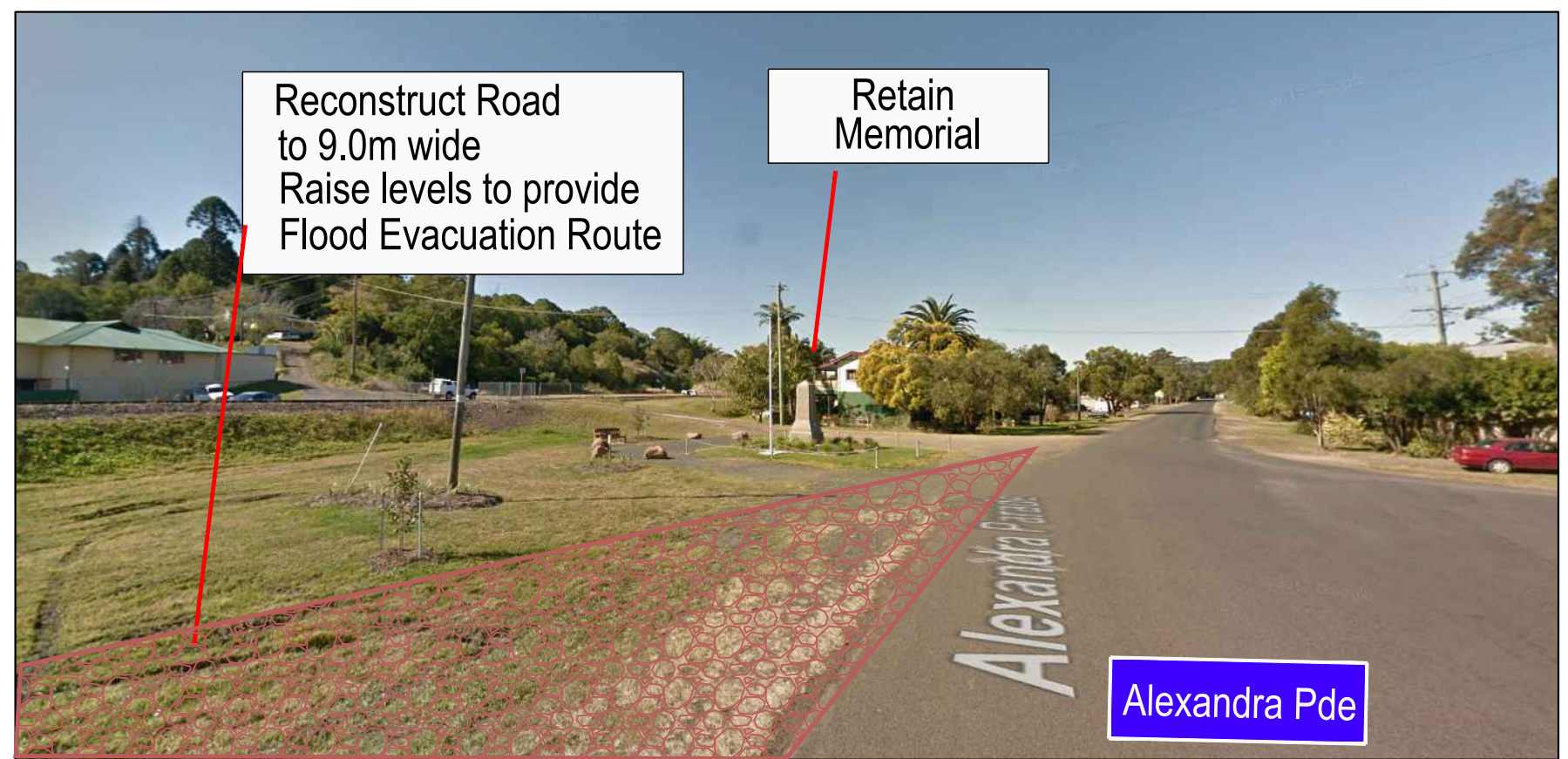
LISMORE CITY COUNCIL
Proposed Road Realignment
Alexandra Parade
North Lismore
Site Photos and Details

SHEET 4 of 7

AUTOCAD 2021-077.DWG

DRAWN B.V.G.

PLAN No.
2021-077



VIEW TO WEST FROM ALEXANDRA PARADE (EAST)



VIEW TO WEST FROM ALEXANDRA PARADE (EAST)



LISMORE CITY COUNCIL	SHEET 5 of 7
Proposed Road Realignment Alexandra Parade North Lismore Site Photos and Details	AUTOCAD 2021-077.DWG
	DRAWN B.V.G.
	PLAN No. 2021-077



VIEW TO EAST FROM ALEXANDRA PARADE (EAST)



VIEW TO WEST FROM ALEXANDRA PARADE (EAST)

	LISMORE CITY COUNCIL		SHEET 6 of 7
	Proposed Road Realignment		AUTOCAD 2021-077.DWG
	Alexandra Parade		DRAWN B.V.G.
	North Lismore		PLAN No.
	Site Photos and Details		2021-077



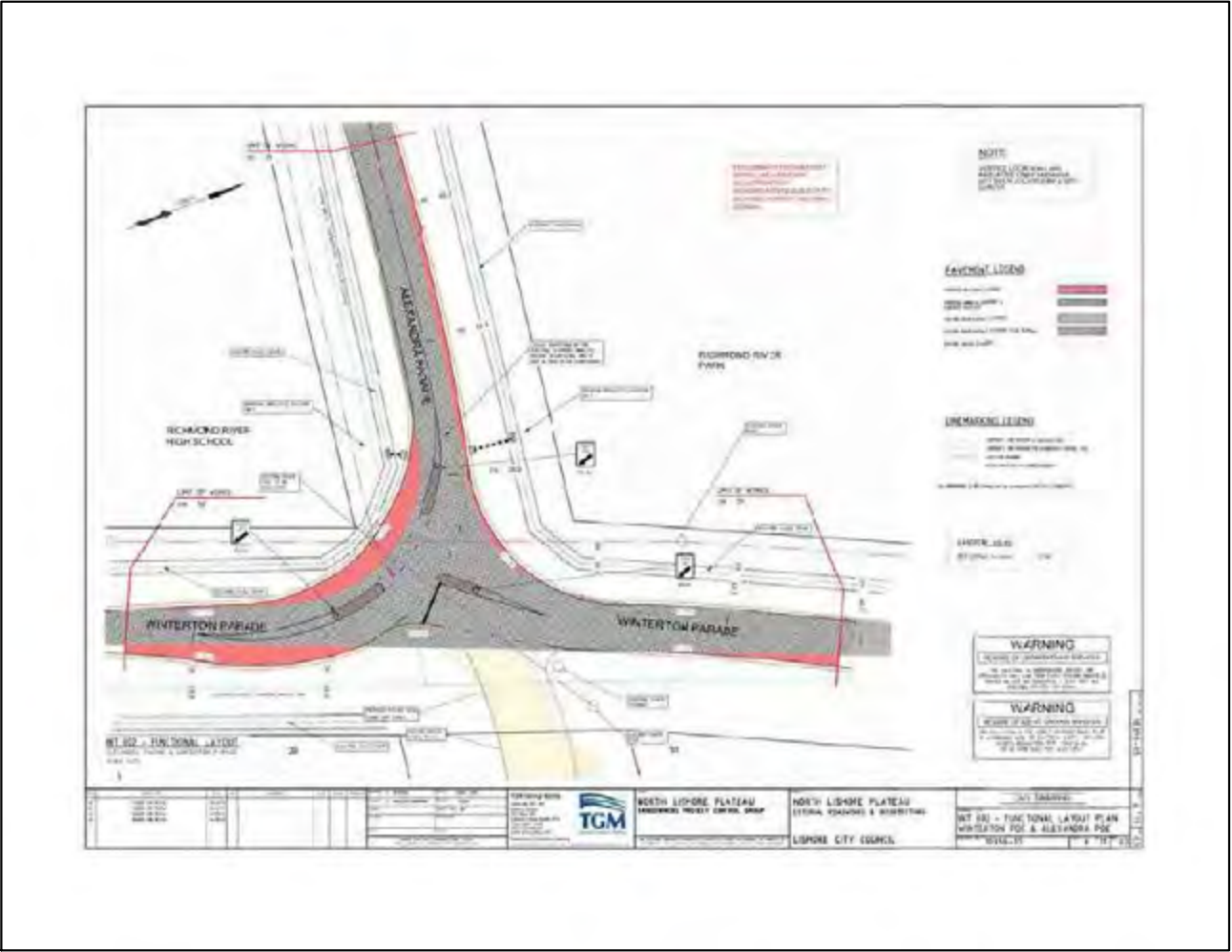
Future Intersection Upgrade
As part of NLP

Alexandra Pde

VIEW TO EAST FROM ALEXANDRA PARADE (EAST)

Future Intersection Upgrade
As part of NLP

PROPOSED INTERSECTION UPGRADE ALEXANDRA PARADE AND WINTERTON PARADE



LISMORE CITY COUNCIL

Proposed Road Realignment
Alexandra Parade
North Lismore
Site Photos and Details

SHEET 7 of 7

AUTOCAD 2021-077.DWG

DRAWN B.V.G.

PLAN No.
2021-077

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Job number: 220339

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Appendix C – Statement of Heritage Impact (SOHI)

Statement of Heritage Impact

SHR 1044 Lismore Railway Underbridges

March 2024

transport.nsw.gov.au

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Executive Summary

This SOHI has been prepared to accompany an application under s60 of the Heritage Act 1977 to demolish the State Heritage Register listed (SHR) Terania Street underbridge, part of the non-operational Lismore Railway underbridges, with consideration under s63 of the Act. (Attachments 1a and 1b).

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

s63 (2) and (3) of the Heritage Act 1977 include considerations for an application to enable demolition of the whole of a building or work if:

*It is of the opinion that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.** {s63(3)(a)}*

SOHI assessment of danger to the public under s63(3)(a)

The SOHI concludes that underbridges at Terania Street constitute a **danger to the public and users for the following reasons:**

- i. **The Terania Street underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**
- ii. **The Terania Street underbridge has low height clearances and narrow lane widths that are life-endangering with escalating safety risks to the public and users of the road.**
- iii. **The Terania Street underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

Terania Street underbridge condition in 2024

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the non-operational Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**¹ This report **recommends demolition as the preferred option**².

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**³, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

¹ *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

² FBE Options Assessment, 2023, page 15

³ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002* (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes**.⁴

SHR statement of significance

The SHR listing has the following statement of significance for the Lismore Railway underbridges:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The 'end of life' condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

Options assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

⁴ SMEC Structural reports following vehicle strike #1 19 January 2024 and #2 7 February 2024

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁵ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

Proposed heritage impact

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

Proposed mitigation measures

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life-endangering public safety risks.

Mitigation measures are set out in section 5 to support this application.

⁵ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

Statement of Heritage Impact (SOHI)

Lismore Railway Underbridges

Relevant listings: State Heritage Register #01044; Lismore City Council LEP 2012 (A7, A8, A13 and A10); UGLRL s170 Register 2022 (Lismore, Leycester Creek Underbridge AKA Coleman's Bridge and Lismore, Leycester Creek Underbridge Approaches).

Address: Terania Street, Alexandra Parade, Union Street, Leycester Creek.

Statement of heritage impact for:

Removal of underbridge spans at Terania Street, Lismore.

Prepared by:

This SOHI has been prepared by TfNSW Miriam Stacy, Heritage Specialist and Felicity Barry, Senior Environmental Officer, (Heritage) who have worked with the TfNSW bridge project management team during the development of this document.

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Prepared for:

Vicki Oszko, Director Regional Property & Asset Renewal, Network & Assets, Regional and Outer Metropolitan, Transport for NSW

Date: 8 March 2024

Issue: Version 1.0

1.0 The heritage item

1.1 Site Description

The following site description is taken from the State Heritage Register listing⁶ for the Lismore railway underbridges. Figure 1.1 includes a location plan with the location and names of the underbridges within Lismore City.

1.1.1 Description

STRUCTURES underbridges - steel, 3 span truss between Lismore and North Lismore 836.8km, 1894
viaducts - 3 sets of timber viaducts over flood plain, 837.1 to 837.7km, 1x12, 1x16, 1x17 spans, 1894.

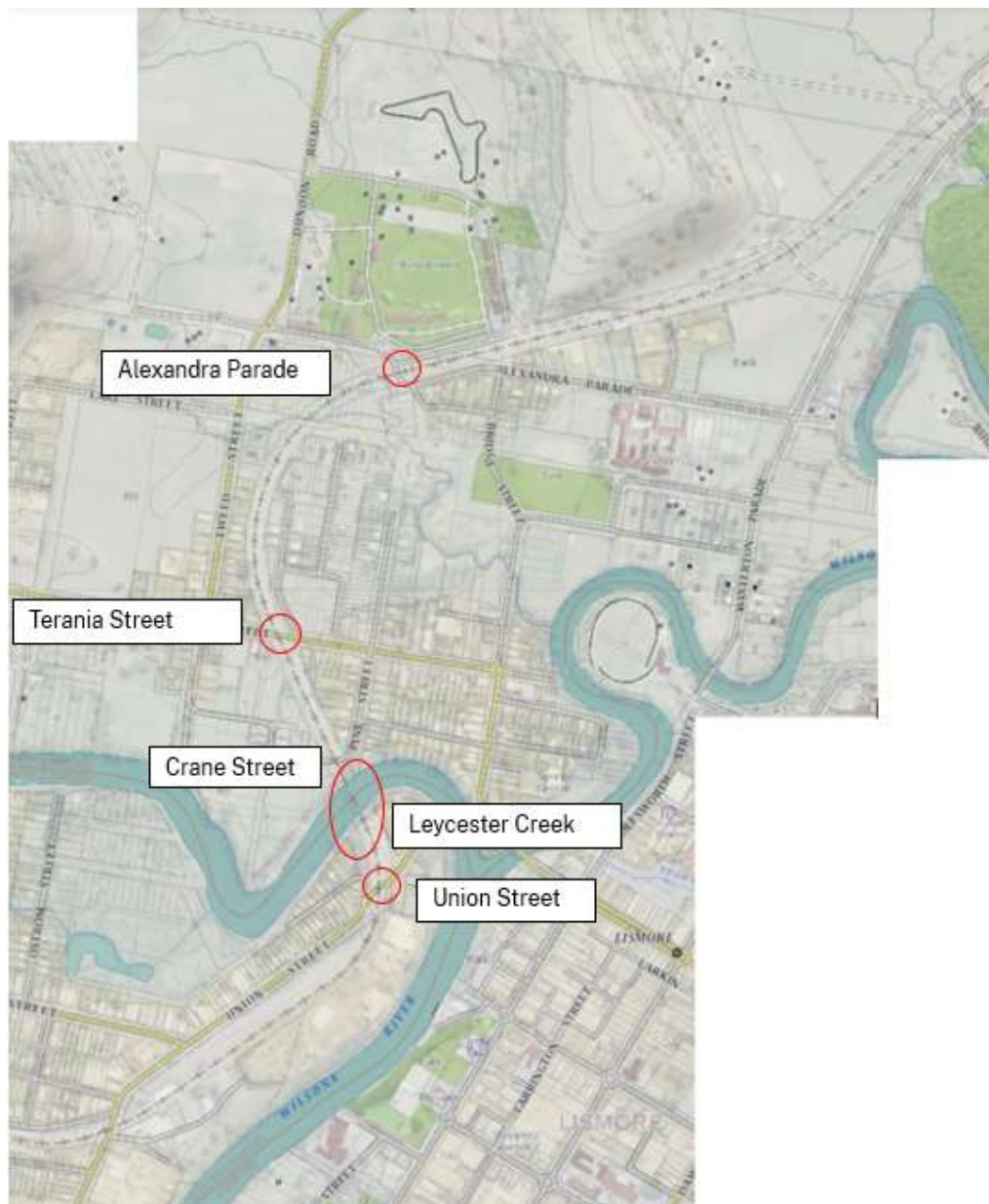


Figure 1.1 Location Plan (Topographic map) of Lismore and North Lismore showing the locations of the Lismore railway underbridges. Source: NSW Sixmaps, accessed February 2024.

⁶ [HMS - ViewItem \(nsw.gov.au\)](https://www.nsw.gov.au/heritage/pubs/hsr/hsr-viewitem) accessed February 2024

1.1.2 Heritage Item

The Lismore railway underbridges State Heritage Register listing includes four bridges (Alexandra Parade, Terania Street, Leycester Creek including Crane Street, and Union Street) that were built as part of the Casino to Murwillumbah rail Line. The listing includes three timber girder bridges, a steel pratt truss crossing Leycester Creek. The listing includes but does not discuss two plate web girder bridges in its curtilage. These plate web girder bridges are connected to the timber viaduct at Union Street and at Crane Street connected to the Leycester Creek steel Underbridge.

1.1.3 Use

The Lismore railway underbridges have not been in use since the cessation of the Casino to Murwillumbah Line operations in 2004.

1.1.4 Condition

In 2020, Bill Phippen, heritage structural engineer and timber truss and girder bridge specialist (retired) notes in the Preface to his book:

... while none of the {timber} railway bridges are in service and the few survivors of an already small number are in such a poor state of repair that public safety may require their demolition, if nature does not intervene first by rot or flood.⁷

Terania Street underbridge condition in 2024

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**⁸ This report **recommends demolition as the preferred option**⁹.

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**¹⁰, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes.**¹¹

Following further vehicle strike in February 2024, further mitigation works are being considered (March 2024) to reduce traffic speed to 20km/hour by the introduction of chicanes and rumble tracks as traffic calming devices, to reduce, but not eliminate the risk of further vehicle strike resulting in potential bridge collapse.

⁷ *The Timber Truss Railway Bridges of New South Wales*, self-published by Bill Phippen, 2020, preface, page 7.

⁸ *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

⁹ FBE Strategic Options report, 2023, page 15

¹⁰ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002* (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

¹¹ *SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024 and SMEC #2 – 7 February 2024*

FBE have assessed the condition of elements of the Terania Street underbridge as percentages of the overall structure, as set out in the table below. **FBE conclude that 50% of the structure is in a predominantly poor condition, in large part owing to rotting, split, termite infestation and damaged timber members. These members are typically transoms, trestle piles, trestle branches, corbels and girders. Connections and bracing elements are typically loose and for the transoms non-functional.**¹²

Table B-7 Terania Street Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As-built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	15	28	57	Girder	Med. - High	Flexure – Midspan
					Girder	Medium	Shear – Support
					Transom Ties	High High	Flexure Section Loss
Substructure	0	12	37	51	Corbel	Med – High	Flexure – Ends
					Corbel	Medium	Shear – At Support
					Trestle	Med. - High	Splitting/ Crushing
Foundations	0	39	40	20	Pile	Low	Crushing
Overall Condition	0	17	33	50			

The superstructure is in a predominantly poor condition and has a high risk of transoms falling off along with bolted connections. The main girders are also a medium to high risk of failure primarily owing to rotting and termite infestation. The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The piles are typically split or splitting with many having rotten or are infested with termites. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. The foundations are typically seen and estimated to be in a good to fair condition.

Figure 1.2 Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15

¹² Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15



Figure B-13 Terania Street – Evidence of global rotation of Pier 6 together with failed pile (Source: FBE)



Figure B-15 Terania Street – Splitting & weathering of piles at Pier 11 (Source: FBE)



Figure B-14 Terania Street – Rotten and damaged east corbel at Pier 6 (Source: FBE)



Figure B-16 Terania Street – Loose connections & weathered beams (Source: FBE)



Figure B-17 Terania Street – View over looking south (Source: FBE)

Figure 1.3 Photographs showing typical condition of the Terania Street underbridge (July 2023. Source FBE, Lismore railway underbridges Strategic Options.

Two further recorded vehicle strikes occurred in early 2024 to the Terania Street underbridge. The following additional structural assessments were provided by SMEC, consultant engineers to TfNSW.

SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024

It should be noted that the SMEC report prepared for TfNSW, is focused on affected spans and *managing public safety risks* arising from potential bridge failure on road traffic passing under the Terania St underbridge, while FBE have focused on the structural soundness of the whole underbridge.

Impact loading was not checked but it is highly unlikely that the bridge can resist the impact load case specified in ASS100.2. SMEC note that this is not a change and it is also unlikely that the bridge could resist this loading before it was damaged.

Recommendations

Given the poor condition of the bridge and the damage sustained from repeated truck impacts, SMEC recommends that the spans over the road be demolished as a matter of urgency.

SMEC report on structural soundness following impact of vehicle strike #2 – 7 February 2024

Once again, it should be noted that the SMEC report been prepared for TfNSW is focused on affected spans and *managing public safety risks* arising from potential bridge failure on road traffic passing under the Terania St underbridge, while FBE have focused on the structural soundness of the whole underbridge.

Based on the inspection, the key concerns identified were:

1. As before the bridge is stable when just standing, but a large impact would likely cause progressive collapse of the structure. The stability of the piers is the main concern. While they are protected by barriers, if the superstructure is hit by a large enough impact, a pier may fail. Once one pier fails, progressive collapse of the bridge is likely. The magnitude of such an impact is difficult to stipulate without undertaking some analysis.
2. The corbel mentioned in item 2 above has minimal restraint and therefore if it or the girder it supports are hit with sufficient force, the corbel could fall out, causing the middle beams to also fall. This obviously presents a risk to any vehicles passing underneath (if the road were reopened).
3. There remains a risk that the bridge could be hit again.

Recommendations

Given the regularity that this bridge is hit and the poor condition, it is our view that the spans of the bridge over the road should be removed. However, the stability of the bridge as a whole would need to be determined through a demolition assessment as it may be necessary to demolish the entire structure if individual spans are removed due to global stability issues.

The SMEC reports note and recommend:

- **The key concern is that a large impact would likely cause progressive collapse of the structure.**
- **Given the poor condition of the bridge and the damage sustained from repeated truck impacts, SMEC recommends that the spans over the road be demolished as a matter of urgency*.**

*However, it should be noted that SMEC were only engaged to assess and report on road traffic affected spans and not the entire length of the Terania Street underbridge.

1.1.5 Setting

The setting for the Lismore railway underbridges falls largely within the urban town settlement (Union Street) and also on the town fringes into open flood plains/farming lands near Terania Street and Alexandra Parade, adjacent to the Lismore showgrounds entry.

The setting for the underbridges has been disrupted due to major flooding in Lismore in 2021 and 2022, where repeated flooding which has left water damaged houses unsuitable for occupation, and in some instances either abandoned, demolished or relocated as part of the NSW Government buy back program, the NSW Government Resilient Homes Program.

In 2023 and 2024, the setting for the Lismore railway underbridges continues to change radically. Existing housing is either being retained and raised above flood levels, demolished or relocated away from flood prone low lying areas near the viaducts, to higher flood free land identified within Lismore, generally outside the setting and viewshed of the Lismore railway underbridges.

1.1.6 State heritage items located in the vicinity

A search of the State Heritage Inventory (see below) shows there are five SHR listings in Lismore, refer to table below. This includes the Lismore Railway Station group in Union Street, Coleman’s road bridge over Leycester Creek which are within the vicinity, but not in the viewshed of the Lismore railway underbridges.

It is also worth noting the SHR listing for the High Conservation Value Old Growth forest, which is now protected as a state heritage item, and would in the past, have supplied readily available old growth hardwood timbers for the construction and maintenance of the railway underbridges at Lismore and across NSW.

Item Name ▲	Location	Local Government Area	Type	SHR ID
📍 Coleman's Bridge over Leycester Creek	Main Road 544 LISMORE NSW 2480	Lismore	Built	01463
📍 High Conservation Value Old Growth forest	Upper North East Region COFFS HARBOUR NSW 2450	Coffs Harbour	Landscape	01487
📍 Lismore Railway Station group	North Coast railway LISMORE NSW 2480	Lismore	Complex / Group	01180
📍 Lismore railway underbridges	North Coast railway LISMORE NSW 2480	Lismore	Built	01044
📍 Tulloona	562 Ballina Road GOONELLABAH NSW 2480	Lismore	Built	00051

Table 1 State Heritage Register listings for Lismore LGA Source: State Heritage Inventory

1.1.7 Heritage Listings

Table 2 includes heritage listings for the Lismore railway underbridges.

Table 2 Heritage Listings			
Heritage listing	Name	Listing Date	Bridges included
State Heritage Register (SHR #1044)	Lismore Railway Underbridges	April 1999	Alexandra Parade Terania Street Leycester Creek/Crane St Union Street

Local Environmental Plan (Lismore LEP 2012)	North Lismore Railway Viaducts (A7); (A8); (A13)	2012	Alexandra Parade Terania Street (also included in 2000 LEP)
	Railway Bridge (A10)		Union Street Leycester Creek
S170 Heritage and Conservation Register (UGLRL)	Lismore, Leycester Creek Underbridge Approaches (A8; 1044)	13.06.2022	Terania Street Leycester Creek Union Street Alexandra Parade

1.1.8 Site and its context

Terania Street underbridge (12 spans), the site subject to this application, is circled in yellow on the SHR map below. It is located in Lismore forms part of the SHR listed Lismore railway underbridges.

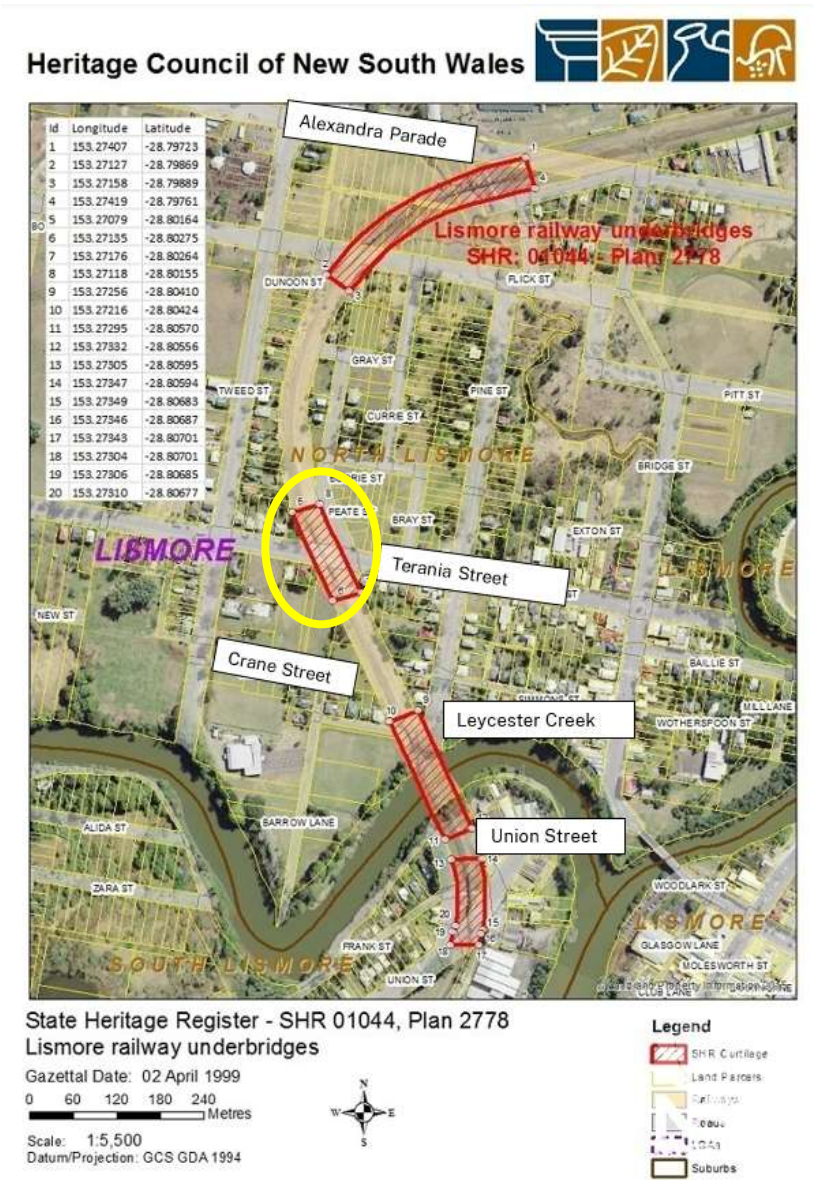


Figure 1.4 SHR boundary listing plan for Lismore railway underbridges. Terania Street underbridge is circled in yellowSource: State Heritage Inventory, accessed February 2024

1.1.9 Topography

Lismore is located in the Northern Rivers Region of NSW and an estimated population of 44,276 in 2022¹³. Lismore is situated on the flood plains at the junction of Leycester Creek and Wilsons River. The town is surrounded by hilly topography forming a basin and catchment of these two water systems. During times of heavy rain, the basin fills up as the movement of water is contained resulting in major town flooding.

Although no other major environmental hazards generally affect the area, Lismore is renowned for frequent floods. Factors such as building in flood prone areas and the increasingly severity of weather events (intensity and frequency) have exacerbated flooding in the Lismore area.

The Lismore CBD, East, South and North Lismore, as defined as the extent of probable maximum flood (PMF¹⁴) has a long history of documented flood events¹⁵. A flood levee (10.7m in height) was installed in the Lismore CBD in 2005, and this was topped by the 2017 and subsequent floods.

The 2022 flood event reached an unprecedented 14.4 metres (47 ft). Prior to this the worst floods were in 1954 and 1974, when waters rose to a height of 12.1 metres (40 ft), with a number of others recorded as exceeding the stated height of the levee wall protection.¹⁶

The Casino Murwillumbah rail line crosses the flood plain via a series of railway bridges which are now known as the Lismore railway underbridges. The Real Levels for the Lismore Railway Underbridges vary from 11-13m AHD (or above sea level), refer to the figure below.

The Terania Street railway underbridge was topped out by flood waters, causing obstructions to the SES and disaster risk management emergency egress, rescues and recovery along Terania Street, which is a nominated Evacuation Route.

¹³ Lismore Council (.idcommunity demographic resources) based on ABS data, accessed February 2024, [Population and dwellings | Lismore City | Community profile \(id.com.au\)](#)

¹⁴ Engeny Water Management, Draft Lismore Floodplain Risk Management Study, report prepared for Rous County Council dated 2021, [Lismore Floodplain Risk Management Study - Report - Datasets - NSW Flood Data Portal](#)

¹⁵ [Why can floods in Northern Rivers towns like Lismore and Byron Bay come in clusters? - ABC News](#), Margaret Cook for ABC News, 31 March 2022, accessed February 2024

¹⁶ [Lismore, New South Wales - Wikipedia](#) that references [Flood information Lismore City Council \(nsw.gov.au\)](#), accessed February 2024

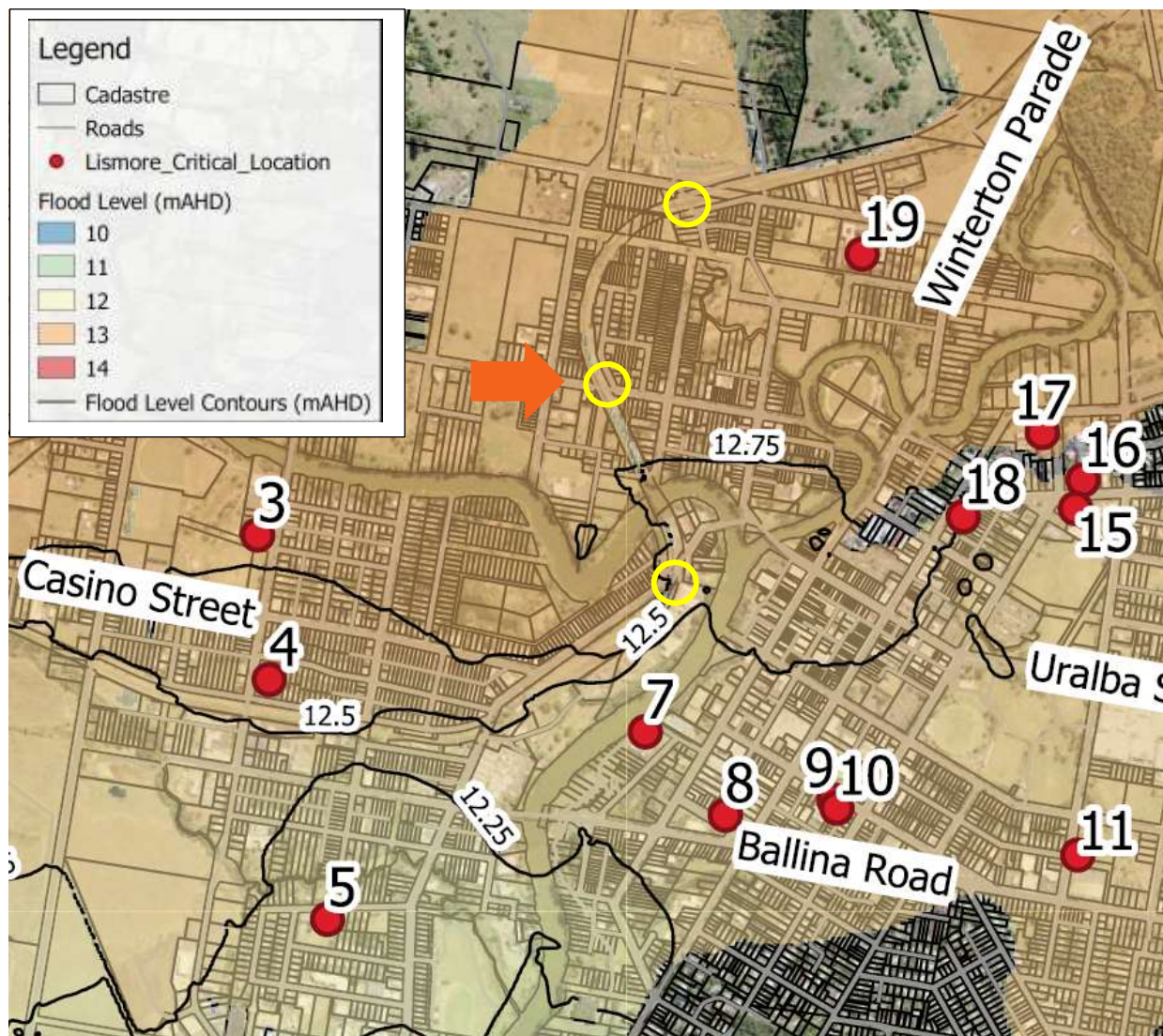


Figure 1.5 Part of the Vulnerable Land Uses and Infrastructure showing the Real Levels in Australian Height Datum of the Lismore Area. [0m AHD is sea level]. Source: *Final Lismore Floodplain Risk Management Study*, prepared by Engeny Water Management dated 2021

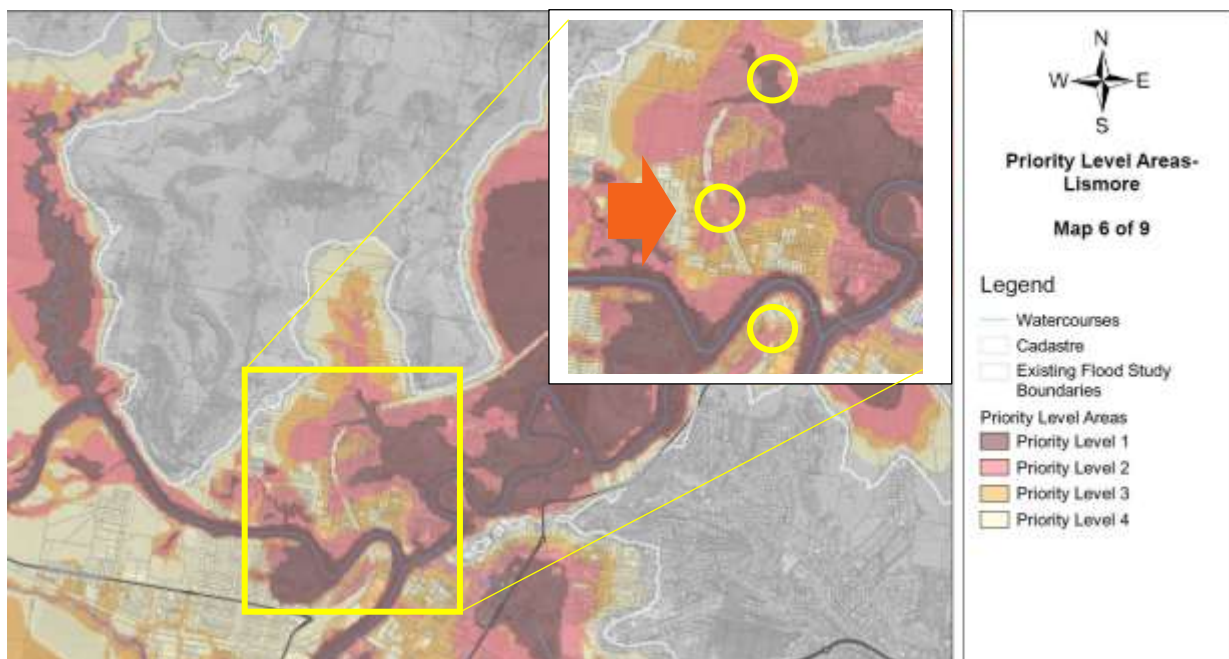


Figure 1.6 The map shows each of the Lismore Railway underbridges (circled yellow) are located in Priority Level Areas 1 and 2 where the Resilient Homes Program applies. Source: NSW Government Flood Hazard Information, Refer to Lismore Map 6 of 9 showing Priority areas, [Flood Hazard Information | NSW Government](#), accessed February 2024

In 2022, responding to severe impacts from major flood events repeatedly affecting the residents of Lismore, the NSW Government established the Lismore Flood Recovery Planning Package which includes a buy back program for property in Priority areas.¹⁷

1.1.10 Character and sustainable use of resources

The railway line through Lismore is characterised as a series of raised embankments forming the permanent way, combined with a series of underbridges over the low lying open flood plain and creeks. The rail line was surveyed and engineered to provide a stable and elevated level path of travel for the train tracks and train operations.

Originally built in the 1890s, the Lismore underbridges were constructed using timber girder beams supported on a series of closely spaced timber trestle piers in old growth hardwood timbers. Timber beam or timber girder construction is a simple bridge type that relies on a single support point, distributing load along its length as an integrated system. The span length is limited by the carrying capacity of the shorter girder beams and does not have the load carrying advantages of a sophisticated trussed beam system.

The earlier timber truss bridges, designed between the 1850s and the 1880s, made use of vast forests of large, strong and durable NSW hardwoods. ... once the comparative strength and durability of these hardwoods became known around the world, so much timber was exported that these earlier types of timber truss bridges could no longer be built. Bridges designed in the 1890s and 1900s still made use of the future management options and opportunities strength and durability of the local hardwoods, but timber sizes were limited to these smaller and shorter sections still readily available.¹⁸

¹⁷ [Lismore Flood Recovery Planning Package | Planning \(nsw.gov.au\)](#), NSW Government, Resilient Homes Program, accessed February 2024

¹⁸ *The Timber Truss Bridge Book*, Lenore Coltheart and Amie Nicholas, (Sydney: Roads and Maritime Services), 2019, 32

The Lismore railway underbridges were maintained during their operational use, with old growth hardwood timber, at a time when these timbers were readily accessible and cost effective.

Today, Forests NSW manages the two million hectares of state forests sustainability to balance timber production, recreational activities and the conservation of wildlife. The large section, old growth, native hardwood timber used in bridge construction is very difficult to obtain from these sustainably managed state forests, due to the rarity of trees of the correct species of sufficient height and age. Moreover, even when suitable logs exist, they are often cut into small marketable lengths for buildings, rather than set aside for use in timber bridges.¹⁹

In 2024, Transport considers using sustainably sourced materials as a key component of its responsible management of Transport assets.²⁰

Future Transport Strategy 4.4 Use more sustainable materials: ... *As we plan the future of transport in NSW, we must take factors such as the role transport, climate change, population and economic shifts, shocks and stresses into account. In doing so, we will create successful places and make our transport network and communities resilient. To reduce the impact of climate change and improve the liveability of communities, we will transition to net zero emissions and seek to minimise the environmental impact of transport with actions for decarbonisation and sustainable infrastructure design.*



Figure 1.7 1890s image showing clear felling of local timbers at Lismore, in the immediate vicinity of timber bridge construction that was underway. Source: *Construction of the Lismore – Tweed Railway Line, c1890s* sourced from the Richmond Rivers Historical Society, Folder Transport – Railways, image 52 as cited in Extent Heritage, 2017, *Lismore Underbridges (UBN62837A & UBN62837C) Interim Statement of Heritage Impact FINAL*, prepared for John Holland Rail Pty Ltd, p26

¹⁹ Coltheart and Nicholas, *The Timber Truss Bridge Book*, 2019, page 99

²⁰ [Future Transport Strategy \(nsw.gov.au\)](https://www.nsw.gov.au/future-transport-strategy), Transport for NSW, P4.4: *Use more sustainable materials*, pages 78,80-81, NSW Government, 2022, accessed February 2024

SOHI assessment of sustainable outcomes

Partial retention, rebuilding or reconstruction are not viable options and do not address public safety risks and are not good or sustainable conservation outcomes.

These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

1.1.11 The proposed works area – Terania Street

The proposed works area for the Terania Street underbridge is shown on the following aerial photographs and street views in January 2024. Also refer to the attached works documentation. (Attachments 1a and 1b)



Figure 1.8 showing Terania Street underbridge looking west. Source TfNSW January 2024



Figure 1.9 Aerial view of Terania Street underbridge. Source Aerial imagery, Six maps, September 2012

1.2 Site summary history

1.2.1 Documented history

The Casino to Murwillumbah Line on which Lismore is located, was built progressively over several stages. The first railway constructed to service the northern rivers of NSW was built to main line standards extending from Murwillumbah to Byron Bay and then onto Lismore in 1894, moving goods to the port at Byron Bay. The rail line between Lismore and Casino was completed in 1903 to form a continuous connection from Casino to Murwillumbah.

Built in the constrained financial and social times of the 1890s, early 1900s and World War 1 through to the 1920s, many of the railway station buildings and bridges were constructed in readily available and affordable hardwood timbers.

Track formation for this line required the construction of major bridges over substantial rivers, along with tunnels through mountainous regions in the north east corner of NSW. There are numerous extant timber bridges on the Casino Murwillumbah line over valleys and smaller river tributaries and catchments.

The completion of the North Coast Line from Casino through to Kyogle and onto Brisbane, downgraded the Casino to Murwillumbah to branch line status. The Casino to Murwillumbah Line continued for just over 100 years, ceasing operations in 2004 and was replaced with coach based services.²¹ To date, the line has not been formally closed in Lismore.

The railway line runs through the city of Lismore dividing the town north south. The line crosses over the Leycester Creek and adjoining Crane Street, Terania Street (a regional classified road connection to the towns of Kyogle and Nimbin), Alexandra Pde (access to the Lismore showground) and Union Street (a regional classified road connection to Bruxner Highway into South Lismore over Leycester Creek to Bridge Street and Lismore CBD).

1.2.2 Chronological development and previous physical changes

During the operation of the Casino to Murwillumbah Line to ensure the structural capacity, the underbridges were regularly maintained and repaired using replacement timber members.

Since cessation of operations in 2004, bridge management has focused on regular inspection and monitoring regimes. Recent works have addressed public safety and traffic safety requirements. Works include safety fencing to prevent unauthorised access, line markings and traffic signage alerting traffic height limits, and warning signage alerting public safety risks.

Known previous works to the Lismore railway underbridges are included in Table 3 below. (Note: No works are included in this application for Alexandra Pde, Union St, Crane St or Leycester Creek underbridges (shaded dark grey).

²¹ [Murwillumbah Branch \(nswrail.net\)](https://www.nswrail.net/), accessed May 2023 and February 2024.

Table 3 Chronological development and previous physical changes – Lismore railway underbridges

Underbridge	Type of bridge	Construction date	Modification date	Number of Spans	Number of Trestles or Piers
Terania Street	Timber girder	1894	<i>1994-1995 Proposed but not executed demolition and replacement with concrete bridge</i> <i>2019-2020 (Barrier fencing to underbridges on rail corridor)</i> <i>Oct 2023 (Stabilisation propping to piers 6,7; concrete barriers piers 4,5,6)</i> <i>Jan 2024 (Emergency works to girder beams between spans 6 and 7 and at corbels)</i>	12	13 timber trestles

1.3 Physical Analysis

The application is seeking to demolish the underbridge located at Terania Street, from abutment to abutment.

In January and February 2024, two vehicle strikes at Terania St resulted in road closure (February to March 2024) due to structural engineering concerns about the stability of the underbridges. TfNSW must consider recommendations for the future management of these failing assets and actively manage public safety risks for road and pedestrian users. Road closures are also majorly affecting local business operations.

The timber girder bridge design has low height clearance and narrow lane widths between piers that impedes road users, and disaster risk management egress and recovery posing life-endangering public safety risks.

1.3.1 Asset Condition

Terania Street underbridge condition in 2024 is discussed in section 1.1.4 Condition

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**²² This report **recommends demolition as the preferred option**²³.

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**²⁴, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category*

²² *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

²³ FBE Strategic Options report, 2023, page 15

²⁴ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0)*, prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

‘B’ (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.

FBE have assessed the condition of elements of the Terania Street underbridge as percentages of the overall structure, as set out in the table below. **FBE conclude that 50% of the structure is in a predominantly poor condition, in large part owing to rotting, split, termite infestation and damaged timber members. These members are typically transoms, trestle piles, trestle branches, corbels and girders. Connections and bracing elements are typically loose and for the transoms non-functional.**²⁵

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes**.²⁶

Following further vehicle strike in February 2024, further mitigation works are being considered (March 2024) to reduce traffic speed to 20km/hour by the introduction of chicanes and rumble tracks as traffic calming devices, to reduce, but not eliminate the risk of further vehicle strike resulting in potential bridge collapse.

Life endangering public safety risks arising from further vehicle strike can only be eliminated by road closure or bridge demolition. Lismore City Council has advised TfNSW that road closure is unacceptable and have requested the non-operational rail bridges be demolished. (refer to Attachments 9 and 10)

Select photographs are included below, with more detailed images included in the *BridgeDoctors Level 2 Condition Assessments* dated September 2023 for Terania Street underbridge.

Terania Street, 2024	
	
Terania St Piers 3, 2 and 1 looking south west, note splitting damage to girder overhead of pedestrian pathway.	Terania St Pier 5 looking south. Note the trestle is no longer load bearing and is leaning. The props are taking the load.

²⁵ Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15
²⁶ SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024 and SMEC #2 – 7 February 2024



Figure 1.10 Terania Street underbridge showing condition. Source Bridgedoctors September 2023

1.3.2 Impact on the Lismore road network and business operations

The Casino Murwillumbah Rail Line runs northerly from Lismore through to North Lismore and imposes height restrictions to traffic running east-west in North Lismore. This means that road closure due to rail underbridge impacts the Lismore road network by diverting all vehicles, including trucks and buses, onto alternative roads that have low clearance and lane width restrictions due to overhead rail underbridges and trestle supports. The road closures and low height clearances are having major impacts on operations of local businesses and truck movements.

Road safety hazards/risks for the Lismore railway underbridges have been identified in the *Road Safety Audit for the Lismore Rail Viaducts, November 2022* (Ardill Payne & Partners for Lismore City Council). (Refer below and Attachment 8)

Transport for NSW is required under section 163 of the Roads Act 1993 to keep a record of all classified roads. Terania Street is identified as regional classified main roads, and funding is provided by TfNSW to Lismore City Council for their management.

1.3.3 Risk assessment and public safety

Two risk assessments have been prepared to assess the public safety risks of the Lismore railway underbridges:

- *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002* (Rev 0) prepared by Focus Bridge Engineering, heritage engineering consultants to UGLRL in October 2023.
- Road Safety Audit for the Lismore rail Viaducts prepared by Ardill Payne and Partners for Lismore City Council, November 2023.

The Focus Bridge Engineering Risk Assessment recommends the demolition of the underbridge at Terania Street. The Executive Summary²⁷ states:

²⁷ Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'b' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.

The FBE Risk Assessment table²⁸ for Terania Street recommends:

Underbridge	SFAIRP Control	Comment
Terania Street	Entire demolition	Due to the nature and number of 'very high' and 'high' risks, immediate action is required. Implementation of a road closure/detour would mitigate risk in interim until demolition takes place

Table 4 FBE Risk Assessment, 2023. Page iii

The Road Safety Audit assessed road safety priorities for the Lismore Railway underbridges, assigning levels of risk against the likely severity of the impact to Austroads standards. High, Medium and Low road safety risks were identified for the Terania Street underbridge.

When the RSA was prepared all roads in Lismore were open (November 2022). The Road Safety Audit Findings²⁹ identified safety risks/hazards: what is potentially dangerous about the road or what could lead to crashes occurring or injury resulting.

In 2024, since completion of the RSA risk assessment, the risks have increased due to further vehicle strikes to the Terania Street underbridge.

RSA Terania Street underbridge recommendations:

High and medium risks of:

- **Vehicle collision with other vehicles or with viaduct pylons** requires road edge clearances, outer lane delineation, **narrow road widths**; delineation and protection of safety barrier ends; lane merging priorities.

Low risk of:

- Vehicle strike due to **minimal vertical clearance**. Warning and high vehicle detour routes must be in place to reduce collision with the viaduct.

In 2022 the RSA assessed the minimal vertical clearance at Terania St as a low risk leading to crashes occurring or injury resulting. However multiple vehicle strikes due to low height clearances are likely to increase this risk classification and treatment approach.

(Note: In order to reopen the road after two vehicle strikes, TfNSW are intending to introduce traffic calming devices to reduce vehicle speed to 20km/hour as an interim measure pending a decision on bridge removal. (March 2024)

Noting the RSA recommended Treatment Approach below³⁰:

²⁸ Lismore Railway Bridges Risk Assessment, FBE, 2023, page iii.
²⁹ Lismore Railway Road Safety Audit, Ardill Payne & Partners, 2022, pages 15 to 23.
³⁰ Lismore Railway Road Safety Audit, page 16 to 18.

Level of Risk	Treatment Approach
Negligible	No action required.
Low	Should be corrected or the risk reduced if the treatment cost is low.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
High	Should be corrected or the risk significantly reduced, even if the treatment cost is high.
Extreme	Must be corrected regardless of cost

Low height clearance and increased road safety risks

The rail underbridges are well below the minimum standard for overheight vehicle clearance of 4.6m³¹. All bridges under 4.6m require warning signage for OSOM (over size and over mass vehicles) to alert road users to the safety risks.

The underbridge at Terania Street is signposted with the following low height clearance restrictions:³²

- Terania Street 3.8m and 4.0m as the underbridge is sloping the lanes height restrictions vary

The low clearance under the rail underbridges requires OSOM vehicles to obtain permits to travel on these affected roads, or to detour to other regional roads that can accommodate their height. Terania Street is a regional roads that connects Lismore to Kyogle and Nimbin.

Narrow lane width and increased road safety risks

The sealed road width of 4.6 metres has approximately 2.1 metre wide lanes which is less than the 3.5 metre minimum width required by Austroads.³³

The width of the road lanes passing under the underbridge is limited by the span width and placement of the supporting upright piers. The lane widths are further reduced by the inclusion of safety barriers installed to prevent vehicle strike (Terania St). The narrow road widths are identified as a road safety risk in the Road Safety Audit at the Terania Street underbridge.³⁴

Traffic strike at the underbridges

The Lismore railway underbridges have a history of traffic strikes and accidents at Terania Street are summarised in the table below and updated from TfNSW data, February 2024³⁵.

³¹ Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022, page 17.

³² Height restrictions as signposted on the underbridges, and Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022

³³ Lismore Railway Viaducts Underbridges Stage 2: Strategic Options Report, Rev B, 2023 Focus Bridge Engineering Consulting, for UGLRL, Appendix C Table C-5, page 27.

³⁴ Road widths noted for the underbridges, and Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022

³⁵ Lismore Railway Viaducts Underbridges Stage 2: Strategic Options Report, Rev B, 2023 Focus Bridge Engineering Consulting, for UGLRL, Appendix C Table C-5.

Table 5 Traffic strike at Terania Street underbrige		
Accident Characteristics	Terania Street	Works to underbridge resulting from accidents
Recent Accidents between 2017-2021	1 accident	Severe damage to underbridge pier. Low clearance and safety signage
Severity	severe	
Accidents between 2000-2021	unknown	
Accidents 2022 - 2023	1 accident	
Accidents 2024	2 accidents	emergency works to stabilise timber girder/beam

Lismore City Local Flood Emergency Plan and evacuation routes

The Lismore City Local Flood Emergency Plan³⁶ identifies Terania St as a Regional classified main roads which is nominated by the NSW State Emergency Services as Evacuation Route for South Lismore. The route is used to assist community evacuation, rescue and recovery, and other response situations as necessary.

³⁶ Lismore City Local Flood Emergency Plan, Vol 3, Annexure G, page 69, endorsed August 2023, accessed February 2024

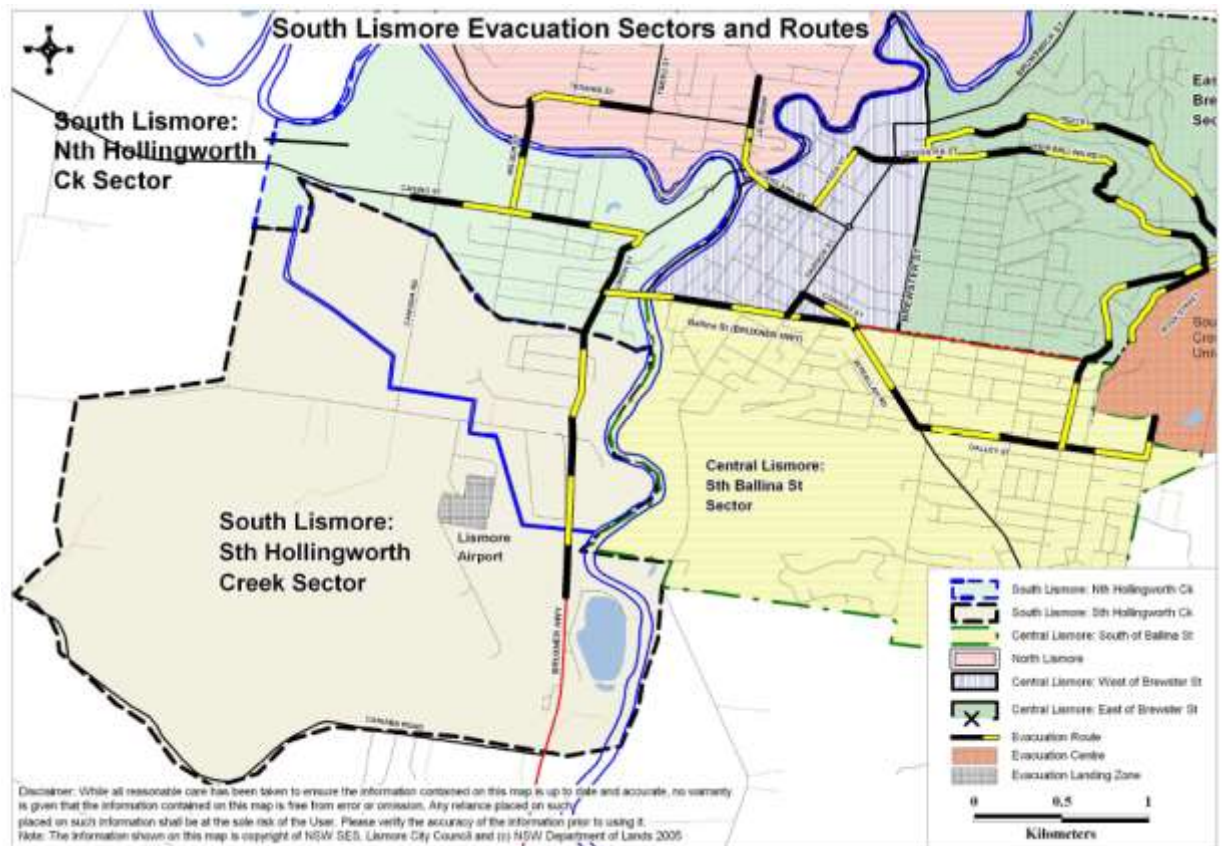


Figure 1.11 The Lismore City Local Flood Emergency Plan identifies Terania Street as Evacuation Routes for South Lismore, 2006 map included in the updated 2023 report. Source Lismore City Local Flood Emergency Plan August 2023.

Lismore City Council support for removal of underbridges

The Lismore City Council's (LCC) letter to TfNSW dated 27 October 2023, supports the demolition of Terania St underbridge as a matter of urgency. LCC also support the removal of the underbridges at Union St and Alexandra Pde due to safety concerns and impact on local businesses. (Refer to Attachment 9)

A further letter from LCC to TfNSW dated 15 February 2024, formally requests TfNSW to remove the railway bridge at Terania St, and to seek legal advice as to the fastest way to remove the underbridge, should TfNSW refuse to do so. (Refer to Attachment 10)

2.0 Significance Assessment

2.1 Statement of Significance

State Heritage Register listing statement of significance

The SHR listing has the following statement of significance for the Lismore Railway underbridges:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

The SHR listing boundary map is included in Section 1.1 Site and Context.

Heritage and Conservation Management Strategy statement of significance

The *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail in 2016, provides the following statement of significance for the Lismore railway underbridges.

Lismore City Underbridges – Terania St – Union St – Alexandra Parade – Winterton Parade	Lismore	Timber Girder – transom top	The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894. (SHR). The Leycester Creek Underbridge Approaches (Union Street underbridge and approaches) at Lismore provide an intact and durable example of late 19th Century railway bridge technology and a solution to the problem of building the railway line across a river and large flood plain close to a populated area. The timber approach viaducts and plate web girders date back to the inception of the Murwillumbah Line (originally the Lismore to Murwillumbah Railway), providing an example of the use of different materials for bridge construction in the 1890s and the introduction of technically sophisticated methods for the time. (s170)
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Table 6 *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016, page 41.

2.2 Significance of the proposed work area

The Lismore railway underbridges are included in the SHR listing as part of the state significant heritage listing.

- There is no grading of significance for individual bridge elements in the SHR listing Description, or Statement of significance, nor in the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016.
- Extent's Strategy broadly identifies the relative lesser heritage significance of the timber girder bridges, compared with steel and masonry bridges; that the timber bridges were never expected to be retained in the long term; and that future management must acknowledge these inherent limitations in the bridge materials.
- The statement of significance and written description do not consider the visual setting of the Lismore railway underbridges or 'end of life' condition at time of listing.

3.0 Proposed Works

3.1 The proposal

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

The Scope of Works for Terania Street underbridge is summarised as:

- demolition and removal of all timber elements and rail tracks for the Terania St underbridge from abutment to abutment.
- Demolition and removal of all on-ground concrete piles in pre-disturbed areas.
- All works are inside the curtilage of the SHR item.
- There is no change of use proposed.
- At completion of works, the site will be made good and all existing road lanes repaved with bitumen.
- A recycling and reuse plan will be developed as part of the demolition documentation. This will only include suitable salvageable timbers. These will be marked before removal from the bridge and appropriate care taken during demolition.

Refer to Attachments 1a and 1b for the full set of works documentation.

Title	Author	Date
Terania Street Underbridge, Lismore Scope of Works	TfNSW	March 2024
Terania Street Underbridge, Works Plan and Elevation	TfNSW	March 2024

3.2 Background

3.2.1 Prelodgement consultation

- Transport for NSW approached Heritage NSW in September 2023 to request a meeting with Heritage NSW to discuss concerns with failing timber underbridges in Lismore and urgency for resolution due to proposals for imminent road closure at Terania St underbridge, with discussions between UGLRL and Lismore City Council.
- On 19 September 2023 an online meeting was held with Heritage NSW Executive Director Sam Kidman and A/Executive Director Sam Knight and TfNSW and HNSW officers. HNSW provided initial advice on documentation requirements for a 60 application for the Lismore rail underbridges.
- In October 2023, Heritage NSW invited TfNSW to present to the Heritage Council at the November meeting as part of the prelodgement discussion for the proposed works scope.
- TfNSW presented to the 1 November 2023 Heritage Council meeting on priority heritage timber rail bridges focusing on Lismore railway bridges. This was a prelodgement meeting

to discuss the proposed works scope. At this time TfNSW indicated that the scope of works had yet to be fully assessed and determined.

- Following the 1 November 2023 Heritage Council meeting, the Heritage Council noted the following Resolutions in its meeting minutes for the Lismore railway underbridges.
- In February 2024, due to two vehicle strikes causing further structural damage to Terania St (Jan and Feb 2024), TfNSW has determined that the escalating safety concerns requires an urgent and immediate s60 application for works to manage the public safety risks with an application to be lodged in March 2024.

Item 3.2 Six Timber Truss Bridges – pre lodgement consultation – Lismore Railway Underbridges section 60 application

Resolution 2023-37

The Heritage Council of NSW resolves to:

1. **Note** Transport for NSW's presentation and the safety concerns raised in relation to the Lismore Railway Underbridges.
2. **Express** an ongoing concern about the underfunding of the maintenance of their s.170 and SHR listed rail heritage assets.
3. **Seek assurance** from Transport for NSW that the cost required to adequately maintain all of its SHR listed heritage assets will be included in their Rail Heritage Strategy.
4. **Establish** a Working Group with representatives from the Heritage Council of NSW, Approvals Committee, Technical Advisory Panel and Heritage NSW, to consult with Transport for NSW during project scope development for Lismore and other identified bridges.
5. **Advise** Transport for NSW to prepare a scope of works for the total listed asset to enable a holistic understanding of impacts. The work scope should be prepared with the advice of a heritage engineer and in consultation with a project-specific Working Group.
6. **Advise** Transport for NSW that section 60 application for works should be accompanied by:
 - a. Independent heritage engineering advice
 - b. An options assessment and with clear, evidence-based justification for the preferred option. The analysis should include consideration of options for retention
 - c. Complete works documentation
 - d. Revised SHR curtilage recommendations relating to the proposal
 - e. Statement of Heritage Impact.
7. **Note** that the Heritage Council of NSW will be the determining authority of any section 60 applications for this work program, given the potential for substantial heritage impacts resulting in material affect and cumulative impacts across timber truss railway bridges in NSW.
8. **Provide** further comment by letter to Transport for NSW on the proposed long-term management strategy of bridge span removal for all four Lismore bridges.

Moved by Colleen Morris and seconded by Vanessa Holtham

Table 7 Item 3.2 Resolutions from the 1 November 2023 Heritage Council meeting. Source HNSW online

3.2.3 Consideration of alternatives

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge, included in 4.1.7 *Options Assessment*.

SOHI preferred option is for full demolition.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes and the rebuilding of this non-operational rail structure to retain heritage significance would require the extensive use of old growth hardwood timber which is currently not available in the volumes required.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade) will bypass the timber underbridges.

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.³⁷ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

³⁷ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

4.0 Heritage Impact Assessment

4.1 Matters for consideration

The proposed scope of works set out in Section 3.1 and Attachments 1a and 1b is for the demolition and the removal of the SHR listed Lismore railway underbridge at Terania Street.

4.1.1 Fabric and spatial arrangements

Road traffic in the 19th century when the bridges were first built, could be accommodated by the design and construction of the underbridges. However, modern day transport needs can no longer be met by these earlier and now defunct bridge design standards.

The timber girder design and construction of the underbridges has low height clearance and narrow lane widths between piers that impedes road users, and disaster risk management egress and recovery and poses life-endangering public safety risks.

SOHI assessment

The proposed scope of works and resulting adverse impact to fabric and spatial arrangements of the Lismore railway underbridges must be supported for the reasons discussed in sections 1, 2, 3 and 4 of the SOHI.

TfNSW has considered mitigation measures and these are set out in section 5.

4.1.2 Setting, views and vistas

The Lismore railway underbridges are set in a flood plain and are low lying single storey horizontal and open structures that are not highly visible or dominant in their settings. The views and vistas to the Terania Street underbridge are generally restricted to close ups and middle distance views.

The following image demonstrates the limited nature of the views and vistas of this structure in its immediate setting, which is a combination of residential and rural environments. Its removal will have a minimal impact on its setting.



Figure 4.1 Photo of Terania Street underbridge taken at Tweed Street corner, showing a low lying single storey horizontal structure that is not highly visible along the street from any distance. (facing east). Source TfNSW February 2024

SOHI assessment of visual impact

The Extent Strategy assessment argues that any heritage value in the landscape for its visual impact is as an identifiable timber structure common throughout regional and rural NSW.

However, the SOHI has argued that the lack of visibility of the Terania Street underbridge from any distance is lost in its streetscape and rural setting, meaning the impact of its removal to the listed values is acceptable.

4.1.3 Current and future use

The existing timber railway underbridges are located on the non-operational Casino to Murwillumbah Line that ceased operations in 2004. Rail operations have been replaced with bus services and there is no plan to reopen the railway line.

The existing timber rail underbridge at Terania Street cannot not be retained insitu, maintained and repaired, or reused, and unable to carry live rail loads as it is structurally unsound.³⁸

Future community use

The current condition of the underbridge precludes upgrade and future community use.

The rail trail proposal for Lismore, in the same way as the recently completed Northern Rivers Rail Trail (Murwillumbah to Crabbes Creek, March 2023), is considering constructing an on ground trail path at the Terania Street underbridge or other underbridge location. The rail trail at present is only a proposal and has no formal NSW Government support.³⁹

Lismore City Council have confirmed *that the business case for Lismore to Crabbes Creek Rail Trail has been developed, submitted, and approved, with funding being sourced, with one section already submitted and waiting to hear on funding. The Casino to Bentley section construction is well underway and approximately 90% completed, with the Bentley to Lismore section being commenced in January 2024 and having 4km of trail installed to date and due to be completed by the end of 2024.*⁴⁰

³⁸ Bridgedoctors P/L Level 2 assessments for Alexandra Pde, Terania St and Union St, prepared September 2023.

³⁹ TfNSW Regional and Outer Metropolitan advice February 2024.

⁴⁰ Lismore City Council Business for Rail Trail, October 2023. LCC email confirmation provided to TfNSW on 26 February 2024.

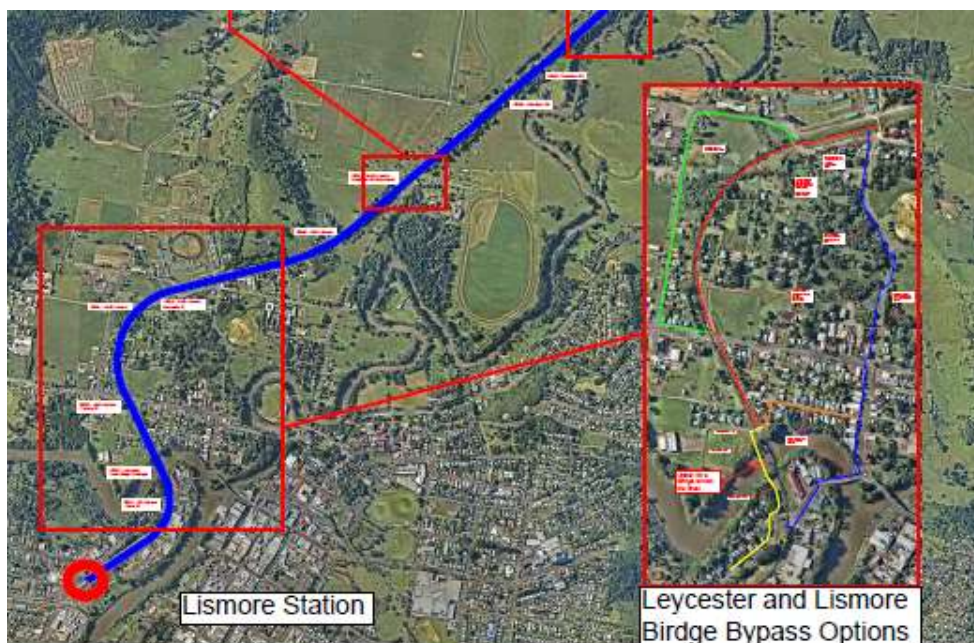


Figure 4.2 Lismore City Council Business Case, October 2023 shows options for the rail trail through Lismore.
Source: LCC

There is also a competing proposal from the Northern Rivers Rail Ltd group to re-introduce rail services from Lismore to Yelgun. The group has been granted a license to undertake survey work to allow them to develop a feasibility study. Even so, any reintroduction of train usage would be unable to use the existing timber underbridge at Terania Street and should this proposal proceed, a replacement bridge will be required to upgrade the line to comply with current safety and design standards.⁴¹

SOHI assessment of future use

The Lismore City Council business case for the rail trail notes that the Lismore underbridge at Terania St will be bypassed, and as shown on the plan provided above., Figure 4.2.⁴²

There is a feasibility study in progress to re-introduce rail services, however the Terania Street underbridge will need to be demolished and replaced to comply with current rail safety and design standards.

There is no agreed future use for the non-operational Terania Street underbridge or timber underbridges at other locations in Lismore.

4.1.4 SHR listing, end of life condition and maintenance

The asset condition is considered in section 1.1.4 and 1.3.1.

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The 'end of life' condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such

⁴¹ TfNSW Regional and Outer Metropolitan advice February 2024.

⁴² Lismore City Council Business for Rail Trail, October 2023. LCC email confirmation provided to TfNSW on 26 February 2024.

an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

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Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

Risk Assessment

FBE prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**⁴³, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

Options Assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023) (Attachment 2); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

⁴³ Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁴ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

4.1.5 Demolition

<i>If demolition is proposed, why is it necessary?</i>	The Terania Street underbridge constitute a danger to road users, the public or a section of the public. Refer to discussion below under SOHI assessment of danger to the public i, ii, iii and SOHI assessment of demolition.
<i>Have options for retention and adaptive re-use been explored?</i> <i>If yes, set out why these options have been discarded</i>	Refer to the detailed table under <i>Options Analysis</i> below including adaptative reuse of the underbridge.
<i>Has technical advice for demolition been obtained?</i>	Refer to discussion below under The underbridge is at end of life, not structurally sound and are a safety risk to the public and users of the roads.
<i>Identify and include advice about how significant elements, if removed by the proposal, will be salvaged and reused.</i>	This is addressed through a mitigation measure included in the scope of works set out in section 5.

Why is demolition proposed?

As set out in section 3.1, *Proposed works*, the proposal seeks to demolish the Terania Street underbridge which forms part of the Lismore railway underbridges.

S63 (2) and (3) of the Heritage Act 1977 makes allowances for approval of an application to enable demolition of the whole of a building or work if:

s63(3)(a) It is of the opinion of that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.**

SOHI assessment of danger to the public

- i. **The Terania Street underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the poor condition and reasoning to support

⁴⁴ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

In 2024 SMEC engineers have supported this position, following two further vehicle strikes to Terania Street underbridge.

SOHI assessment of danger to the public

- ii. **The Terania Street underbridge has low height clearances and narrow lane widths that are life-endangering and escalating safety risks to the public and users of the road.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the constraints on the underbridges and impacts on the road network and reasoning to support demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

Evidence of frequent vehicle strikes are well documented and increasing due to existing height restrictions on the bridges (all below 4.6m see section 1.3 *Low clearance and increased road safety risks*). This is further exacerbated by lane width limitations (also discussed in Section 1.3 *Narrow lane width and increased road safety risks*).

If the bridge was to be removed and replaced (like for like reconstruction or with new materials), the existing low height clearance would continue to pose life endangering public safety risks.

SOHI assessment of danger to the public

- iii. **The Terania Street underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the constraints on the underbridges and impacts on disaster management egress and recovery and reasoning to support demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

The Lismore railway underbridges are situated within a flood plain. The *Lismore Local Flood Emergency Plan* identifies Terania Street as a classified regional main road and is nominated as a flood evacuation route in Lismore (section 1.3).

The Terania Street bridge is a danger to the public during flood events as it may cause an obstruction and may be hit while submerged and impact disaster egress, rescue and recovery efforts.

The underbridge blocks the transportation of oversized houses as part of the Resilient Homes Program.

Lismore City Council has written to Transport for NSW in 2023 advising the bridge presents an impediment to disaster responses⁴⁵. (Attachments 9 and 10)

SOHI assessment of demolition

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

However as demonstrated by this SOHI, the **demolition of the Terania Street underbridge is essential to address the existing danger to users and the public safety risks** arising from the current end of life condition of the underbridge.

- It is not possible to **partially retain** the underbridges due to poor condition and global stability of the underbridge.
- As addressed in i, ii, and iii above, **partial retention or reconstruction** will not resolve the residual danger and public safety risks.

4.1.6 Disaster Risk Mitigation

Are the proposed works designed to minimise or mitigate the risks of natural heritage disasters to the heritage item?	As discussed under 4.1.5 <i>Demolition</i> , the proposed works are designed to facilitate disaster management egress and recovery. The Terania Street underbridge is assessed as a life-endangering safety risk to the public especially during floods, which Lismore is renown for. Lismore resilience and disaster risk management continues to make state headline news in 2024 following major flood disasters in 2021 and 2022.
Will the proposed works impact on the significance of the heritage item? If yes, how have the impacts of the proposed works been minimised?	The proposal will have a major adverse impact to the significance of the Lismore railway underbridges. Mitigation measures included in the scope of works set out in section 5.

4.1.7 Options assessment

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge. Refer to 4.1.10 for the Extent Heritage options assessment prepared as part of the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* for John Holland Rail.

⁴⁵ Email from Andy Parks Strategic Planning Coordinator Lismore City Council to UGLRL, 7 March 2023.

FBE Strategic Options Assessment Recommendation

The Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B sets out an options assessment for the Terania Street underbridge.

The options assessment consider seven options against six constraints and provides an overall assessment, as shown below.⁴⁶

Table 8-1 Terania Street Underbridge options assessment (Source: FBE0

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage Impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Preferred
Option 4 – Alternative route	●	●	●	●	●	●	●	Not recommended
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not recommended
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not recommended
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Figure 4.3 Terania Street Underbridge options assessment, FBE Options Report

The FBE Strategic Options Assessment for Terania Street underbridge recommends:

Entire demolition of the Terania Street underbridge is the preferred option. However, this has a significant negative heritage outcome, but it would satisfy all the other project and site constraints by removing the {road} network restrictions, removing the limited height and width clearances and would eliminate all safety and flood evacuation and rescue concerns.

Partial demolition would not fully resolve the ongoing maintenance and safety concerns for the remaining spans including flood evacuation and rescue risks and is therefore not recommended,⁴⁷ and is not a good heritage outcome.

⁴⁶ FBE Strategic Options report, 2023, Page 27

⁴⁷ FBE Strategic Options Report, 2023, Page 33

Options assessment prepared by TfNSW heritage specialists as part of the SOHI

The Options assessment set out in Table 8 has been prepared by the TfNSW heritage specialists, who have been working closely with the TfNSW bridge project team.

Table 8		
Option description	Analysis of the proposal	Impact to Listed values
Adaptive reuse	The reuse of the Lismore Railway underbridges for railway purposes (inc. tourist group reinstatement) would require several factors including: - Rail Infrastructure Manager (RIM) status. - Compliance with rail safety standards and technical structural engineering requirements to meet <i>National Rail Safety Law 2012</i>, Australian codes and standards. The three underbridges are located on a non-operational rail line and not used for rail traffic in 24 years. To comply with these requirements and standards, the bridges and permanent way associated with the rail line would require removal and reconstruction. The Lismore City Council business case for the Rail Trail (2023) does not propose the reuse of the Lismore Railway underbridges, instead it is bypassing the three underbridges at Alexandra Pde, Terania and Union Streets.	The proposed rail trail will bypass the three timber underbridges and they are not proposing to adaptively reuse the existing structures. Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under <i>National Rail Safety Law 2012</i>. This is not a viable option. There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).
Traffic management measures	This will guide traffic and pedestrians in using the bridge and is one avenue to support management of the bridges, but its focus is on how motorists/pedestrians interact with the bridges.	Traffic management measures have been implemented to lower the risks for the Lismore railway underbridges. This is not a long term management option as it will not resolve the deteriorating fabric condition and bridge

	This option will not resolve the deteriorating fabric condition and bridge construction including low height clearance, narrow lane width and disaster management egress and recovery issues.	construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues. Traffic management measures are an interim measures and will have no impact on the management of the bridge. Their impact to the listed values is assessed as little/no and they are reversible. Traffic management is an interim measure and not a viable long term management option for Terania Street underbridge.
Road closure and rerouting the road	As at March 2024, one lane at Alexandra Parade and all Terania Street lanes are closed due to concerns about the condition of the bridges. This is causing traffic congestion, impacting on local businesses, and community disquiet, as one closure diverts users to another crossing under the viaduct in Lismore. The option will mean traffic is moved under the remaining Lismore railway underbridges due to the flow on effect of traffic movement, it may result in additional vehicle strikes to the remaining underbridges due to low height clearance and narrow lane width issues at all bridges. Terania and Union streets are both classified as regional main roads, their closure for extended periods is not acceptable to the community. Road closure responds to immediate public safety concerns by the relevant road manager and is not a long term option. This option will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues.	This is not a long term management option as it will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues. This measure will not impact the item's listed values. Road closure and rerouting the road is not a long term management option for Terania Street underbridge

	Lismore Council has requested the bridge at Terania Street is removed rather than the road be closed. [ref to Council meeting records and article 15 Feb 2024]. Lismore Council requested in October 2023 that all of the Lismore bridges be removed including Alexandra Pde and Union St underbridges.	
Additional propping	Propping will not address the fabric issues and the underlying structural condition of the bridge including its inability to carry its own dead weight or live loads. Additional propping may further reduce the height clearance of the structures and further reduce already narrow lane widths, exacerbating these problems increasing public safety risks. This is an interim management measure while propping is safely able to be undertaken (for workers).	This is not a long term management option. This option will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues. Propping will have a minor visual impact on the listed values, depending on how it is undertaken. It can be reversed. Additional propping is not a long term management option for Terania Street underbridge.
Maintenance and repair	The engineering condition data and analysis for Alexandra Pde, Terania St and Union St indicates the timber structures have reached end of life with Terania Street at the point of global failure. The existing fabric cannot be repaired and maintained. This option will not resolve the global failure issues due to the integrated/interconnected construction and stability of the underbridges that are at end of life. Maintenance and repair will not resolve low height clearances, narrow lane widths or disaster management egress and recovery issues at these structures, or address the public safety risks.	This option will not resolve the deteriorated condition and global failure of fabric and bridge design and construction with low height clearances, narrow lane widths and disaster management egress and recovery issues or address the public safety risks. Maintenance and repair is not a viable short or longer term management option for Terania Street underbridge.
Replacement of spans	The engineering condition data and analysis for Alexandra Pde, Terania St and Union St indicates the timber structures have reached end of life. Individual span replacement will not resolve the global failure of fabric due to end of life of the materials.	This option will not resolve the deteriorated condition and global failure of fabric and bridge design and construction with low height clearances, narrow lane widths and disaster

	This option will not resolve the global failure of fabric issues due to the integrated/interconnected construction and stability of the underbridges that are at end of life. Span replacement will not resolve low height clearances, narrow lane widths or disaster management egress and recovery issues at these structures, or address the public safety risks.	management egress and recovery issues or address the public safety risks. The span replacement option with like for like materials (timber) will not resolve the above issues and is not a viable option. Although this offers a sympathetic heritage solution, it is not an achievable option for the underbridges. Span replacement is not an option for the Terania Street underbridge.
Reconstruction of each bridge in like for like (old growth hardwood timber)	Reconstruction of each of the bridges in a like for like form (old growth hardwood timber) will not resolve the ongoing low height clearance, narrow lane width safety issues or disaster management egress and recovery issues which will remain at each of these structures. Reconstruction must consider the economic viability and use for a new structure including ongoing maintenance and repair as a non-operational NSW government asset. Reconstruction of these underbridges in timber has an estimated life of 40 years before replacement. Reconstruction of a new bridge on a non-operational rail line is not financially responsible, feasible or viable. Reconstruction using old growth hard wood timbers is contrary to sustainable development practice set out in TfNSW's Guiding Strategy 'Future Transport' and is not supported by TfNSW. There is no sustainable source of timbers available in the large quantities necessary to rebuild these structures. Reconstruction in old growth	Reconstruction would not resolve the ongoing low height clearance, narrow lane width and disaster management egress and recovery issues or address the public safety risks which remain at each of these structures. This option does not consider the non-operational status of the underbridges. Reconstruction with like for like materials (timber) will not resolve the above issues, including maintenance and recurrent replacement of materials, and is not a viable option. Although this offers a sympathetic heritage solution, it is not an achievable option for the underbridges. Reconstruction is not supported for the Terania Street underbridge.

	hardwood timbers is not a desirable or sustainable management outcome for scarce and finite resources. Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁸ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks for non-operational rail.	
Reconstruction in new materials (not timber)	Reconstruction of each of the bridges in new materials (form and fabric) would require a new design. The new designs will continue to obstruct the clear movement along Evacuation routes necessary for disaster management egress and recovery issues which will remain at each of these structures. Reconstruction must consider the economic viability and use for a new structure including ongoing maintenance and repair as a non-operational NSW government asset. Reconstruction of a new bridge on a non-operational rail line is not financially responsible, feasible or viable.	Reconstruction will not resolve the disaster management egress and recover issues or address the public safety risks which remain at each of these structures. This option does not consider the non-operational status of the underbridges. Reconstruction with new materials and design will not resolve the above issues and is not a viable option. Although this offers a sympathetic heritage solution, as it would demonstrate new designs for the suite of bridges responding to historic and current flooding issues, it is not an achievable option for the underbridges. Reconstruction is not supported for the Terania Street underbridge.
Raise the existing underbridges superstructure	This option will not resolve the existing known engineering condition for each of the bridges and global failure of fabric.	This option will not resolve the existing fabric condition issues and global failure of fabric.

⁴⁸ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

	Physically and visually, raising the existing underbridges would disconnect the structures from the permanent way (the Casino Murwillumbah rail line) and would require major regrading of the permanent way to accommodate the new structures. These works must consider the economic viability and use for a new structure including ongoing maintenance and repair as a NSW government non-operational asset. This option will continue to obstruct the clear movement along Evacuation routes identifies in the disaster management plan for egress, rescue and recover, or address the public safety risks which will remain with each structure.	Structurally, it is not clear that it would be possible to attach new connections to the existing structures, unless the fabric condition issues are first resolved. This will first require reconstruction of the underbridges. Raising the superstructure does not support the listed values of the Lismore railway underbridges or the interpretation of how the 19th century railway and bridge construction responded to the floodplain. Raising the superstructure of the underbridges is not supported for the Terania Street underbridge.
Partial span removal (only select spans)	Removing individual spans at each of the underbridges immediately over the road/pedestrian walkways will resolve the immediate road height constraints and safety concerns from fabric issues over these specific locations. Technical engineering advice states that the nature of bridge construction relies on interconnected stability across spans for the full length of each bridge. Removal of individual spans affects stability of the whole structure. Technical advice in February 2024 following bridge strikes raises concerns about global failure of the bridges. Several of the trestles are non-load bearing and supported by propping. Removal of spans will require considerable stabilising works to secure the remaining spans that are already at end of life, and this may not be achievable given the deteriorating condition of the remaining timbers. Partial span removal may prolong the end of life condition of the underbridges for a short time. However, partial span removal is death by a	Partial span removal will not resolve the ongoing end of life condition for the whole underbridges. It will not address lane width constraints or issues linked to disaster management and recovery as there would still be material at end of life to cause safety issues with traffic and during major floods. Partial span removal will be a negative and cumulative impact to the heritage listed values of the bridges. Partial span removal does not support the listed values of the Lismore railway underbridges or the interpretation of how the 19th century railway and bridge construction responded to the floodplain. Partial span removal is not supported for the Terania Street underbridge.

	thousand cuts and its only a matter of a short time to when the remaining spans will require removal, or will fall down due to rot or flood. Partial span removal will not resolve the end of life condition for the whole underbridges. It will not address lane width constraints or issues. This option will continue to obstruct the clear movement along Evacuation routes identifies in the disaster management plan for egress, rescue and recover, or address the public safety risks which will remain with each structure. It will not address disaster management egress and recovery as the remaining bridge elements will continue to cause safety issues with traffic and obstructions during floods.	
Full span removal up to abutments	This proposal will resolve the ongoing end of life global failure of fabric, and existing dangers to the users and public safety risks of the low height clearance, narrow lane widths for road users. It will remove the bridge obstructions and enable clear movement along Evacuation routes necessary for disaster management egress and recovery issues which currently exist at each of these structures. These works consider the economic viability and use of the existing structures and eliminate costs and management associated with ongoing maintenance and repair as a NSW government non-operational asset.	Full span removal is the preferred option as it addresses the ongoing global failure of fabric, the low height clearance, narrow lane widths and disaster management egress, rescue and recovery and eliminates the ongoing danger to life and public safety risks. Measures to mitigate this impact are proposed and appropriate to ensure an accurate record, provide interpretation of the underbridges in the setting of the Casino Murwillumbah rail line within Lismore and respond to recovery/salvage of structural fabric. Full span removal at the three underbridges will materially and negatively affect the listed values which form a collection of bridges in the statement of significance. Full span removal to abutments for Terania Street underbridge is supported.

In summary the SOHI supports the demolition of the Terania Street underbridge.

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessments for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁹ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

4.1.8 Curtilage

The SHR curtilage includes four separate sections of bridges (at Alexandra Parade, Terania Street, Union Street and at Leicester Creek connecting to Crane Street).

The proposed removal of the Terania Street underbridge would not in itself change the curtilage.

SOHI assessment of curtilage impacts

Transport will consider lodging a future application under Part 3A of the *Heritage Act, 1977* to amend and reflect the changes to the SHR listing and listing boundary, or to consider delisting of the SHR item.

Under s38 of the *Heritage Act*, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that “...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated”.

4.1.9 Cumulative impacts

No major change has occurred to these structures since listing, however as noted in 1.1.4 and 1.3.1 Asset Condition the underbridge is in poor condition and at end of life and at risk of local and global failure.

Previous works undertaken to the underbridges are set out above in Section 1.2 *Chronological development and previous physical changes*. This table outlines Exempt works for fencing; propping and traffic management have taken place at the Lismore railway underbridges.

⁴⁹ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

The proposed works will remove the Terania Street underbridge from the SHR listing for the Lismore railway underbridges. The works will have a major adverse impact on the heritage item.

SOHI assessment of cumulative impacts

The previous Exempt works present a little to no adverse impact to the significance and listed values of the Lismore railway underbridges as a whole.

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in **poor condition and at end of life causing critical life-endangering public safety risks**, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, **given the problems identified above**, demolition is the only feasible option now open to TfNSW.

4.1.10 The Conservation Management Strategy

Extent Heritage prepared the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* for John Holland Rail in 2016.

The Strategy reviews the rail heritage timber assets on the CRN and sets out a discussion of significance, future use and management options and conclusions.

The Strategy discusses the heritage significance of the Lismore railway underbridges and the relative heritage significance of timber underbridges, and questions future management options: ⁵⁰

What we can reason from our analysis is that the timber underbridges are an important part of the history of the regional railway network. They are important relics, evidence of times of political and financial uncertainty, as well as of ingenuity and resourcefulness over financial and logistical challenges. A truth that is also clear from our historical analysis is that the timber bridges, while forming part of evocative and sometimes iconic landscapes, were never built for that intention. The use of timber instead of steel or masonry is evidence of the relatively lesser and inferior status of these structures when built. The lines were not important enough to warrant more permanent and expensive structures. The material itself, being more susceptible to weathering, was never expected to stand the test of time, the result being that many structures have since been demolished or replaced. For many of the existing underbridges, much of the material has been repaired, replaced or reinforced, leaving the amount of original fabric questionable.

The challenge therefore in understanding the significance of these items is finding the balance between their historic, social and technological values and their current and ongoing management options.

⁵⁰ *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016, pages 43 and 59.

Many timber girder bridges were built and many are extant. Apart from particular adaptations for their railway use, there is little difference between timber girder bridges built for railways or for roads (or as wharfage) and this type of bridge is of comparatively low technical significance. Any heritage value lies primarily in their visual impact as identifiable timber structures common throughout regional and rural NSW.

Consequently, it is important to note that, in general terms, timber railway bridges are of lesser heritage significance overall than the metal bridges built for the NSW railways and are considerably less significant than some examples of the timber truss road bridges of NSW. T

Strategy review of significance of timber girder rail bridges (including Lismore railway underbridges)

The SOHI supports the Strategy assessment of the relative lesser heritage significance of the timber girder bridges compared with steel and masonry bridges and that these timber bridges were never expected to be retained in the long term. Future management must acknowledge these inherent limitations in the bridge materials.

The Strategy puts forward a 'Catalogue of Conservation Options' with 11 Conservation Treatments *which might be considered for conservation planning*.⁵¹ The Strategy provides a high level guideline of heritage listed underbridge assets but does not provide strict policies for the conservation management of the heritage assets.

The Strategy sets out the following 'conservation treatments' that could be applied for the Lismore railway underbridges.

Conservation Treatment 4 – Remediating public risk

The Strategy notes *for some sections of the [Lismore] viaducts that are over the roadways and pose a higher potential for public risk, you could consider the application of temporary or permanent engineering options to mitigate risk where feasible and appropriate to the risk profile and other variables*.⁵²

The SOHI assessment does not support the implementation of this option.

TfNSW (and John Holland Rail and UGLRL) have completed temporary engineering options to mitigate public risk.

Structural engineering condition assessments and risk assessments prepared for the underbridges in 2023 and 2024 and associated escalating public safety risks due to overall poor bridge condition and low height clearances do not support the implementation of this option as a long term option. (refer to section 1.3 Physical Analysis).

Conservation Treatment 7 – Partial retention

The Strategy notes that *sections of the bridges over the roadways pose a higher potential for public risk could be removed*.⁵³

The SOHI assessment does not support the implementation of this option.

Structural engineering condition assessments and risk assessments prepared for the underbridges in 2023 and 2024 and associated escalating public safety risks due to overall poor

⁵¹ CRN Timber Underbridges CMS, Extent, 2016, page 54.

⁵² CRN Timber Underbridges CMS, Extent, 2016, Page 55

⁵³ CRN Timber Underbridges CMS, Extent, 2016, Page 56

bridge condition and low height clearances do not support the implementation of this option (refer to section 1.3 Physical Analysis).

Conservation Treatment 8 – Interpretation

The Strategy notes that *bridges at these locations {Lismore} have a high public profile and interface with interpretation can be most effective, thereby justifying the expense of this treatment and promoting conservation and public outcomes.*⁵⁴

The SOHI assessment supports the implementation of this option.

Refer to section 5 mitigation measures.

Conservation Treatment 9 – Reinstate Railway Line to carry trains for railway and tourist groups.

The Strategy notes that *the associated costs in the short-term and continuing maintenance would be significant in most cases.*⁵⁵

The SOHI assessment does not support the implementation of this option.

Any proposed reinstatement of the railway to carry trains for railway and tourist groups will require Rail Infrastructure Manager (RIM) status. The line will need to comply with current rail safety standards and technical structural engineering requirements (2024). The underbridges dating from 1894 and last used in 2004, due to end of life condition would need to be demolished and rebuilt to meet the *National Rail Safety Law 2012* and relevant Australian codes and standards.

As the Strategy states, associated costs for start-up, operations and ongoing maintenance of the line and infrastructure assets including underbridges, would be significant and this may preclude the implementation of this option by a community organisation.

Conservation Treatment 10 – Adaptive community use

The Strategy notes that *bridges in these locations {Lismore} have a high public profile and interface where interpretation can be most effective.*⁵⁶

The SOHI assessment does not support the implementation of adaptive community reuse option.

Lismore City Council business case (October 2023) for a rail trail is proposing to bypass the underbridges at Terania Street, Alexandra Pde and Union Street.

Conservation Treatment 11 – Removal from Asset Register

The Strategy notes that *removal from the asset register, through de-listing, transfer of ownership, gifting or demolition can be a conservation outcome in some instance. ... This treatment may be considered for bridges where they are no longer financially viable to maintain, a particularly pertinent option criterion when considering inoperable assets.*⁵⁷

The SOHI assessment supports this option for Removal from Asset Register.

⁵⁴ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁵ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁶ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁷ CRN Timber Underbridges CMS, Extent, 2016 page 57

As noted above, the end of life condition of these underbridges and associated escalating public safety risks, support this option as a viable and practical management option for the Lismore underbridges.

Strategy conclusions

The Strategy Conclusions state *consequently, the better conservation treatments for the management of the 21 timber bridges {that includes Lismore} would be short-immediate management as a ruin, partial removal, and potential delisting and demolition.*⁵⁸

The SOHI assessment supports the Strategy recommendations for delisting and demolition and this option is able to be implemented by TfNSW.

The SOHI assessment does not support partial removal due to the overall condition assessments and risks assessments as included in Section 1.3 Physical Analysis and Section 4.0 Heritage Impact Assessment.

The SOHI assessment does not support the management of underbridges as a ‘ruin’, for non-operational heritage timber bridges {at Lismore} as this is not feasible or achievable given the poor condition. Managing as a ruin or partial removal does not address the critical public safety risks and escalating risks associated with the overall condition of the ‘end of life’ underbridges. These approaches cannot be supported as viable and achievable by TfNSW for the Lismore railway underbridges.

4.1.11 Other heritage items in the vicinity

There are no heritage items in the immediate vicinity of the Terania Street underbridge.

⁵⁸ CRN Timber Underbridges CMS, Extent, 2016 Page 60

5.0 Summary and Recommendations

5.1 Assessment of heritage impact

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

The SOHI has assessed the demolition of the Terania Street underbridge as part of the Lismore railway underbridges, considering s63 of the Heritage Act.

s63 (2) and (3) of the Heritage Act 1977 include considerations for an application to enable demolition of the whole of a building or work if:

*It is of the opinion that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.** {s63(3)(a)}*

SOHI assessment of danger to the public under s63(3)(a)

The SOHI concludes that the Terania Street underbridge constitutes a **danger to the public and users for the following reasons:**

- i. **The underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**
- ii. **The underbridge has low height clearance and narrow lane widths that are life-endangering with escalating safety risks to the public and users of the road.**
- iii. **The underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The 'end of life' condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister

is of the opinion that “...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated”.

Options assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁵⁹ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

5.2 Mitigation measures

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

The following mitigation measures are proposed in support of the application:

- An archival photographic recording of each of the Lismore railway underbridges in accordance with *Heritage NSW Guidelines for Photographic Recording of Heritage Items using Film or Digital Capture*, 2006⁶⁰ (in preparation)
- A photogrammetric record of the Lismore Railway underbridges that will be made available to Heritage NSW. (in preparation)

⁵⁹ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

⁶⁰ <http://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Heritage/photographic-recording-of-heritage-items-using-film-or-digital-capture.pdf>, accessed February 2024

- Interpretation of the Lismore Railway underbridges as part of the Casino to Murwillumbah Line.
- Salvage of suitable timbers removed from the underbridges for the purpose of recycling and reuse, ensuring treatment and management of potential contaminants that may exist on or within the bridge timbers and provide certification that all timbers satisfy the requirements for reuse in accordance with TfNSW requirements.

6.0 Attachments

Attachment 1a Scope of Works and 1b Work Plans and elevations

Attachment 2 2023 (July, Rev B), Focus Bridge Engineering Lismore Railway Viaducts Underbridge stage 2: Strategic Options Report for UGL Regional Linx

Attachment 3 2023 (Oct, Rev 0) Focus Bridge Engineering *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standards TMU MD 20002 ST.*

Attachment 4 2024 (Jan) SMEC Condition Assessment Terania St post impact #1 19 January 2024

Attachment 5 2024 (Feb) SMEC Condition Assessment Terania St post impact #2 7 February 2024

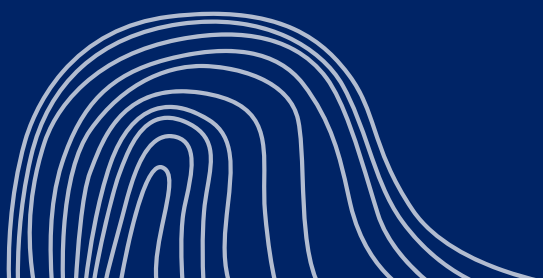
Attachment 6 State Rail Authority Plans for Terania Street renewal general arrangement 1995

Attachment 7 2016 Extent Heritage *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy*

Attachment 8 2022 (Nov) Lismore Council Road Safety Audit, Ardill Payne

Attachment 9 2023 (Oct) Letter Lismore Council to TfNSW seeking removal of all the Lismore underbridges

Attachment 10 2024 (Feb) Letter Lismore Council to TfNSW seeking immediate removal of Terania St bridge



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Appendix D – S60 Approval

HMS Application ID: 6016

Ms Miriam Stacy
TAHE - Transport Heritage NSW
7 HARVEST ST
MACQUARIE PARK NSW 2113
By email: miriam.stacy@transport.nsw.gov.au

Dear Ms Stacy

APPLICATION UNDER SECTION 60 OF THE *HERITAGE ACT 1977*

Lismore railway underbridges
State Heritage Register No. 01044

Address: North Coast railway, LISMORE NSW 2480
Proposal: Demolition and removal of the Terania St underbridge from abutment to abutment.

Section 60 application HMS ID 6016, received 15/03/2024
no:

At its meeting on 8 May 2024 the Heritage Council resolved, pursuant to Section 63 of the *Heritage Act 1977*, to approve the above described Section 60 application, subject to the following conditions:

APPROVED DEVELOPMENT

1. All work shall comply with the information contained within:
 - a) Terania Street Underbridge Lismore Scope of Works, March 2024
 - b) Terania Street Underbridge Lismore - Works Plan and Elevation, March 2024.

EXCEPT AS AMENDED by the conditions of this approval:

ADDITIONAL CONDITIONS OF APPROVAL

2. A timber recycling and reuse plan for the fabric of Terania St underbridge must be developed and submitted to Heritage NSW for approval prior to demolition works commencing on site. This plan must include details on how suitable salvageable timbers will be marked before removal from the bridge, where they will be stored to ensure they will not be subject to pest or weathering and which of the other Lismore Railway Underbridges these timbers will be incorporated into during future works.
3. Transport for NSW must submit a curtilage amendment request, which includes an updated heritage assessment for the remaining Lismore Underbridges, to the Heritage Council of NSW to remove

Terania St underbridge from the wider Lismore Railway underbridges State Heritage Register item 01044 within six months of its demolition.

Reason: these conditions are considered necessary to ensure that the remaining intact fabric form the Terania Street underbridge can be reused to support the other bridges in the same listing, and that the listing record is up to date.

HERITAGE INTERPRETATION PLAN

4. An interpretation plan for the Lismore Railway underbridges must be prepared in accordance with Heritage NSW publication '*Interpreting Heritage Places and Items Guidelines*' (2005) and submitted for approval to the Heritage Council of NSW (or delegate).
5. The interpretation plan must detail how information on the history and significance of the underbridges, with an emphasis on Terania St underbridge will be provided for the public, and make recommendations regarding public accessibility, signage and lighting. The plan must identify the types, locations, materials, colours, dimensions, fixings and text of interpretive devices that will be installed as part of this project.
6. Interpretation relating to the Terania St underbridge to be installed on site within 12 months of its demolition.

Reason: Interpretation is an important part of every proposal for works at heritage places.

PHOTOGRAPHIC ARCHIVAL RECORDING

7. A photographic archival recording must be prepared prior to the commencement of works and during works. This recording must be in accordance with the Heritage NSW publication '*Photographic Recording of Heritage Items using Film or Digital Capture*' (2006). The digital copy of the archival record must be provided to Heritage NSW.

Reason: To capture the condition and appearance of the place prior to, and during, modification of the site which impacts significant fabric.

UNEXPECTED FINDS

8. The Applicant must ensure that if substantial intact archaeological deposits and/or State significant relics or any other buried fabric such as works are discovered, work must cease in the affected area(s) and the Heritage Council of NSW must be notified. Additional assessment and approval may be required prior to works continuing in the affected area(s) based on the nature of the discovery.

Reason: All significant fabric within a State Heritage Register curtilage should be managed according to its significance. This is a standard condition to identify to the applicant how to proceed if historical archaeological relics, or other unexpected buried discoveries such as works are identified during the approved project.

ABORIGINAL OBJECTS

9. Should any Aboriginal objects be uncovered by the work which is not covered by a valid Aboriginal Heritage Impact Permit, excavation or disturbance of the area is to stop immediately and Heritage NSW is to be informed in accordance with the *National Parks and Wildlife Act 1974*. Works affecting Aboriginal objects on the site must not continue until Heritage NSW has been informed and the appropriate approvals are in place. Aboriginal objects must be managed in accordance with the *National Parks and Wildlife Act 1974*.

Reason: This is a standard condition to identify to the applicant how to proceed if Aboriginal objects are unexpectedly identified during works.

COMPLIANCE

10. If requested, the applicant and any nominated heritage consultant may be required to participate in audits of Heritage Council of NSW approvals to confirm compliance with conditions of consent.

Reason: To ensure that the proposed works are completed as approved.

DURATION OF APPROVAL

11. This approval will lapse five years from the date of the consent unless the building works associated with the approval have physically commenced.

Reason: To ensure the timely completion of works

Advice

Section 148 of the *Heritage Act 1977* (the Act), allows people authorised by the Minister to enter and inspect, for the purposes of the Act, with respect to buildings, works, relics, moveable objects, places or items that is or contains an item of environmental heritage. Reasonable notice must be given for the inspection.

Right of appeal

If you are dissatisfied with this determination appeal may be made to the Minister under section 70 of the Act.

Other approvals

It should be noted that an approval under the Act is additional to that which may be required from other Local Government and State Government Authorities in order to undertake works.

If you have any questions about this correspondence, please contact Katrina Stankowski, Manager at Heritage NSW on (02) 9873 8500 or heritagemailbox@environment.nsw.gov.au

Yours sincerely



Manager Assessments, Major Projects
Heritage NSW
Department of Climate Change, Energy, the Environment and Water

10 May 2024

cc: Lismore Council: council@lismore.nsw.gov.au

HMS Application ID: 6016

Ms Miriam Stacy
TAHE - Transport Heritage NSW
7 HARVEST ST
MACQUARIE PARK NSW 2113
By email: miriam.stacy@transport.nsw.gov.au

Dear Ms Stacy

APPLICATION TO MODIFY S60 APPROVAL
for works to Lismore railway underbridges
State Heritage Register No. 01044

Address: North Coast railway, LISMORE NSW 2480
Proposal: Demolition and removal of the Terania St underbridge from abutment to abutment.
Section 65a application no: HMS ID 6016, received 15/03/2024

I refer to your application under Section 65A of the *Heritage Act 1977* (the Act) to modify the approved Section 60 application ([\[insert application no\]](#)).

At its meeting on [XX Month XXXX](#) the Heritage Council considered the modified proposal and found it to be substantially the same as the approved section 60 application.

Your application for modification is approved under section 65A of the *Heritage Act 1977*. The revised conditions are below (with amendments shown by striking through text or new text in ***bold italics***):

[\[insert conditions\]](#)

If you have any questions about this correspondence, please Katrina Stankowski, Manager at Heritage NSW on (02) 9873 8500 or heritagemailbox@environment.nsw.gov.au

Yours sincerely

[\[insert signature\]](#)

Manager/ Senior Manager/ Director/ Executive Director
South Assessments, North Assessments, Major Projects
Heritage NSW

Department of Climate Change, Energy, the Environment and Water

As Delegate of the Heritage Council of NSW

[XX Month XXXX](#)

cc: Lismore Council,

Appendix E – Schedule 6A Certificate - Notice to Enter

BNCIT0032627

Title

Approval Briefing - Schedule 6A Certificate Notice to Enter
- Lismore City Council

Division

Regional and Outer Metropolitan

Branch

Network and Assets

Approval History

This section details the approval history of the request.

Final Approver of this Briefing Note is Victoria Oszko

Date / Time	Description	Comments	Attachment Versions Reviewed/Approved
29/04/2024 11:55:22 AM	Request approved (final) by Victoria Oszko		Approval Briefing - Schedule 6A Certificate Notice to Enter - Lismore City Council.docx- Version:4, Attachment C - Title Searches - Lismore - Terania Street - Bridge works.pdf- Version:2, Attachment E - Cardno Bridge Inspection Report 2019 - Lismore - Terania St Inspection Report v2.pdf- Version:2, Attachment F - Terania St Underbridge Level 2 Inspection Report.pdf- Version:2, Attachment D - DRAFT Schedule 6A Notification - Lismore.docx- Version:3, Attachment B - Email from Council re TfNSW proposal.msg- Version:2,

Date / Time	Description	Comments	Attachment Versions Reviewed/Approved
			Attachment G - SMEC Terania St Bridge Assessment - September 2023 TfNSW Commissioned SMEC.pdf- Version:2, Attachment A - Lismore - Map.pdf- Version:4,
29/04/2024 11:55:19 AM	Request Approved by Victoria Oszko	Please send me the final version of the letter (attached at D) for signature when it's ready. Thank you	Approval Briefing - Schedule 6A Certificate Notice to Enter - Lismore City Council.docx- Version:4, Attachment C - Title Searches - Lismore - Terania Street - Bridge works.pdf- Version:2, Attachment E - Cardno Bridge Inspection Report 2019 - Lismore - Terania St Inspection Report v2.pdf- Version:2, Attachment F - Terania St Underbridge Level 2 Inspection Report.pdf- Version:2, Attachment D - DRAFT Schedule 6A Notification - Lismore.docx- Version:3, Attachment B - Email from Council re TfNSW proposal.msg- Version:2, Attachment G - SMEC Terania St Bridge Assessment - September 2023 TfNSW Commissioned SMEC.pdf- Version:2, Attachment A - Lismore - Map.pdf- Version:4,
22/04/2024 02:18:07 PM	Sent to Victoria Oszko for approval by Bronwyn Williams	For approval please.	
11/04/2024 05:37:11 PM	Review completed by Teena Renes	Endorsed	Approval Briefing - Schedule 6A Certificate Notice to Enter - Lismore City Council.docx- Version:4, Attachment C - Title Searches - Lismore - Terania Street - Bridge works.pdf- Version:2, Attachment E - Cardno Bridge Inspection Report 2019 - Lismore - Terania St Inspection Report v2.pdf- Version:2, Attachment F - Terania St Underbridge Level 2

Date / Time	Description	Comments	Attachment Versions Reviewed/Approved
			Inspection Report.pdf- Version:2, Attachment D - DRAFT Schedule 6A Notification - Lismore.docx- Version:2, Attachment B - Email from Council re TfNSW proposal.msg- Version:2, Attachment G - SMEC Terania St Bridge Assessment - September 2023 TfNSW Commissioned SMEC.pdf- Version:2, Attachment A - Lismore - Map.pdf- Version:4,
09/04/2024 03:19:38 PM	Sent to Teena Renes for review by Bronwyn Williams		
09/04/2024 11:46:01 AM	Draft created by Bronwyn Williams		

Briefing: Director Regional Property & Asset Renewal

FOR APPROVAL by 30/04/2024

Urgent

Approval to issue Notice of Certificate of Entry to utilise Third Party Land

Purpose: To seek approval to exercise Schedule 6A powers under the *Transport Administration Act 1998* (NSW) (the **Act**) and issue a notice of intention and Schedule 6A Certificate to enter and use third party land outside the Country Regional Network (**CRN**) at Lismore.

Analysis: Transport for New South Wales (**TfNSW**) wish to utilise land owned by Lismore City Council (the **Council**) to facilitate urgent repair works (the **Works**) to a CRN rail underbridge asset, CRN asset number 67467 (old asset reference UBN62837A) (the **Infrastructure**) which is situated over Terania Street, Lismore NSW.

The Works will be detailed under separate cover and require different approvals.

The proposed entry and use of land under Schedule 6A allows TfNSW to occupy non-CRN land adjacent to the non-operational Casino to Murwillumbah line at approximately 837.125 km, off Terania Street, Lismore NSW. The various Lots and DP's (the **Land**) associated with the worksite, are as follows:

- Lots 1, 2 and 3 DP 798803
- Lots 3, 4, 14, 15, 16, 17, 18 and 19, Section 2, DP 975080
- Lots 1, 2 and 3 DP 197618
- Lot 1 and 2 DP 798796
- Lots 1, 2 and 3 DP 798811

The use of the Council's Land will enable the TfNSW Project Team to deliver the Works in a manner that provides greater worksite management and worksite protection for TfNSW staff and TfNSW appointed contractors.

The reputational risk is high if the Works are delayed, as there is considerable disruption and inconvenience to the local Community due to the closure of Terania Street and redirection of all local traffic to ensure safety.

The Director Regional Property and Asset Renewal is one of the delegates authorised to undertake all activities as agent for TAHE and to exercise the functions of TfNSW under Schedule 6A of the Act.

Recommendations

1. **Approve** the issuance of the Schedule 6A Certificate of Authority to enter and occupy Land identified in this briefing and for the specified duration by exercising the powers under Schedule 6A of the *Transport Administration Act 1998* (NSW) for entry and use of Council Land adjacent to the rail corridor.

The TfNSW Financial and General Delegations dated 28 Nov 2023 provide at item 20.5 that the Director, Regional Property and Asset Renewal has the delegation to exercise all functions of TAHE in relation to the CRN, and this notice is being sent on behalf of TfNSW under item 14.3 which is exercising the functions under Schedule 6A of the Act.

Key issues

Current Position

TfNSW are required to complete the Works to secure and make safe the CRN rail underbridge asset at Lismore, which is situated above Terania Street. The Infrastructure has been damaged by numerous vehicle strikes over time, causing instability and a potential hazard to the public and users of the roadway.

To secure the area, TfNSW, in conjunction with Council, have closed Terania Street under the Infrastructure and diverted traffic around the area to ensure public safety.

To deliver the Works, the TfNSW Project Team have indicated that Land outside of the CRN rail corridor (**Attachment A**) is required as an access and laydown worksite area for clean material stockpiling, site compound to facilitate the Works.

Council have given verbal approval for the use and access of the Land and have suggested TfNSW consider utilising legislative powers, given the lengthy process to secure a temporary short-term licence with Council (**Attachment B**) as the preferred option.

With Council's agreement, the use of powers under Schedule 6A would be the most effective method to gain access and use of the Land to perform the Work as a priority.

The Land

The Land is outside and adjacent to, the non-operational Casino to Murwillumbah Line and owned by Council.

The Land is not subject to Heritage significance and is located with the Local Government Authority (**LGA**) of Lismore City Council and zoned RU2: Rural Landscape and classified under the LGA as community land.

The occupation of the Land is not considered high risk and the Land will be returned to the same condition or better post the Works.

Title Search confirms the Council is the registered owner of the Land (**Attachment C**).

Supporting analysis

Financial impact

There is no material financial impact to TfNSW issuing the Schedule 6A Certificate of Notice of Authority to Enter.

Legal impact

Legal to approve the final Schedule 6A Notice (**Attachment D**) prior to issuing to the Council.

Consultation

TfNSW Legal have been consulted and have provided legal guidance with respect to the issue of the notice and the application of Schedule 6A under the Act.

Lismore City Council were approached and provided advice and concurrence to the issue of the notice.

Options

The following Option 1 has been identified being the preferred Option and supports the recommendation.

Option	Analysis
1 Approve the Recommendations	The Works to the CRN underbridge asset, over Terania Street, Lismore can commence in a timely manner. Works on the Infrastructure will reduce the risk of potential harm to the Community. The use of legislative powers to expediate the works will protect TfNSW's reputation and mitigate exposure.
2 Not approve the Recommendations	Works to CRN Infrastructure will be stalled. Potential negative public perception. High Risk to the safety of the public if the Works are not completed in a timely manner. Potential for unauthorised access, ignoring the current road closures and possible transfer of risk of damage to the rail underbridge at Alexandra Parade (detour route).

Agency Approval

Victoria Oszko

Director Regional Property and Asset Renewal

Regional and Outer Metropolitan (ROM)

Network and Assets (N&A)

Choose an item.

Date: Click or tap to enter a date.

Background

The Infrastructure is on land that forms part of the Country Regional Network (CRN) State Rail Lines and/or Land across New South Wales (NSW).

Based on Cardno's 2019 Bridge Inspection Report (**Attachment E**) and the 2023 Bridge Doctors condition report (**Attachment F**), the condition of the bridge is observed to be in very poor condition and has sustained damage as a result of a number of vehicle impacts. One pier has been displaced by approximately 300mm. Propping has been erected to support Piers 6 and 7.

Based on the outcome of the Bridge Doctors inspection, Transport in consultation with Council arranged for the closure of Terania Street to road traffic and engaged SMEC to consider options to re-open the road for a period of up to six (6) months while preparations were made to demolish the bridge (or spans over the road).

SMEC conducted an inspection of the bridge in September 2023 (**Attachment G**), specifically to consider the stability of the bridge. The inspection conducted by SMEC was a visual inspection only. SMEC noted Piers 4, 5 and 7 were unlikely to be able to sustain vehicle impact damage without breaking at the base and displacing. Pier 6 had already sustained vehicle impact damage and was propped and provided with concrete barrier protection. SMEC proposed a range of risk mitigations including revised propping, additional concrete barriers, height restriction structures, and imposing a limitation to only light vehicles access Terania Street.

These additional mitigations were installed and the road re-opened to traffic in October 2023. Since the road re-opened in December 2023, there have been two (2) further vehicle strikes recorded to the Terania Street bridge in January and February 2024 resulting in additional road closures at Terania Street. A temporary detour via Alexandra Parade Lismore was established as a detour for vehicles. As a result of the detour, the rail underbridge at Alexandra Parade also sustained a vehicle strike on 20 February 2024.

The Works to remove the spans over Terania Street are urgent and deemed as a priority to manage the existing risk at Terania Street, together with the transfer of risk to Alexandra Parade as a result of the detoured vehicles.

Attachments

Attachment	Title
A	MAP showing identified Land
B	Email from Lismore Council dated 27 March 2024
C	Title Search showing registered landowner as Lismore City Council
D	DRAFT Notice of Issuance of Certificate of Authority to Enter Land
E	2019 – Cardno Bridge Inspection Report
F	2023 – Bridge Doctors Condition Report
G	2023 – SMEC Bridge Inspection

Internal approvals

Teena Renés

Property Manager

Regional Property and Asset Renewal
Network and Assets
Regional and Outer Metropolitan

Endorsed

Date: 11 April 2024

Attachments



From: Rochelle Hellier <rochelle.hellier@lismore.nsw.gov.au>
Sent on: Wednesday, March 27, 2024 4:24:26 PM
To: Bronwyn Williams <Bronwyn.Williams@transport.nsw.gov.au>
CC: Teena Renes <Teena.Renes@transport.nsw.gov.au>; Luke Lawler <Luke.Lawler@transport.nsw.gov.au>; Jessica Butcher <jessica.butcher@lismore.nsw.gov.au>
Subject: Transport for NSW proposal for tenure /access over Terania Street Park Reserve (LCC ref: CDR24/645)

CAUTION: This email is sent from an external source. Do not click any links or open attachments unless you recognise the sender and know the content is safe.

Hi Bron,

Just a quick question please – does Transport for NSW have any powers available to take possession of land when carrying out these works? I believe as a Roads Authority, Transport does have powers under [s175 Roads Act 1993](#)? This may be a far simpler and quicker process than entering tenure. Can you please confirm if this is an option before making an application to enter a licence?

For the purpose of transparency, in order to enter a licence over this community land the following steps are required to be undertaken:

Step 1: Attend to payment of Council's non-refundable lease/licence renewal application fee:

As part of the agreement process, Council has a non-refundable licence renewal application fee of \$366. Payment of this fixed fee can be made by clicking on the following link, which will take you to our secure payment page: [Property - Payments for Property Services](#).

To assist you in completing Page 1 of the form, please enter the following for Council Details:

Council reference number:	CDR24/645
Council's property address:	Terania Street Park Reserve
Information Required:	Proposed Licence to TfNSW

To assist in completing Page 2, I advise the payment item you need to select is found under the heading 'CU2: Commercial Users: Lease or Licence', I have highlighted the payment option you will need to select.

COMMERCIAL USERS

CU1: Commercial Users - Request for owner's consent to lodge a development application over public land ☐ \$85.50 per request

CU2: Commercial Users - Lease or Licence Application/Renewal Administration Fee (non-refundable) ☐ \$366 per application

Could you please make payment at your earliest convenience. Once the application and payment are received one of the Council's Property Officers will attend to Public Notification

Step 2: Public Notice – Placing attached Exhibit Notice on Land

Our next step in the process is providing 'Public Notice' of the Council's proposal to enter the licence with TfNSW. In order for the Council to grant tenure over community land, legislation requires the Council must give 28 days' Public Notice of its proposal. The Council is required to publish this Public Notice on the Council's website, exhibit the notice on the community land and send notice to those who own (or occupy) land adjoining the community land. The Public Notice needs to provide sufficient details to identify the land concerned, the purpose of the tenure, the term of the agreement (e.g. three months), the name of the person whom the tenure is proposed to be granted and a statement that submissions in writing may be made to Council concerning the tenure proposal within the period specified in the notice. I appreciate the information provided about Public Notice requirements is quite brief. Please let me know if you have any questions about this legislation requirement.

Step 3: Reported to Council for Final Approval

Once the Public Notice period has closed, the proposed tenure is then discussed at the Council's monthly meeting for final review and approval by our Councillors that it may be entered into. You do not need to be in attendance at this Council meeting. However if you are interested in more information about Council Meetings and/or would like to speak in support of this matter at the Council meeting, then please see the following link for more information: [Engage with the democratic process through our meetings and briefings – Lismore City Council \(nsw.gov.au\)](https://www.lismore.nsw.gov.au/engage-with-the-democratic-process-through-our-meetings-and-briefings).

Once we have confirmation from the Council that the licence may be entered, we will be in a position to send you the agreement for review and signing.

Of course, if you have any questions about this e-mail or the Council's application process in general, please don't hesitate to contact me directly at 6625 0500.

Rochelle Hellier | Property Officer | **Lismore City Council**

PO Box 23A, Lismore, NSW 2480 | T 6625 0500 | www.lismore.nsw.gov.au

Lismore City Council acknowledges the people of the Bundjalung Nation, traditional custodians of the land on which we work.



OFFICIAL

From: Bronwyn Williams <Bronwyn.Williams@transport.nsw.gov.au>

Sent: Tuesday, March 19, 2024 10:46 AM

To: Records <Council@lismore.nsw.gov.au>

Cc: Teena Renes <Teena.Renes@transport.nsw.gov.au>; Luke Lawler <Luke.Lawler@transport.nsw.gov.au>;

Rochelle Hellier <rochelle.hellier@lismore.nsw.gov.au>

Subject: Request for Access - non TfNSW land at Lismore North - Various lots off Terania Street - owned by Lismore City Council

CAUTION: This email was sent from outside our organisation. Be cautious, particularly with links and attachments unless you recognise the sender and know the content is safe.

Good morning

Transport for New South Wales ("TfNSW") are seeking permission to utilise some land adjoining the rail corridor at Lismore North NSW, which title searches have shown the owner to be Lismore City Council. TfNSW would like to licence the land for a period of approximately three (3) months with a start date to be determined. The proposed Licence would be for access for trucks and for a laydown area, stockpiling of materials, carparking, site compound sheds and plant unloading loading area utilising heavy vehicle access to facilitate rail works in the rail corridor for the removal of the derelict rail underbridge over Terania Street.

Details of the land requested is listed below and the proposed area of use is shown outlined in the MAP below marked "Site Compound".

- Lots 1,2 and 3 DP 798803
- Lots 3, 4, 14, 15, 16, 17, 18 and 19, Section 2, DP 975080

- Lots 1, 2 and 3 DP 197618
- Lot 1 and 2 DP 798796
- Lots 1, 2 and 3 DP 798811

TfNSW request consideration to waive any fees applicable for the access and use of Council land for the works period. Should agreement be reached for access, TfNSW understand that some properties adjoining the rail corridor have current biosecurity plans in place and, if applicable, please provide the plan.

Please don't hesitate to contact me should you need further information or to discuss the access. I await your advice.

Figure 1 Lismore



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Kind regards,

Bronwyn Williams

Property Officer

Regional Property & Asset Renewal

Network & Assets

Regional and Outer Metropolitan

Transport for NSW

M 0484 342 871 E Bronwyn.Williams@transport.nsw.gov.au

transport.nsw.gov.au

Level 1, 6 Stewart Avenue
Newcastle West NSW 2302



WiSe Transport Network



Transport
for NSW



I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

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We work flexibly. If you receive an email from me outside of business hours, I'm sending it at a time that suits me. I'm not expecting you to read or reply until your normal business hours.

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1/798803

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	14/3/1989

LAND

LOT 1 IN DEPOSITED PLAN 798803
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798803

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA34098)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

PRINTED ON 13/3/2024

Search Date/Time: 13/03/2024 8:26AM

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 2/798803

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	14/3/1989

LAND

LOT 2 IN DEPOSITED PLAN 798803
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798803

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA34098)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 3/798803

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	14/3/1989

LAND

LOT 3 IN DEPOSITED PLAN 798803
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798803

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA34098)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 14/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	19/5/1994

LAND

LOT 14 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63038)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 15/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	19/5/1994

LAND

LOT 15 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63039)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 16/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	26/5/1994

LAND

LOT 16 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63059)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH
-----FOLIO: 17/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
-----	----	-----	----
13/3/2024	8:26 AM	1	26/5/1994

LAND
-----LOT 17 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63058)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

PRINTED ON 13/3/2024

Search Date/Time: **13/03/2024 8:26AM**

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 18/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	26/5/1994

LAND

LOT 18 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63057)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 19/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:26 AM	1	26/5/1994

LAND

LOT 19 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

LISMORE CITY COUNCIL (CA63062)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Lismore-Terania St

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 3/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:27 AM	1	19/2/1992

LAND

LOT 3 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34100)

SECOND SCHEDULE (2 NOTIFICATIONS)

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NOTATIONS

UNREGISTERED DEALINGS: NIL

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 4/2/975080

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:30 AM	1	19/2/1992

LAND

LOT 4 OF SECTION 2 IN DEPOSITED PLAN 975080
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP975080

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34100)

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1/197618

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:30 AM	1	25/5/1992

LAND

LOT 1 IN DEPOSITED PLAN 197618
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP197618

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34097)

SECOND SCHEDULE (2 NOTIFICATIONS)

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LAND

LOT 2 IN DEPOSITED PLAN 197618
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP197618

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THE COUNCIL OF THE CITY OF LISMORE (CA34097)

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LAND

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AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP197618

FIRST SCHEDULE

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1/798796

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:30 AM	1	18/5/1992

LAND

LOT 1 IN DEPOSITED PLAN 798796
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798796

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34095)

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
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NOTATIONS

UNREGISTERED DEALINGS: NIL

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FOLIO: 2/798796

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LAND

LOT 2 IN DEPOSITED PLAN 798796
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798796

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34096)

SECOND SCHEDULE (2 NOTIFICATIONS)

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NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1/798811

SEARCH DATE	TIME	EDITION NO	DATE
13/3/2024	8:30 AM	1	21/2/1992

LAND

LOT 1 IN DEPOSITED PLAN 798811
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798811

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34099)

SECOND SCHEDULE (2 NOTIFICATIONS)

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LOT 2 IN DEPOSITED PLAN 798811
AT NORTH LISMORE
LOCAL GOVERNMENT AREA LISMORE
PARISH OF NORTH LISMORE COUNTY OF ROUS
TITLE DIAGRAM DP798811

FIRST SCHEDULE

THE COUNCIL OF THE CITY OF LISMORE (CA34100)

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The General Manager
Lismore City Council
PO Box 23A
LISMORE NSW 2480

Attention: Rochelle Hellier, Property Officer
By Email: rochelle.hellier@lismore.nsw.gov.au

NOTICE OF ISSUANCE OF CERTIFICATE OF AUTHORITY TO ENTER LAND

9 April 2024

Dear Sir / madam,

TfNSW holds a statutory power to access and occupy land adjacent to Transport for New South Wales (**TfNSW**) rail corridor, by persons issued with Certificates of Authority, pursuant to clause 3 of Schedule 6A of the *Transport Administration Act 1998* (NSW) (**Act**) for the purpose of exercising its functions.

Given the risk to the community and with the agreement of Council, TfNSW will be utilising its powers under the Act to authorise the holder(s) of a Certificate of Authority, and the persons referred to below, to access and occupy the Land for the purpose of urgent Bridge works outlined in Table 1 below (the **Land** and the **Works**) and any associated works, together with any necessary equipment, machinery and vehicles.

These Works constitute works undertaken to repair and maintain TfNSW’s rail infrastructure facilities. Access will be needed from **DATE TO DATE**.

TABLE 1

Land	Land known as: - Lots 1, 2 and 3 DP 798803 - Lots 3, 4, 14, 15, 16, 17, 18 and 19, Section 2, DP 975080 - Lots 1, 2 and 3 DP 197618 - Lot 1 and 2 DP 798796 - Lots 1, 2 and 3 DP 798811 off Terania Street at Lismore as depicted in yellow in the Plans at Annexure A
Works Proposed on the Land	Rail activities to be undertaken on the Land associated with TfNSW's adjacent rail infrastructure project works (in accordance with environmental approvals); including but not limited to the following:

	1. Access for TfNSW and its contractors to use the Land for its construction vehicles and heavy equipment; 2. To pass and re-pass over the Land; 3. Stockpiling of materials (with sediment and erosion protection in place); 4. Storage of site sheds, plant, equipment, and, rail components; 5. Parking of vehicles (if required); 6. Removal, installation, repair, replacement or reinstatement of fencing, gates, or, cattlegrids (if any) as required; 7. Works associated with mobilisation and site preparation of; and 8. Such other uses of the Land that is reasonably necessary by TfNSW to carry out associated works being adjacent rail infrastructure project works.
Locality	LISMORE, NSW

The Certificate of Authority will authorise the holders, being the TfNSW Project Team, the Site Supervisor for TfNSW's appointed contractor, and the constituent members of his or her respective teams, to access and occupy the Land (on a non-exclusive basis subject to appropriate safety protocols) for the purpose described above.

The Certificate of Authority is proposed to commence **DATE till midnight DATE**.

In issuing this Certificate of Authority, TfNSW acknowledges its obligations pursuant to the Transport Administration Act 1988 (NSW) (the "Act") to do as little damage as practicable in accessing and occupying the Land.

Sincerely,

Signed on behalf of Transport Asset Holding Entity of NSW (TAHE)

Victoria Oszko

Director Regional Property & Asset Renewal

Network and Assets

Regional and Outer Metropolitan (ROM)

Transport for NSW

0419 013 347

Vicki.Oszko@transport.nsw.gov.au

Encl.

Annexure A
("Land")



Bridge Inspection Report

UBN62837A Underbridge Lismore, NSW

80520018-02



Prepared for
John Holland Group

May 2020

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Document Information

Prepared for John Holland Group

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Version	Effective Date	Description of Revision	Prepared by	Reviewed by
1	02/04/2020	Issued for Review	JJ, TP	SGB, LMcl
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Executive Summary

Cardno was commissioned by John Holland Rail Country Regional Network (JHRCRN) in December 2019 to undertake a detailed visual inspection of the UBN62837A Terania Street Underbridge in Lismore, NSW.

A detailed visual inspection and condition assessment was carried out on 3 December 2019 by Cardno's Principal Bridge Engineer Lachlan McLean and Civil Design Manager Scott Brisbin, accompanied by JHR Representatives Rebecca James and Gary Estcourt. The purpose of the inspection was to identify and record defects, measure key elements of the bridge geometry and assess options to reduce the incidence of repeated vehicular impact to the soffit and trestles of the bridge, and removal of the temporary propping.

The bridge is on the State Heritage register and is located on a non-operational line. Due to identified safety concerns the inspection was undertaken from ground/road level, with access to rail level only possible at the top of embankments. Several defects were noted and based upon our inspection findings the bridge is in generally poor condition.

Observed defects are very extensive and significant and do not allow for a normal structural engineering code assessment to reliably predict ongoing structural safety concerning residual stability (without extensive remedial / replacement works).

A series of actions are recommended, including:

- a. Replacement of missing girders and repair trestle piers and tie bars;
- b. Reconstruction of columns, headstocks, diagonal and horizontal bracing at Pier 4;
- c. Closure of the original (central) carriageway;
- d. Installation of appropriate warning signs and overhead steel protection structure;
- e. Installation of guardrail with approved end terminals and associated pavement line marking;
- f. Ongoing inspection and maintenance.

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1 Introduction

John Holland Rail Pty Ltd engaged Cardno (NSW/ACT) Pty Ltd to undertake a detailed visual inspection and condition assessment of UBN62837A Terania Street Underbridge in Lismore, NSW at 837.125 KM.

The timber bridge is on the State Heritage register and is located on a non-operational line. Due to identified safety concerns the inspection was undertaken from ground/ road level, with access to rail level only possible at the top of embankments. Several defects were noted and based upon our inspection findings the bridge is in generally poor condition.

Terania Street is a public road and passes under the rail bridge. At the bridge location the main road carriageway splits around the bridge span over the centre of the road due to vehicles strikes to the bridge.

2 Asset Description

The table below presents a summary of asset information derived from JHR asset information, the asset's State Heritage list and Cardno's site observations.

Table 2-1 Bridge Information

Kilometrage	837.125
Region	Northern Rivers
Bridge Name	UBN62837A Terania Street Underbridge
Year of Construction	Circa 1894
Location	Lismore NSW
Track Alignment	Straight
No. of Tracks	1
Total Width (m)	2.1
Total Length (m)	88 (skew)
Rail Level to Invert (m)	Varies
No of spans	12
Span Length (m)	7.3 (skew)
Span type	Timber Transom Top
Number of girders	Not noted
Deck	Timber
Piers	Timber
Abutment	Timber/ Concrete

3 Bridge Inspection

3.1 General

The bridge inspection was carried out on 03 December 2019 by Cardno Bridge Engineers accompanied by JHR Representatives Rebecca James and Gary Estcourt. The weather was sunny and fine.

Access was gained to the structure on foot from ground level, there was no specialist equipment or traffic management required.

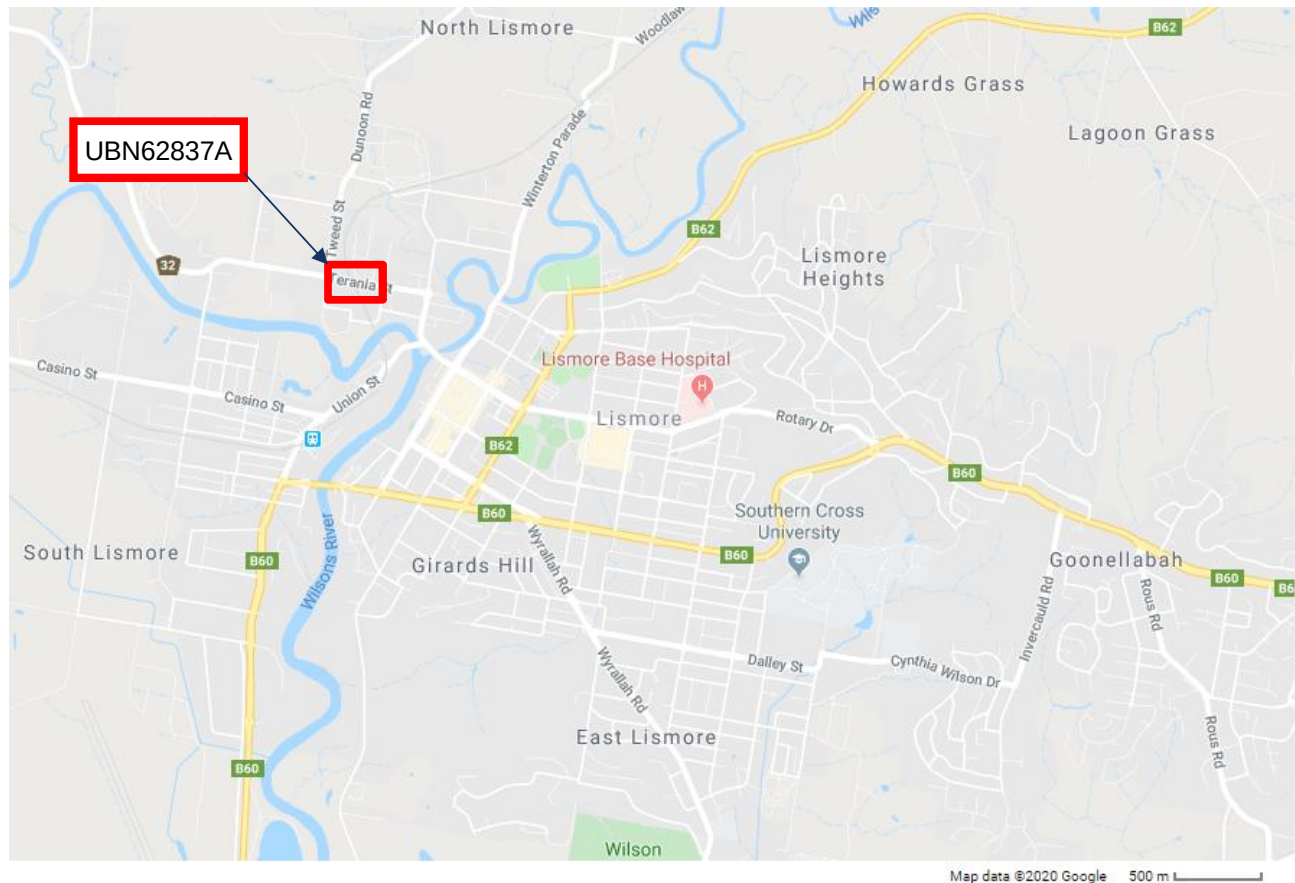


Figure 3-1 Location Plan

3.2 Description of Structure

The structure is a 12 span timber trestle top bridge listed on the State Heritage Register, which carries the non-operational Casino to Murwillumbah Railway over Terania Street.

The deck comprise timber transoms bolted to 3 double timber girders (300mm x 300mm) with 125mm x 125mm x 5mm equal angles at both sides, supported on 3 square timber corbels (300mm x 300mm x 2800mm) over the piers. The corbels are supported directly on top of timber headstocks at the trestle piers.

The bridge abutments consist square timber headstock sill beams supported on concrete footings.

The timber trestle piers comprise square timber headstock beams (300mm x 300mm) on 3 timber piles with 2 outer bracing piles, 2 diagonal timber cross bracing (200mm x 200mm) and 2 timber wale beams on concrete footings. The bridge elements are connected using steel tie bars.

Pier 6 has structural support in the form of 4 trishore props, 2 on each side of the pier under each corbel.



Figure 3-2 Downside elevation of bridge over Terania Street (looking east)



Figure 3-3 Upside elevation of bridge over Terania Street (looking west)



Figure 3-4 General view of Abutment 1 (south)



Figure 3-5 General view of Abutment 2 (north)

3.3 Bridge Defects

Following is a summary of the defects found during the inspection.

The defects currently observed include material member deterioration caused by extensive rot, termite attack, with significant timber splitting, connection failure, & missing or significantly damaged members from earlier vehicle strikes. These defects are present across the spans open for local traffic and in the spans across adjacent unfenced easements which present a risk to the public.

These defects are very extensive and significant and do not allow for a normal structural engineering code assessment to reliably predict ongoing structural safety concerning residual stability (without extensive remedial / replacement works).

Table 3-1 Summary of Bridge Defects

#	Element	Defect Type	Defect Category	Description	Repair Priority	Photo
1	Main girder	Missing girders	D	Middle girders and corbel missing over Trestle 6, no middle girders from Trestle 5 to 7. Girders cut/ broken off at pier locations.	My1	
2	Main girder	Impact damage	E	Vehicle strikes have caused minor damage to bottom of outer girder on Span 5. Several of the outer girders over the road spans have evidence of impact damage.	Mxx	
3	Corbel	Splits	E	A majority of the corbels have large splits, up to 10mm wide. Middle corbel at Abutment 2 has some section loss at the end of the corbel.	Mxx	

						
4	Abutment 1 Headstock/ Sill	Decayed and rotting	C	Abutment 1 headstock/ sill beam generally rotten, cracked, weathered and decaying on the downside.	My2	 
5	Trestle Headstock	Settled, decayed and weathered	B	Pier 7 packers settled and rotated. Headstocks typically decayed and weathered. Note splitting to piles and cross bracing.	Ry1	 
6	Trestle Piles	Impact damage	E	Trestle 6 badly damaged through vehicle strike, 4 trishore temporary props installed below corbels. 1 each side of trestle. Downside piles severely displaced. Span 6 road lane closed beneath structure. Note split to middle pile and cross bracing.	Mxx	

7	Cross bracing	Decayed	C	Trestle 5 Cross bracing badly weathered and decayed/ missing from bottom 800mm adjacent to the road	My2	
8	Steel Tie bars	Loose & corroded	E	Tie bars to corbels and girders over Pier 8 fallen down through timber and loose. Tie bars generally corroded.	Mxx	
	Pier	Sway deflection	E	The skewed deck and impacts to the piers appears to have caused the eccentric drift of the top of the piles relative to the base footing by approx. 1/2 a pile diameter	Mxx	

3.4 Recommended Rectification Works

The defective, damaged and deteriorated bridge spans (particularly over the 3 roadway lanes with public access) needs to be removed or improved to limit potential further impacts and the hazard of falling failed structures.

Options for site structural risk management include;

1. Removal of the structures in the roadway space (deleting three spans and two piers).
2. Improvement of the structures to make safe (rebuilding original or modified members in steel etc).
3. Isolation or barriers to prevent over height vehicles and barrier to protect structures from striking the bridge deck, piers or bracing substructure.
4. Isolation barriers to limit access below the structures in public and private land.

The heritage value of the structure will not be conserved without some conservation of the structure. Expectations under the conservation contract need to be understood to direct appropriate safety management of the structures in public road spaces and on private land.

Below are some potential repair actions to improve safety.

Table 3-2 Recommended Rectification Works

#	Action
1	Replace missing girders from Span 6 to 7
5/6	Repair damage to trestle piers, especially around road spans to reduce continued risk to pedestrians and traffic. With severe impact damage pier reconstruction with new columns bracing and headstocks would be required to ensure effective members and connections are installed.
8	Tighten or replace loose tie bars

The asset management team considering public safety, legal obligations, budgetary limitations, stakeholder expectations and residual risks, needs to form a structural asset management plan to direct current actions and plan for future heritage structure activities. Development of potential options for the site and structure are provided in the following report section. See Table 4-5 Options Assessment Summary.

4 Civil Inspection

4.1 General

A civil inspection of the Terania Street Underbridge (UBN62837A) and its immediate surrounds was undertaken on the 3rd of December, 2019 by Cardno Engineers accompanied by JHR Representatives, Rebecca James and Gary Estcourt.

The underpass consists of one two-lane carriageway traversing east-west. The carriageway diverges beneath the underbridge where each lane crosses underneath one bridge span. This arrangement forms part of previous remedial Works which involved the closure of the original carriageway where both lanes traversed through one bridge span. The small lane widths of the original carriageway resulted in the underbridge being vulnerable to vehicular impacts. A trishore support system was installed during the above-mentioned remedial Works to support pier 6. Concrete barriers have been installed around this support system to protect it from further damage.

The westbound lane lies between piers 4 and 5, the original carriageway between piers 5 and 6 and the eastbound lane between piers 6 and 7. Vertical clearance of the west and east bound lanes to the underbridge is 4 m and that of the original carriageway is 3.8 m.

Terania Street forms part of Tourist Drive 32 which is an approximately 80 km route between Lismore and the NSW / QLD border. Approximately 30 m east of the underbridge on Terania Street is the Peate Street T-intersection which approaches from the north while 150 m west of the underbridge is the Tweed Street intersection.



Figure 4-1 Aerial image of Terania Street Underbridge (Nearmap, 2020)



Figure 4-2 Underbridge facing west



Figure 4-3 Trishore support to damaged Pier 6

4.2 Civil Constraints

4.2.1 Existing Services

A Dial Before You Dig (DBYD) search was undertaken in preparation for the inspection. This information was then confirmed onsite and any additional information pertaining to existing services was also noted. Notes taken from the visual inspection were further refined with a set of asset information provided to Cardno by Lismore City Council, dated 7th January 2020, refer to Appendix B. The results of these investigations have identified the following:

- A water main traverses parallel to the southern edge of the westbound lane and crosses Terania Street east of the underbridge to supply Peate Street. This was confirmed onsite by a water hydrant and a stop valve on the western and eastern sides of the underbridge respectively.
- A stormwater culvert was identified onsite with a measured diameter of 0.375 m which crosses the two carriageways east of the underbridge.
- A fibre optic cable owned by Nextgen Group runs along the eastern boundary of the railway line, a series of cable markers nearest to piers 4 and 7 (SB1-11-054, SB1-11-057 and SB1-11-058) confirmed this onsite and identified the cable is at a depth of 1.2 m.
- An underground cable owned by Telstra runs parallel to the northern edge of the eastbound lane, this was confirmed onsite by a pit which had deteriorated so that the cable was visible from ground level.
- Overhead powerlines owned by Essential Energy are present in the vicinity of the underbridge however, none cross it. Street lights were confirmed onsite on both approaches to the underbridge.
- Underground cables, both high and low voltage owned by Essential Energy run parallel to the southern edge of the westbound lane.

4.2.2 Road and Traffic

The information pertaining to each carriageway as identified during the underbridges visual inspection is presented in Table 4-1.

Table 4-1 Table 4-1 Road Information

Parameter	Westbound lane	Non-operational carriageway	Eastbound lane
Material	Concrete	Asphalt	Concrete
Posted speed limit (km/hr)	50	-	50
Clearance to underbridge (m)	4	3.8	4
Lane width (m)	1 x 3.5	2 x 2.4	1 x 3.5

Average Daily Traffic (ADT) information for the site was provided by Lismore City Council on 7th January 2020 (refer Appendix B). The provided ADT information is summarised below.

Four sets of data were made available for Terania Street measured on the eastern and western approaches to the underbridge dated between 01/07/1986 and 21/11/2013. Additionally, two sets of data were made available for Tweed Street, which intersects Terania Street approximately 150 m west of the underbridge. These records were dated on 01/07/1998 and 21/11/2013. The results of the traffic data for Terania Street and Tweed Street are presented in **Error!**
Reference source not found. and

respectively.

Table 4-2 Terania Street Traffic Information

Date and Location	Average Daily Traffic (ADT)
01/07/1986 (between Tweed St and Underbridge)	5,300 (Heavy = N/A)
01/07/1996 (west of Tweed St)	4,865 (Heavy = N/A)
01/07/2002 (at Underbridge)	5,565 (Heavy = N/A)
29/04/2013 (west of Tweed St)	3,467 (Heavy = 8.2%)

Table 4-3 Tweed Street Traffic Information

Date and Location	Average Daily Traffic (ADT)
01/07/1998 (just north of Terania St intersection)	2,424 (Heavy = N/A)
21/11/2013 (300m north of Terania St intersection)	2,169 (Heavy = 7.8%)

4.2.3 Flooding

The underbridge is located to the north of Leycester Creek and to the west of Wilsons River. It is understood from review of Council's 'Lismore Suburb Flood and Floor Levels' document that the site is inundated during a during 10%, 5% and 1% AEP (Annual Exceedance Probability) storm events per flood information provided to Cardno by Lismore City Council on 19th March 2020 (refer Appendix B). A summary of the flood information modelled at the bridge is presented below.

Table 4-4 Flooding Data

Parameter	Storm Event (AEP)		
	10%	5%	1%
Flood Level (mAHD)	11.51	12.03	12.88
Depth (m)	2.86	3.38	4.21
V*D (m ² /s)	0.83	1.03	1.47
Hazard Rating	High	High	High

The flood mapping provided by Council confirms that Terania Street, as well as the surrounding lots, are inundated during each of the three above-mentioned events.

4.3 Recommended Rectification Works

4.3.1 Options Analysis

Given the above-mentioned site constraints, 10 options have been considered to rectify the issue and ultimately reduce the frequency and severity of vehicular impacts to the bridge. Each option has been assessed at a high level and the suitability of each option is broadly outlined in Table 4-5. Some examples of rectification options installed elsewhere, are presented in Appendix C for reference.

Table 4-5 Options Assessment Summary

Option	Opportunities	Limitations
1. Reconstruct road at a lower level to increase vertical clearance to underbridge	a. Vertical clearance increased b. Improved vehicle accessibility c. Heritage value retained	a. Existing services potentially impacted b. Increased inundation of road during storm events c. Underpinning of underbridge piers may be required d. Potentially high construction cost e. No reduction in risk of bridge components falling onto road
2. Install early warning system i.e. maximum clearance barriers, line marking and associated signage	a. Probability of bridge strike reduced b. Heritage value retained c. Low cost	a. Vehicle access not improved b. No reduction in risk of bridge components falling onto road
3. Install guard rail to protect timber trestles	a. Probability of bridge strike reduced b. Heritage value retained c. Low cost	a. Vehicle access not improved b. No reduction in risk of bridge components falling onto road c. Minor reduction in carriageway width
4. Raise bridge spans over road to an acceptable clearance	a. Vertical clearance increased b. Improved vehicle accessibility c. Heritage value retained	a. Structure in poor condition b. High cost c. Raising two of the 12 spans may not be aesthetically pleasing d. No reduction in risk of bridge components falling onto road
5. Modify bridge girders to increase clearance	a. Moderate increase in vertical clearance b. Some improvement in vehicle accessibility	a. Structure in poor condition b. Potentially impacts heritage value of asset c. High cost for only a moderate (approximately 300 mm) increase in vertical clearance d. No reduction in risk of bridge components falling onto road
6. Remove bridge span over the main carriageway	a. No restriction to vertical clearance b. Improved vehicle accessibility c. Risk of bridge components falling onto road eliminated	a. Heritage item partially removed
7. Remove entire bridge	a. Increased accessibility b. Risk of bridge components falling onto road eliminated	a. Heritage item entirely removed b. High cost
8. Creation of road diversion adjacent to existing carriageway	a. Vertical clearance increased b. Improved vehicle accessibility c. Heritage value retained	a. Existing services potentially impacted b. Increased inundation of road during storm events

		c. Underpinning of underbridge piers may be required d. Potentially high construction cost e. No reduction in risk of bridge components falling onto road
9. Close Terania St each side of underbridge	a. Heritage item retained b. Risk of bridge components falling onto road eliminated	a. Closes an arterial road to public b. Road used by over 5,000 vehicles per day (including about 8% heavy vehicles) c. Alternative route will add significant travel distance d. Option would need to be discussed and agreed with Council e. Proposal may not be viewed as acceptable by the public
10. Do nothing	a. Low capital cost b. Heritage item retained	a. Current strike risk not addressed

Rectifying the potential for bridge strikes and improving the safety of the public is of the highest importance to achieve the overall objective of the project. Additionally, retention of the structure has been prioritised due to the State Heritage listed item's significant bearing on the community.

With consideration to the above, the three most suitable options to address the risk at Terania Street are:

- Option 1: Reconstruct road at a lower level
- Option 2 and 3: Install early warning system and guard rail
- Option 6: Remove bridge span over main carriageway

Note the options table above has provided "Do nothing" and other minimal action options for the purpose of allowing a more complete risk evaluation. Allowing an unsafe damaged bridge structure to be driven under by members of the public is not a safe option and would not be recommended as a final solution.

4.3.2 North Lismore Plateau (NLP) Development

The North Lismore Plateau (NLP) Road Network Suitability Assessment Report (underbridge (TGM Group Pty Ltd, 2013) does not identify Terania Street as a key infrastructure route to service the proposed development. As such, it is assumed that the Underbridge site will not be subject to a significant change in traffic volumes as a result of the development.

4.3.3 Risk Assessment

A risk assessment of the three most suitable options has been undertaken using Cardno's Risk Management Framework. The consequence and likelihood of eight (8) criteria were assessed using the risk matrix presented in Figure 4-4 to determine the recommended rectification Works with the lowest residual risk.

LIKELIHOOD	CONSEQUENCE SEVERITY				
	1 NEGLECTIBLE	2 MINOR	3 MODERATE	4 MAJOR	5 SEVERE
A – Almost Certain	Moderate 5	Significant 10	High 15	High 20	High 25
B - Likely	Moderate 4	Significant 8	Significant 12	High 16	High 20
C - Possible	Moderate 3	Moderate 6	Significant 9	Significant 12	High 15
D – Not likely	Low 2	Low 4	Moderate 6	Significant 8	Significant 10
E - Rare	Low 1	Low 2	Moderate 3	Moderate 4	Moderate 5

Figure 4-4 Assessment Matrix

The eight risk categories considered in this assessment are as follows:

1. Strike to girders
2. Strike to trestles
3. Bridge component falls to road
4. Impact to heritage value
5. Capital cost
6. Maintenance cost
7. Environmental impacts
8. Stakeholder rejection

The results of the risk assessment are shown in Table 4-6, Table 4-7, Table 4-8 and Table 4-9.

Table 4-6 Risk Assessment – Existing

Criteria	Existing		
	Likelihood	Consequence	Risk
Strike to girders	Likely (4)	Major (4)	High (16)
Strike to trestles	Likely (4)	Major (4)	High (16)
Bridge component falls to road	Likely (4)	Major (4)	High (16)
Impact to heritage value	Rare (1)	Negligible (1)	Low (1)
Capital cost	Rare (1)	Negligible (1)	Low (1)
Maintenance cost	Likely (4)	Moderate (3)	Significant (12)
Environmental impacts	Rare (1)	Negligible (1)	Low (1)
Stakeholder rejection	Likely (4)	Moderate (3)	Significant (12)
Total			75

Table 4-7 Risk Assessment – Option 1 Reconstruct road at a lower level

Criteria	Option 1		
	Likelihood	Consequence	Risk
Strike to girders	Not likely (2)	Major (4)	Significant (8)
Strike to trestles	Likely (4)	Major (4)	High (16)
Bridge component falls to road	Likely (4)	Moderate (3)	Significant (12)
Impact to heritage value	Rare (1)	Negligible (1)	Low (1)
Capital cost	Almost certain (5)	Moderate (3)	High (15)
Maintenance cost	Likely (4)	Minor (2)	Significant (8)
Environmental impacts	Rare (1)	Negligible (1)	Low (1)
Stakeholder rejection	Rare (1)	Negligible (1)	Low (1)
Total			62

Table 4-8 Risk Assessment – Option 2-3 Install early warning system and guard rail

Criteria	Option 2 + 3		
	Likelihood	Consequence	Risk
Strike to girders	Rare (1)	Major (4)	Low (4)
Strike to trestles	Rare (1)	Major (4)	Low (4)
Bridge component falls to road	Likely (4)	Moderate (3)	Significant (12)
Impact to heritage value	Rare (1)	Negligible (1)	Low (1)
Capital cost	Almost certain (5)	Minor (2)	Significant (10)
Maintenance cost	Rare (1)	Moderate (3)	Low (3)
Environmental impacts	Rare (1)	Negligible (1)	Low (1)
Stakeholder rejection	Not likely (2)	Minor (2)	Low (4)
Total			39

Table 4-9 Risk Assessment – Option 6 Remove bridge span over main carriageway

Criteria	Option 6		
	Likelihood	Consequence	Risk
Strike to girders	Rare (1)	Negligible (1)	Low (1)
Strike to trestles	Rare (1)	Negligible (1)	Low (1)
Bridge component falls to road	Rare (1)	Negligible (1)	Low (1)
Impact to heritage value	Almost certain (5)	Severe (5)	High (25)
Capital cost	Almost certain (5)	Minor (2)	Significant (10)
Maintenance cost	Rare (1)	Negligible (1)	Low (1)
Environmental impacts	Rare (1)	Negligible (1)	Low (1)
Stakeholder rejection	Almost certain (5)	Severe (5)	High (25)
Total			65

A comparison of the risk assessment results is presented in Table 4-10.

Table 4-10 Comparison of Risk Assessment Options

Option	Risk Rating
Existing	75
Option 1: Reconstruct road at a lower level	62
Option 2 & 3: Install early warning system and guard rail	39
Option 6: Remove bridge span over main carriageway	65

4.3.4 Recommendations

With consideration to the above options analysis and risk assessment, Cardno recommends the following works to reduce the risk of vehicle strike to the underbridge:

- Retain the existing secondary (diverged) carriageways at underbridge.
- Permanently close the original (central) carriageway at underbridge.
- Install appropriate warning signage prior to the underbridge on both approaches warning of the reduced vertical clearance.
- Install appropriate warning signage prior to the underbridge on both approaches warning of lane divergence to secondary carriageways at the underbridge.
- Install overhead steel protection structures to physically restrict high vehicle access and protect the bridge from over-height vehicle strikes.
- Install approved guard rail and approved end terminals to protect the timber trestles at Piers 4, 5, 6 and 7 from vehicle strikes.
- Install pavement line marking to support and reinforce to drivers the above arrangement.

Refer to drawing no. CC000xxx-02 for the proposed layout at Terania Street.

It is considered that the installation of guard rail and approved end terminals is an appropriate measure to protect the timber trestles from vehicle strikes. It is anticipated that the guard rail immediately below the underbridge can be installed without significant impact to existing secondary (diverged) carriageway widths.

It is expected that new edge line pavement markings will be installed just off the face of the guard rail. While this arrangement does not meet the requirements of Austroads, given the site constraints and low speed environment, it is considered appropriate in this instance.

Further, it is considered that closure of the original (central) carriageway (3.8 m vertical clearance) and retention of the two secondary (diverged) carriageways (4.0 m vertical clearance) is the most appropriate configuration as it maximises vertical clearance and provides consistency to travel from both directions.

5 Conclusion and Recommendations

The bridge was constructed circa 1894, and is considered to be in generally poor condition.

Based on the inspection findings and condition of the structure, Cardno recommends the following actions to reduce the risk to the public and road users:

- a. Replacement of missing girders over road Spans 6 & 7
- b. Repair of damage to trestle piers, especially around road spans to reduce continued risk to pedestrians and traffic. This includes ensuring columns and their connections are sound and not loose or defective. Replacement columns, headstocks, diagonal and horizontal bracing at this site would be required at 4 piers between and adjacent to the existing road access lanes.
- c. Carry out repairs to any defective tie bars.
- d. Retain the existing secondary (diverged) carriageways at underbridge.
- e. Permanently close the original (central) carriageway at underbridge.
- f. Install appropriate warning signage prior to the underbridge on both approaches warning of the reduced vertical clearance.
- g. Install appropriate warning signage prior to the underbridge on both approaches warning of lane divergence to secondary carriageways at the underbridge.
- h. Install overhead steel protection structures to physically restrict high vehicle access and protect the bridge from over-height vehicle strikes.
- i. Install approved guard rail and approved end terminals to protect the timber trestles at Piers 4, 5, 6 and 7 from vehicle strikes.
- j. Install pavement line marking to support and reinforce to drivers the above arrangement.
- k. Continue 12 month visual inspection and 2 year engineering inspection per CRN CS 100 (Civil Technical Maintenance Plan).

6 References

- > RailCorp Engineering Manual Structures TMC 301 – Structures Examination
- > RailCorp Engineering Standard Structures ESC 302 – Structures Defect Limits
- > CRN CS 100 - Civil Technical Maintenance Plan – 2019
- > CRN CS 300 – Structures System - 2016
- > CRN CS 310 – Underbridges – 2017
- > CRN CM 101 - Civil Service Schedule - 2017
- > CRN CM 302 - Structures Examination – 2019
- > North Lismore Plateau (NLP) Road Network Suitability Assessment Report, TGM Group Pty Ltd – Feb 2013

APPENDIX

A

JHR DEFECTS LIST



Defect List

Asset	Asset Description	Defect	Defect Start Measure	Defect End Measure	Work Group	Rail Priority	Classification	Date Reported	Repair by Date	Actual Finish	Status	Summary	Details	Corridor Code	Sector Code	Sector Name	Sector Start Measure	Sector End Measure	Operation Type
UBN62837A	UnderBridge - Timber Transom Topped Lismore Yard	91980	837.125	837.213	TAMSTRUC	C-Ry2	RAIL \ UNDERBRIDGE, OVERBRIDGE DEFECTS \ TIMBER \ FOOTINGS, PIERS, TRESTLES, ABUTMENTS \ WALING \ DECAYED, ROT, DEGRADATION	11/09/2015	15/07/2021		NEW	Bottom whaling badly decayed		N62	462	Casino to Murwillumbah	807.400	938.589	DISUSED
UBN62837A	UnderBridge - Timber Transom Topped Lismore Yard	120024	837.125	837.213	TAMSTRUC	B-Ry2	RAIL \ UNDERBRIDGE, OVERBRIDGE DEFECTS \ TIMBER \ GIRDERS, DECKING \ COMPOUND GIRDER \ IMPACT DAMAGE - MAJOR STRUCTURAL DAMAGE	23/02/2017	15/07/2021		NEW	Vehicle strike, damage to pile @ roadway span & damage to girder@ roadway span.	Paul Maloney [Maintainance Inspector] Lismore City Council PO Box 23A, Lismore, 2480 T 0488 002 694 F 6620 1688 www.lismore.nsw.gov.au Lismore City Council acknowledges the people of the Bundjalung Nation, traditional custodians of the land on which we work. <u>Bridge to be removed.</u>	N62	462	Casino to Murwillumbah	807.400	938.589	DISUSED
UBN62837A	UnderBridge - Timber Transom Topped Lismore Yard	87704	837.125	837.213	TAMSTRUC	D-Ry2	RAIL \ UNDERBRIDGE, OVERBRIDGE DEFECTS \ TIMBER \ GIRDERS, DECKING \ COMPOUND GIRDER \ IMPACT DAMAGE - MAJOR STRUCTURAL DAMAGE	20/07/2015	19/07/2017	11/09/2015	RESOLVED	Girders in the middle span have been hit and need to be straightened.		N62	462	Casino to Murwillumbah	807.400	938.589	DISUSED
UBN62837A	UnderBridge - Timber Transom Topped Lismore Yard	73307	837.125	837.213	TAMSTRUC	D-Ry2	RAIL \ UNDERBRIDGE, OVERBRIDGE DEFECTS \ TIMBER \ SAFETY DEVICES \ SIGNAGE	12/09/2014	15/07/2021		NEW	Replace with 3.8 Metre signs.		N62	462	Casino to Murwillumbah	807.400	938.589	DISUSED
UBN62837A	UnderBridge - Timber Transom Topped Lismore Yard	204248	837.125	837.213	TAMSTRUC	A-Rm6	RAIL \ UNDERBRIDGE, OVERBRIDGE DEFECTS \ VEHICLE STRIKE (PARENT DEFECT)	14/07/2019	15/02/2020		NEW	Vehicle strike on No. 6 trestle on the down side.		N62	462	Casino to Murwillumbah	807.400	938.589	DISUSED
Number of Records: 5																			

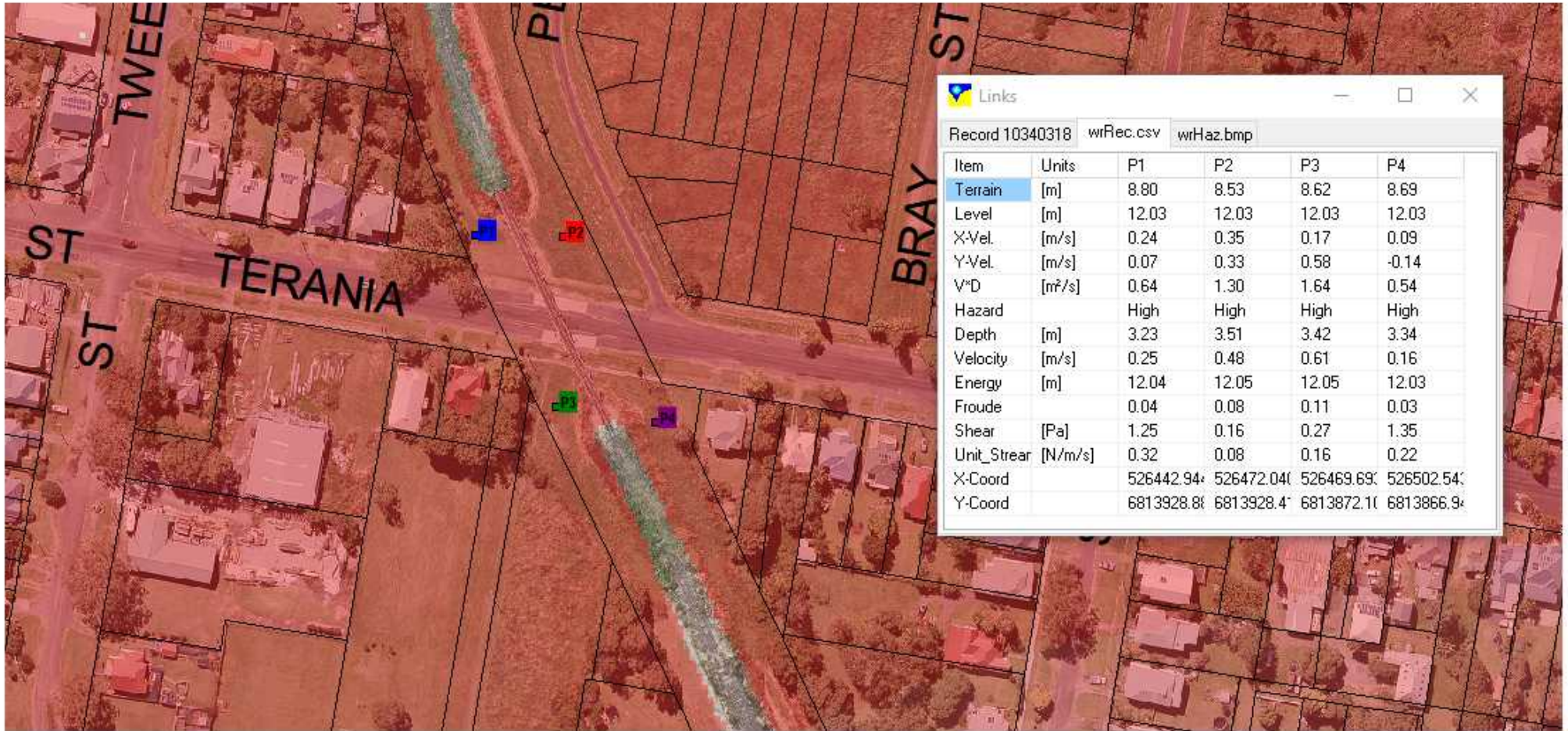
APPENDIX

B

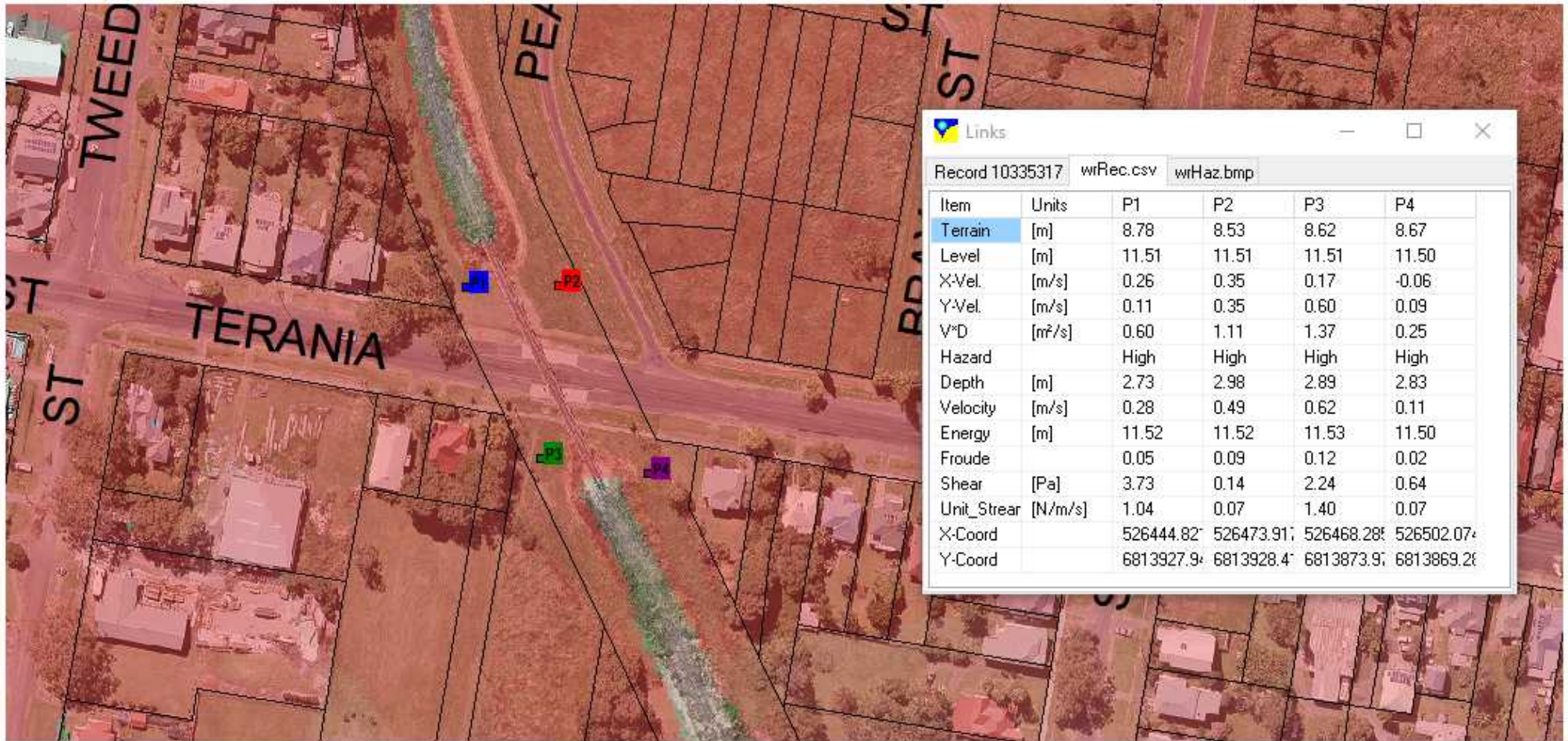
LISMORE CITY COUNCIL DATA



Links						
Record 10350322 wrRec.csv wrHaz.bmp						
Item	Units	P1	P2	P3	P4	
Terrain	[m]	8.76	8.54	8.59	8.76	
Level	[m]	12.87	12.87	12.86	12.88	
X-Vel.	[m/s]	0.19	-0.15	-0.26	0.10	
Y-Vel.	[m/s]	0.01	-0.37	-0.56	-0.19	
V*D	[m ² /s]	0.75	1.73	2.59	0.82	
Hazard		High	High	High	High	
Depth	[m]	4.11	4.33	4.27	4.12	
Velocity	[m/s]	0.19	0.40	0.61	0.22	
Energy	[m]	12.87	12.88	12.88	12.88	
Froude		0.03	0.06	0.09	0.03	
Shear	[Pa]	3.57	8.01	7.74	4.06	
Unit_Steer	[N/m/s]	0.68	3.22	4.74	0.88	
X-Coord		526442.475	526471.10	526471.10	526506.76	
Y-Coord		6813931.70	6813931.20	6813866.40	6813863.60	



Links					
Record 10340318 wrRec.csv wrHaz.bmp					
Item	Units	P1	P2	P3	P4
Terrain	[m]	8.80	8.53	8.62	8.69
Level	[m]	12.03	12.03	12.03	12.03
X-Vel.	[m/s]	0.24	0.35	0.17	0.09
Y-Vel.	[m/s]	0.07	0.33	0.58	-0.14
V*D	[m ² /s]	0.64	1.30	1.64	0.54
Hazard		High	High	High	High
Depth	[m]	3.23	3.51	3.42	3.34
Velocity	[m/s]	0.25	0.48	0.61	0.16
Energy	[m]	12.04	12.05	12.05	12.03
Froude		0.04	0.08	0.11	0.03
Shear	[Pa]	1.25	0.16	0.27	1.35
Unit_Steam	[N/m/s]	0.32	0.08	0.16	0.22
X-Coord		526442.94	526472.04	526469.69	526502.54
Y-Coord		6813928.8	6813928.4	6813872.1	6813866.9





- Gas
 - Gas Pipeline
 - Active
 - Decommissioned
- Water and Sewer Text
- Water Pipe Offsets
 - Water Pipe Offset Arrows
 - Water Pipe Offset Text
 - Fence
 - External
 - Heavy Line
 - Internal
 - Lead Line
 - Plain Line
 - Tie
- AZ Sewerage Connection Text
- AZ Sewer Pipe OffsetText
- AZ Water Pipe Text
- AZ Manhole Depth
- AZ** Manhole Name
- AZ Sewer Pipe Text
- Details
 - AZ Detail Text
 - Detail Lines
 - Detail Points
 - Detail Regions
- Optical Fibre
 - Optical Fibre Pits
 - Pit
 - Splice Pit
 - Optical Fibre Pipes
 - Empty Conduit
 - StormWater Fibre Optic



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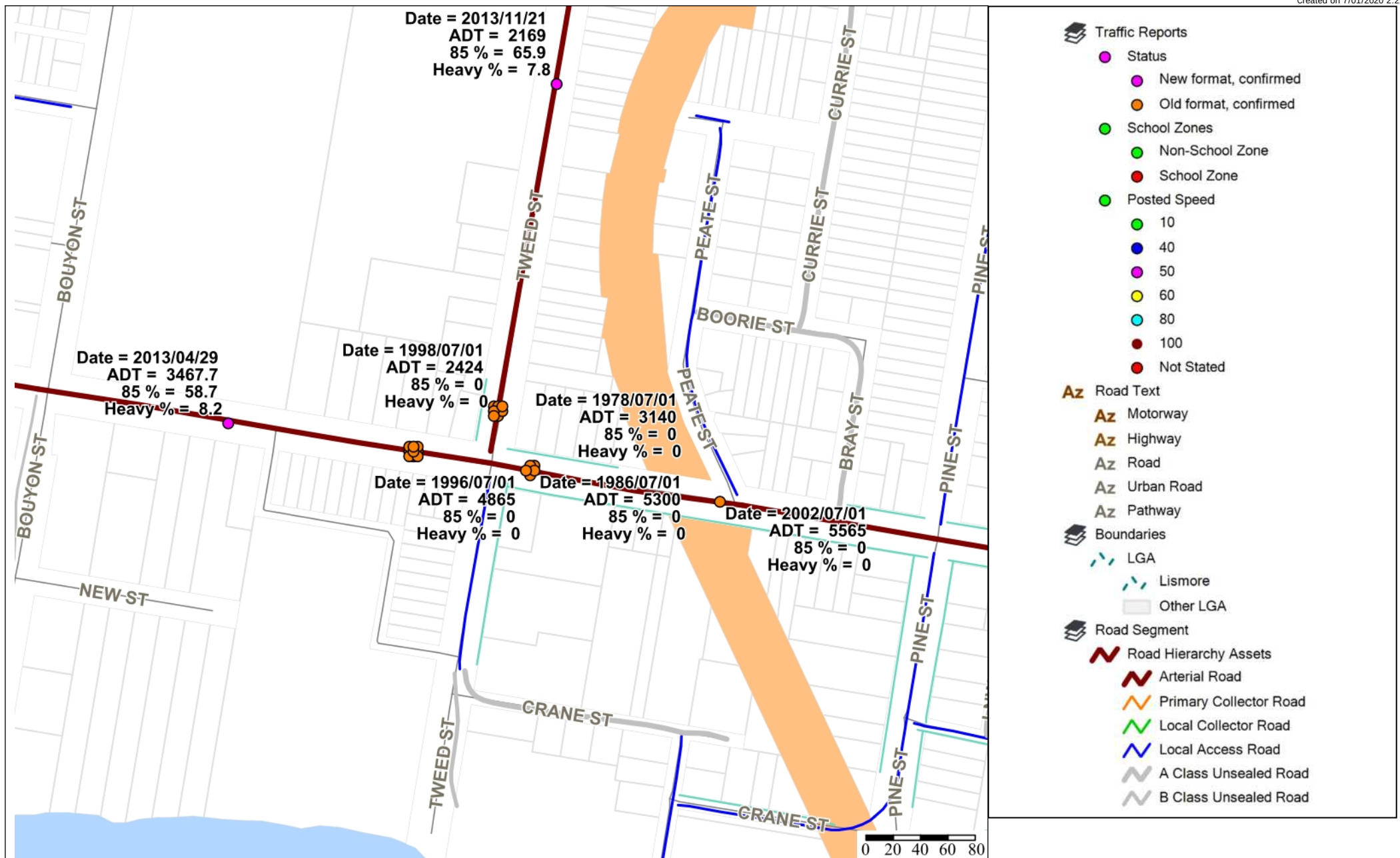
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APPENDIX

C

EXAMPLE RECTIFICATION OPTIONS



Example of Guard Rail protecting timber trestles (Gundagai, NSW)



Example of Underbridge Protection (Gundagai, NSW). Note middle panel has been struck resulting in displacement



Example of Overhead Early Warning System (Woy Woy, NSW)

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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Bridge No.	2.3	Description	Terania Street Underbridge			Over	Terania Street	
Longitude		Location	Terania Street North Lismore			Name	NA	
Latitude						Year Built	NA	
Road ID	Terania Street		LGA	Lismore Shire Council		Maintained		
OA Length	NA	Carriageway	NA	Deck Area	NA	Drawing #	NA	
Span Info.	5, 6 & 7	Span Length	7.4m	Bridge Height	4m	Material	Timber	
Inspection Level	L2	Inspection Date	18/9/2023	Insp. Type	Normal	Next Inspection Due	NA	
Ambient Temp	27°	Weather	Fine	Inspected By	Kevin Mulcahy			
Estimated Quantity in Condition State		Condition	"As Built"	Good	Fair	Poor		
Element Description	Enviro	Quantity	State 1	State 2	State 3	State 4		
Concrete Footings 5600x900	Moderate	4		4				
Timber Bottom Wales 5400x250x150	Moderate	8		2	2	4		
Timber Piles 300-400 dia	Moderate	12		4	4	4		
Timber Spur Piles 350-400dia	Moderate	8		3	1	4		
Timber Bracing 5400x250x125	Moderate	8		4	4	4		
Timber Capwales 4500x300x150	Moderate	8			6	2		
Timber Corbels 2900x300x300	Moderate	12	1	4	3	4		
Timber Girders 7400x300x300	Moderate	9		4	3	2		
Timber Transom 7400x300x300	Moderate	9			7	2		
Timber Sleepers 2000x250x150	Moderate	45		45				
	Moderate							
Required Maintenance Actions	Yes	Attachments or Images	Yes					
Inspectors Comment								

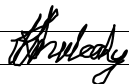
This Level 2 inspection was requested for the section of timber viaduct bridge comprising tressel piers 4, 5, 6 and 7 which support spans 5, 6 and 7 timber girders, railway sleepers and steel tracks. The railway bridge has not been in service by the rail network for 19 years. The westbound vehicle traffic passes below span 5 viaduct and eastbound traffic travels below the span 7 viaduct. The span 6 section of the viaduct bridge is barricaded to prevent traffic use. It appears very minimal maintainance has been completed since the rail line closure in May 2004.

The timber viaduct section of bridge is in very poor condition. The pier 6 and 7 timber tressel piers have been impacted and moved towards the east side of the bridge at the top of the piers. The top of pier 6 is moved 300mm to the east and is also leaning 300mm towards the north end of the bridge. The top of pier 7 is moved 300mm to the east and is also leaning 150mm towards the north end of the bridge. Both piers 6 and 7 have temporary steel props installed under the ends of the outside corbels to support and stabilise the structure. The centre timber girders and timber capping transoms are missing from spans 6 and 7. The centre timber corbel is also missing from the top of pier 6.

There are 74 structural timber components in the 4 piers and 3 bridge spans. There are 26 structural timber components in poor condition. This equates to 35% of the major timber components in the viaduct structure. There are another 40% of timber components in fair condition. All the timber components in the bridge require a test bore to complete a more accurate assessment of the individual bridge components.

Consideration: The disused timber viaduct structure above the west and eastbound public roads is in a visually stable condition. The timber tressels at piers 6 and 7 have been damaged and moved by a large impact. These piers need to be completely reconstructed to realign the bridge spans 6, 7 and 8. The timber elements in a condition 4 state need to be replaced to reinstate the viaduct structure to a fair state. Further assessment and replacement of the selected "fair" state condition timber components are needed to make the viaduct overbridge operational again.

Disclaimer: Bridgedoctors Pty. Ltd. have inspected only the visible and accessible elements of this structure as detailed in this report for the purpose of element health assessment. There may be critical elements, or parts of those elements that by their design, construction or location that are not visible or accessible for inspection. Those elements may be obscured by road surfacing, pavements, embankment fill, footways or be located underground and are not to be included in this report.

Inspectors Name	Kevin Mulcahy							
Inspectors Signature:						Date:	19/09/2023	

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 4 general view piles



Pier 4 south view



Pier 4 north view



Pier 4 bottom capwales ends weathered west end



Pier 4 north diagonal brace rot and weathering on lower east end



Pier 4 north diagonal brace hollow & evidence of white ants centre of brace



Pier 4 south diagonal brace rot and weathering on lower west end



Pier 4 centre pile hollow at base of pile



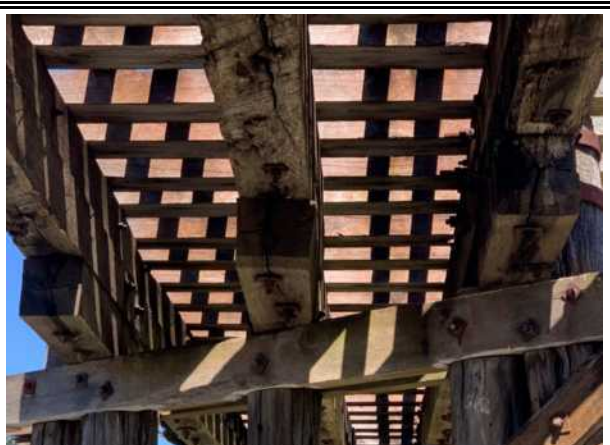
Pier 4 west pile hollow at base of pile



Pier 4 west pile cracked at head of pile



Pier 4 east spur pile cracked & hollow at base of pile



Pier 4 corbel north end centre has moderate split



Pier 4 south end of corbels minor splits



Span 5 east view



Span 5 west view



Span 5 general view of girders



Span 5 centre girder longitudinal crack from vehicle impact



Span 5 centre girder weathered and minor 20mm sag



Span 5 east girder has vehicle impact damage
centre of girder



Pier 5 general view



Pier 5 bottom capwales rot and weathered on east end



Pier 5 north diagonal brace broken lower end



Pier 5 southern diagonal brace small section size
lower end



Pier 5 east spur pile rotted, hollow & damaged at base



Pier 5 east pile hollow & rotted at base of pile



Pier 5 centre undersized pile hollow at base



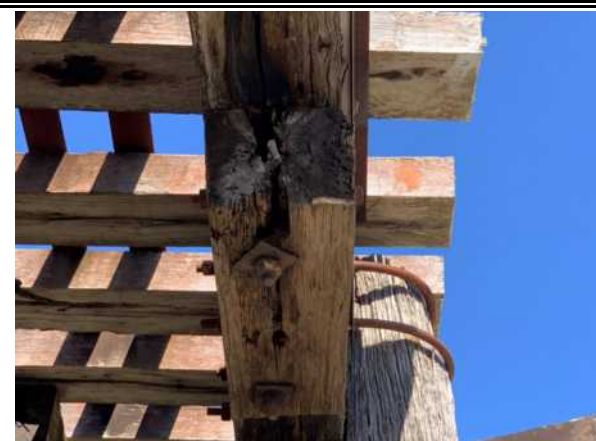
Pier 5 corbels southend



Pier 5 centre corbel southend split and damaged from vehicle impact



Pier 5 corbels northend general view



Pier 5 north corbel on west side split & rotted



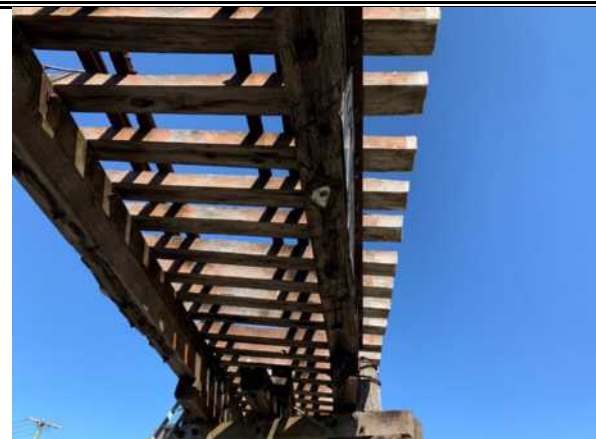
Span 6 east view



Span 6 west view



Span 6 centre girder missing



Span 6 west girder longitudinal crack from vehicle impact



Pier 6 temporary support under outer corbels



Pier 6 bottom capwale rotted & missing southside



Pier 6 bottom capwale rotted & collapsing northside



Pier 6 north diagonal brace rotted on lower end



Pier 6 southern diagonal brace broken from vehicle impact



Pier 6 east spur pile rot and hollow at base



Pier 6 east pile rotted at base



Pier 6 west pile vehicle impact damage and movement towards east at the base of pile

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 6 west spur pile broken and moved from vehicle impact



Pier 6 west end not vertical 300mm - leaning to north end of bridge



Pier 6 east end not vertical 300mm - leaning to north end of bridge



Pier 6 top capwales rot and weathered east end



Pier 6 top capwales weathered west end



Pier 6 corbels south end good condition

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 6 corbels north end good condition



Span 7 east view



Span 7 west view



Span 7 missing centre girder & corbel above pier 6



Pier 7 piles general view

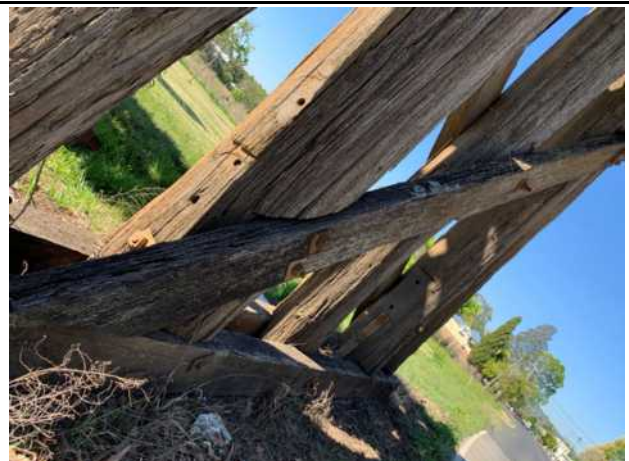


Pier 7 bottom wales weathered east end

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 7 north diagonal brace weathered



Pier 7 south diagonal brace weathered



Pier 7 temporary propping under north end of outside corbels



Pier 7 east spur pile hollow at base of pile



Pier 7 centre pile hollow & evidence of white ants at base of pile



Pier 7 west pile hollow & evidence of white ants at base of pile

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 7 top of west pile split & evidence of white ants



Pier 7 top capwales rot and weathered north side



Pier 7 capwales on south side have minor 20mm sag



Pier 7 south end of corbels minor splits



Pier 7 north end of corbels



Pier 7 east corbel split & crushed

BridgeDoctors Pty. Ltd.
Asset Inspection Imagery



Pier 7 not vertical 150mm - leaning to north end of bridge



Bend in rail lines and sleepers above piers 6 & 7



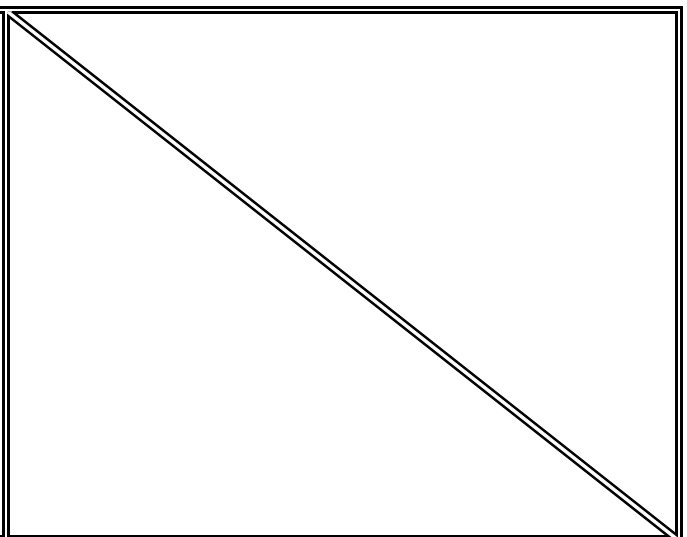
Top of piers 6 & 7 moved to the east from vehicle impact



Piers 6 & 7 moved 300mm to east from vehicle impact



All spans have top section of transoms rotted



Technical Memorandum

Memo No.	001	Date of Issue	25 September 2023
Subject	Terania Street Railway Bridge Assessment	Discipline	Structures
Project Title	Terania Street Railway Bridge Assessment	Project No.	TBC
Document No.		Revision	01
Author	Brendan Keane, Associate Engineer - Structures		
Reviewed by	James Dickerson	Approved by	Stephen Williamson
Prepared for	Transport for NSW	Attention to	Dan Champness
Attachments	Attachment 1 – Pier Sketches Attachment 2 – Barrier Layout		

1. Introduction

The existing disused rail bridge over Terania Street is a timber rail bridge with 12 spans in Lismore NSW. The westbound lane of Terania Street passes under Span 5 and the eastbound lane of Terania Street passes under Span 7. Terania Street is part of one of the main routes between the towns of Lismore and Nimbin. The bridge is currently heritage listed.

A condition assessment was undertaken by Bridge Doctors on 18/09/23 which observed that the bridge is in very poor condition and has sustained impact damage, with one pier displaced by approximately 300 mm. It was observed to be “visually stable”. Piers 6 and 7 have been provided with props to help support them.

SMEC understands that due to the very poor condition and concern that the bridge may become unstable if hit by a vehicle, the decision has been made to close Terania Road under the bridge to traffic.

SMEC has been engaged to consider options to reopen the road for a period of up to 6 months while preparations are made to demolish the bridge (or spans over the road).



Figure 1: Locality Plan

2. Inspection

SMEC conducted an inspection of the bridge on the morning of 22/09/23. As the Bridge Doctors inspection was conducted earlier in the same week, the purpose of the SMEC inspection was not to document the condition, but to consider the stability of the bridge.

The bridge was inspected by an Associate Engineer-Structures and an Experienced Engineer-Structures. The inspection conducted by SMEC was a visual inspection only with a hammer used to check timber members for rot and hollowness. No load rating assessment has been undertaken.

The following observations were made for the main elements in question.

Also refer to Attachment 1 for sketches showing the main defects at each pier.

2.1 Pier 4

While in poor condition, Pier 4 is not at risk of imminent collapse under the loading from the self-weight of the structure.

The pier columns are split and some sound hollow, but there appears to be sufficient sound timber to support the current loading. One of the braces is rotted through at one end, but would otherwise be considered effective.

If this pier were to be hit by a vehicle it is likely that the pier column facing the traffic would break at its base and the pier may displace similar to Pier 7.



Figure 2: Pier 4 - post split

2.2 Pier 5

While in poor condition, Pier 5 is not at risk of imminent collapse under the loading from the self-weight of the structure.

The pier columns are split and some sound hollow, but there appears to be sufficient sound timber to support the current loading. One of the braces is discontinuous at one end, but would otherwise be considered effective. The inclined pier column facing the traffic is badly rotted at its base.

If this pier were to be hit by a vehicle it is very likely that the pier column facing the traffic would break at its base and the pier may displace similar to Pier 7.



Figure 3: Pier 5 - Inclined post rotted

2.3 Pier 6

Pier 6 has sustained impact damage and has displaced approximately 300 mm at its base. Props have been installed to assist in supporting this pier. The props are placed either side of the pier and support the corbels for the superstructure, reducing the reliance on the pier to support the superstructure.

The inclined pier column facing the traffic has been hit by a vehicle and has broken at its base and has rotated to meet the adjacent pier column. All pier columns are displaced and are non-vertical.

Concrete barriers have been placed around this pier and a large sandbag placed at the ends of the concrete barriers. It appears that the sandbag has sustained damage which may be from a vehicle impact.

Based on the observations made on site, this pier should not be relied upon to support the superstructure.

It was noted that while the props are clearly assisting in the support of the load of the superstructure, it was observed that they are not vertical and are supported on timber packers. Additionally, the cross bracing installed between these props will have limited capacity to provide lateral restraint as the connections are mostly clamp type connections and simply rely on friction to hold the braces in place.



Figure 4: Pier 6 – Props and pier not vertical

2.4 Pier 7

While in poor condition, Pier 7 is not at risk of imminent collapse under the loading from the self-weight of the structure.

The pier columns are split and some sound hollow, but there appears to be sufficient sound timber to support the current loading.

All pier columns have some displacement at their base with steel tie down plates bent slightly. It is thought that this has occurred due to the impact on Pier 6, with impact loads having been distributed through the superstructure to Pier 7.

The pier is not vertical and props have been installed to prevent further movement. The props appeared to be vertical and are supported on concrete footings.



Figure 5: Pier 7 – Props installed

2.5 Superstructure

Overall the superstructure appeared to be in a reasonably sound condition. While it could not be relied on to carry live load, it is not at risk of imminent collapse due to its own weight.

The corbels and beams above Pier 6 have displaced and have some splits in the timbers due to this displacement.

The beams over the roadway show signs of impacts from tall vehicles.



Figure 6: Signs of impacts with superstructure

3. Inspection Findings

The bridge is currently in a stable condition. However, this could change with any additional external loading such as vehicle impact or flooding. Under such loading, the bridge may become unstable or collapse.

4. Risks

Based on the observations made on site, the key risks identified are summarised in Table 1 below.

Table 1: Risk Assessment

Element	Risk	Existing Controls	Likelihood (1-5)	Severity (1-5)	Risk Rating	Possible controls	Residual risk
Pier 4	If pier 4 is hit by a vehicle, it may sustain damage similar to Pier 6 and the bridge may become unstable.	Single concrete barrier several metres in front of the pier to deflect errant vehicles. However, it is still possible for a vehicle to hit the pier.	3	5	15 High risk	Install concrete barriers on approaches and beside the pier to greatly reduce likelihood of vehicle impact.	Low
Pier 5	If pier 5 is hit by a vehicle, it would likely sustain damage similar to Pier 6 and the bridge may become unstable	Pair of concrete barriers several metres in front of the pier to deflect errant vehicles. However, it is still possible for a vehicle to hit the pier.	3	5	15 High Risk	Install concrete barriers on approaches and beside the pier to greatly reduce likelihood of vehicle impact.	Low
Pier 6	If pier 6 is hit by a vehicle, it may collapse despite the additional propping provided as bracing on the props is not effective.	Concrete barriers installed both sides of the pier. Props and cross bracing.	2	5	10 Moderate risk	Retain existing barriers. Install new props on concrete footings and effective cross bracing.	Low
Pier 7	If pier 7 is hit by a vehicle, it may sustain damage similar to Pier 6 and the bridge may become unstable.	Single concrete barrier several metres in front of the pier to deflect errant vehicles. However, it is still possible for a vehicle to hit the pier.	3	5	15 High Risk	Install concrete barriers on approaches and beside the pier to greatly reduce likelihood of vehicle impact.	Low

Superstructure	If the superstructure is hit by a vehicle, the load would be expected to be distributed along the superstructure. However, it is possible that the impact may be sufficient to overload the piers (particularly Pier 7) and the structure may collapse.	None	3	5	15 High Risk	Permit only light vehicles on the road. This will reduce the severity of any impact and reduces the likelihood of tall vehicles hitting the superstructure (most tall vehicles are heavy vehicles). Install signage e.g VMS on each approach warning of low bridge and that road under the bridge is closed to heavy vehicles. Reduce the speed under the bridge. This will reduce the severity of any impacts. Install a clearance bar over the roadway on the approaches similar to what is used at the entrance to underground carparks. This will give warning to vehicles that are too tall and give them time to stop before the bridge.	Moderate
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5. Recommendations

Based on the risks and the possible controls, SMEC recommends the following controls could be put into place to enable the road under the bridge to be reopened.

5.1 Protection of piers

Install concrete barriers in front of piers 4, 5, 6 & 7. Not only will this help protect the piers from impact, but it will have the effect of narrowing the lanes which will tend to slow the traffic.

While the concrete barriers should remove the risk of impact with the pier, it is recommended to install new props at Pier 6 on concrete footings and effective cross bracing. This will further reduce the risk of collapse of the pier. At present, this pier should not be relied upon to carry any load and the props should be designed to carry the load from the superstructure. Off the shelf shoring systems such as megashore would be suitable. The props would need to be tied together through the pier to ensure bracing in all directions. Care will need to be made during the installation of concrete footings to ensure that the pier is not undermined.

Install cross bracing to the props at Pier 7.

Refer to Attachment 2 for an indicative barrier layout.

5.2 Reduce risk of impact to superstructure

Close the road under the bridge to heavy vehicles. As most tall vehicles are heavy vehicles, this will reduce the likelihood of a vehicle hitting the bridge.

Reduce speed under the bridge to reduce the severity of any impact.

Install warning signs to indicate a low bridge and closed to heavy vehicles.

To cover the eventuality that a tall vehicle ignores the signage, SMEC recommends that install a clearance bar over the roadway on the approaches similar to what is used at the entrance to underground car parks. This will give warning to vehicles that are too tall and give them time to stop before the bridge. This clearance bar would serve as a warning only and would not stop a vehicle.

The clearance bar would need to be supported on a column each side of the road. These would need to sit behind barriers to protect the columns and to protect road users from hitting them. If an overly tall vehicle did hit the bar, it is also possible that the clearance bar and columns may collapse. This could be mitigated with the use of vertical chains hanging from a beam over the roadway as chains would be less likely to snag a passing vehicle, but would still provide a warning.

5.3 Monitoring

The condition of the bridge should be monitored on a weekly basis. Particular attention should be given to monitoring whether the barriers have been hit by a vehicle or if the superstructure has been hit by a vehicle.

If there are any signs of further movement or deterioration, the bridge should be inspected by a suitably qualified Structural Engineer.

5.4 Remove the bridge

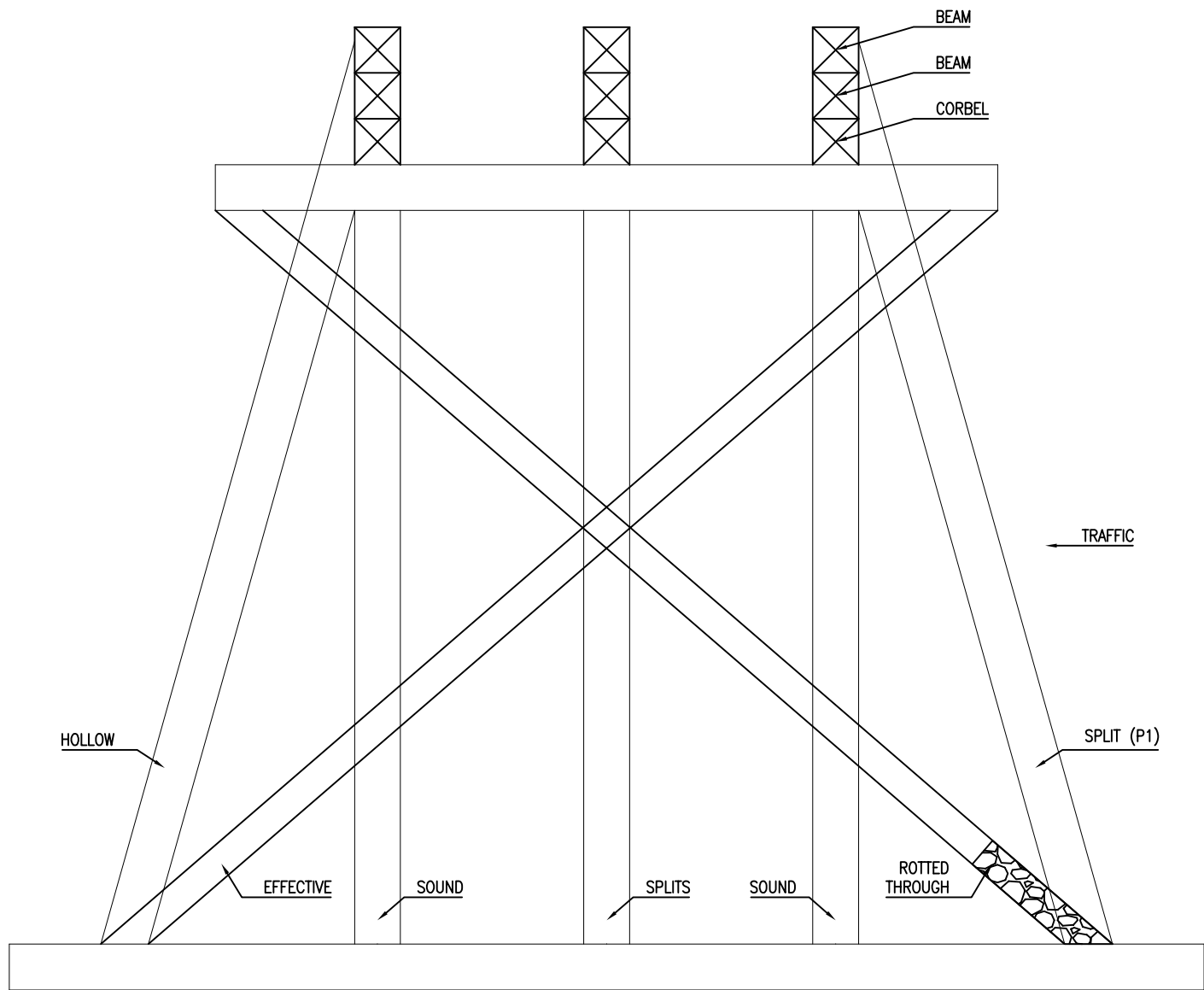
The above recommendations are all temporary and the bridge should be removed as a matter of urgency. The above measures should not be in place for more than six months

6. Next Steps

TfNSW needs to decide if the residual risks after implementing the proposed controls are acceptable. If they are considered acceptable, the main priority would be the design and construction of the required propping and the clearance bars.

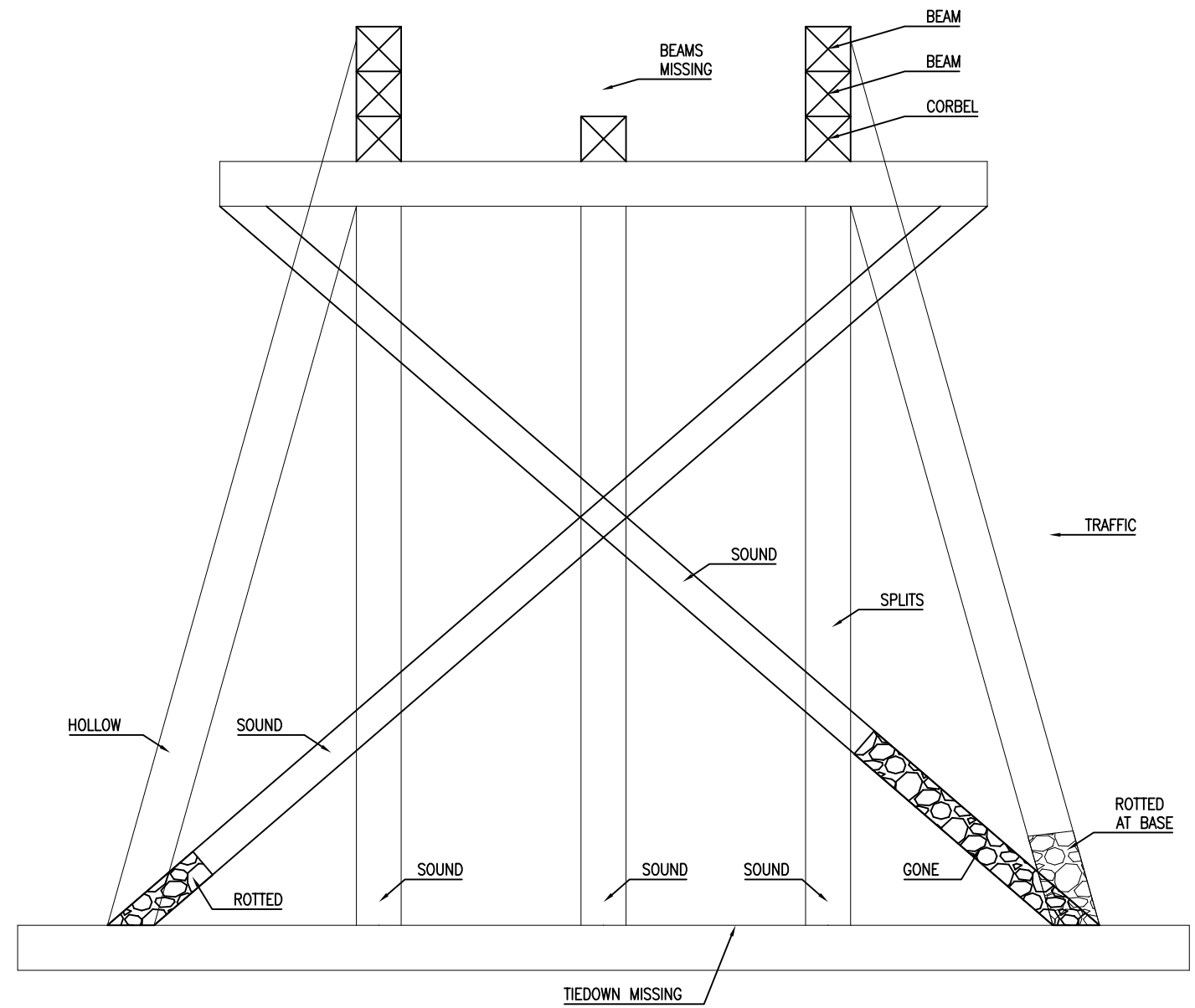
A traffic control plan should be prepared to document the required signage and barriers before these are installed.

Attachment 1 – Pier Sketches



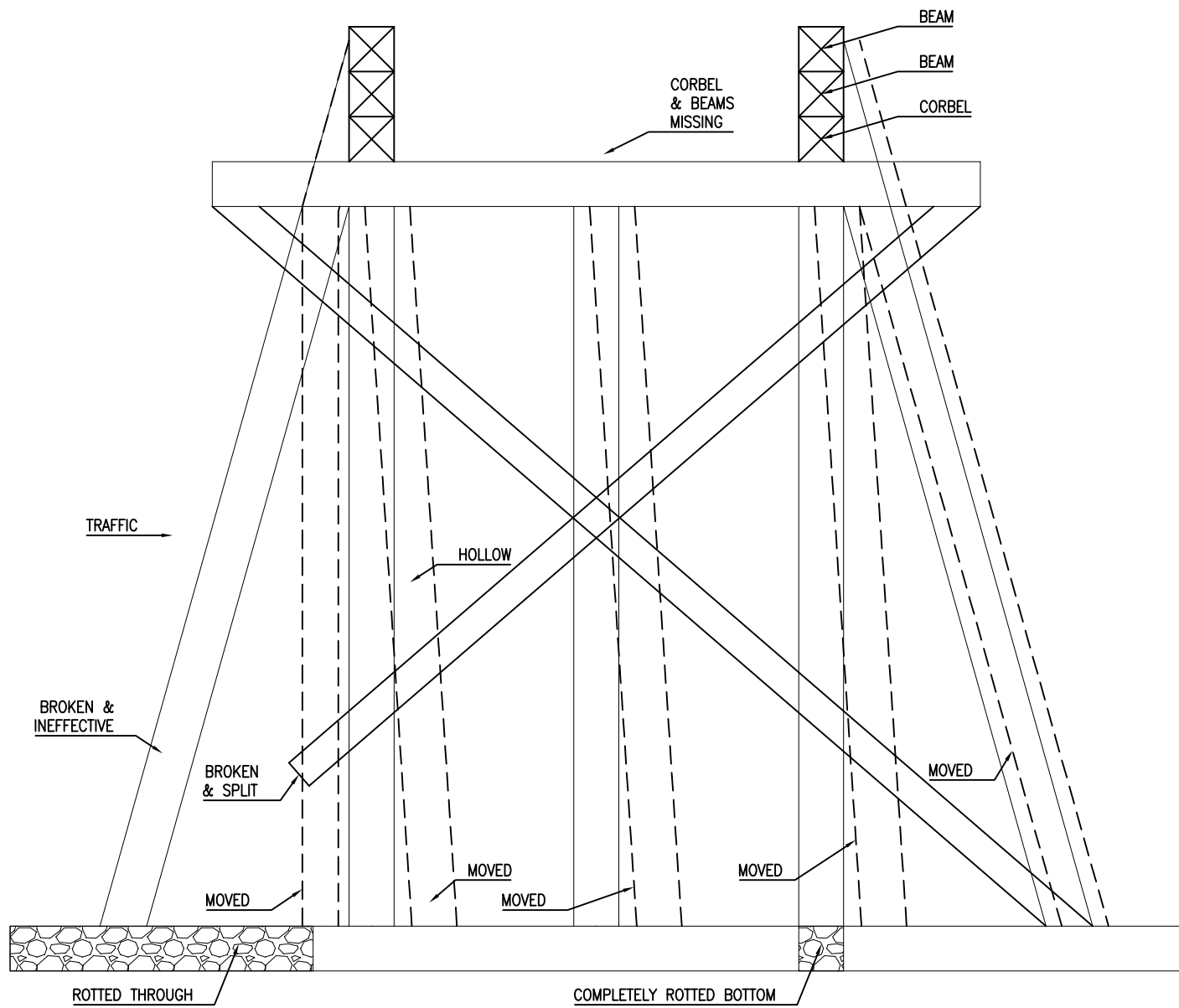
PIER -4

*OVERALL QUITE SOUND, NOT VERTICAL, MAYBE DISPLACED FROM IMPACT



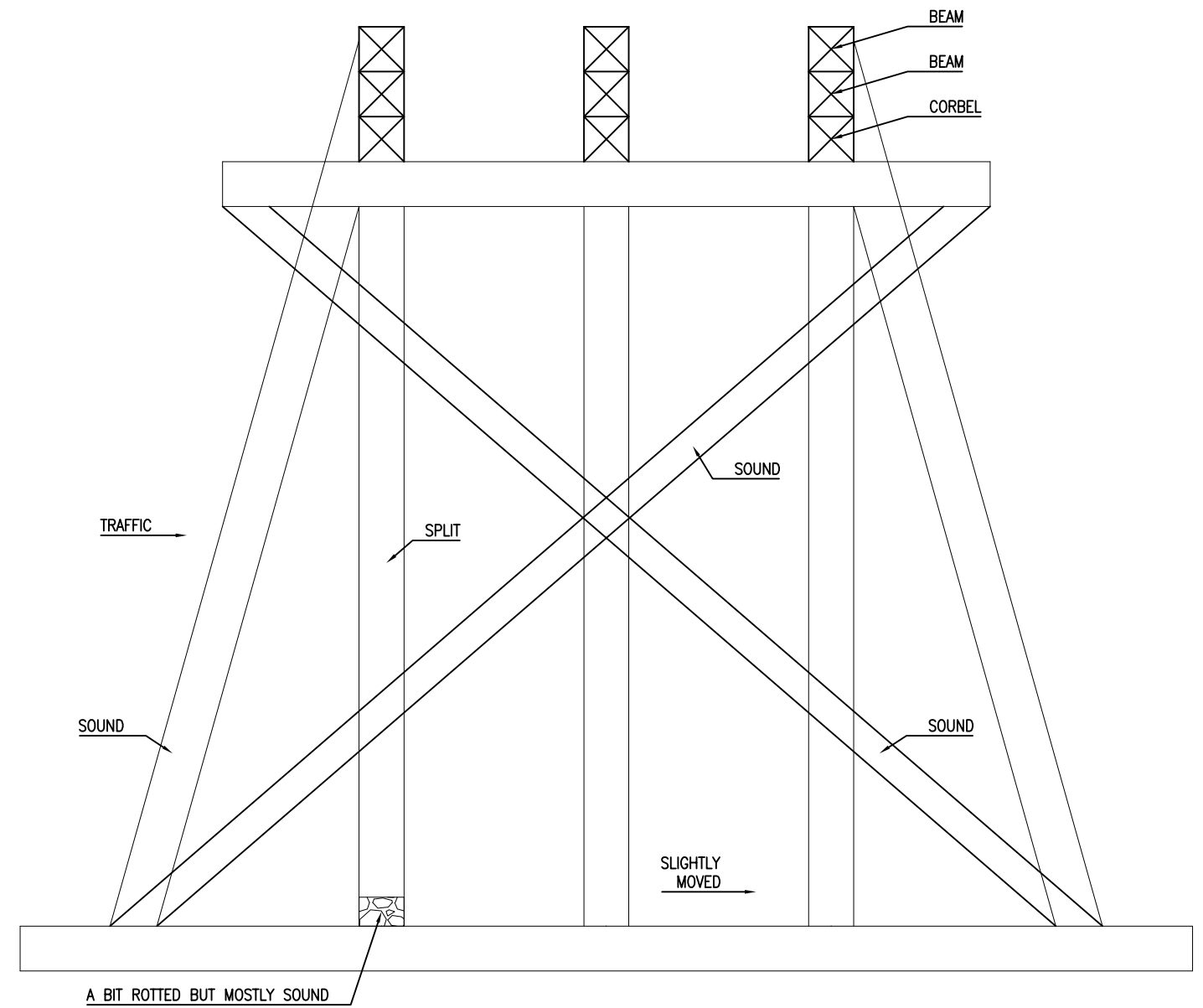
PIER -5

*INCLINED POST FACING TRAFFIC WOULD PROBABLY BREAK AT THE BASE IF IMPACTED



PIER -6

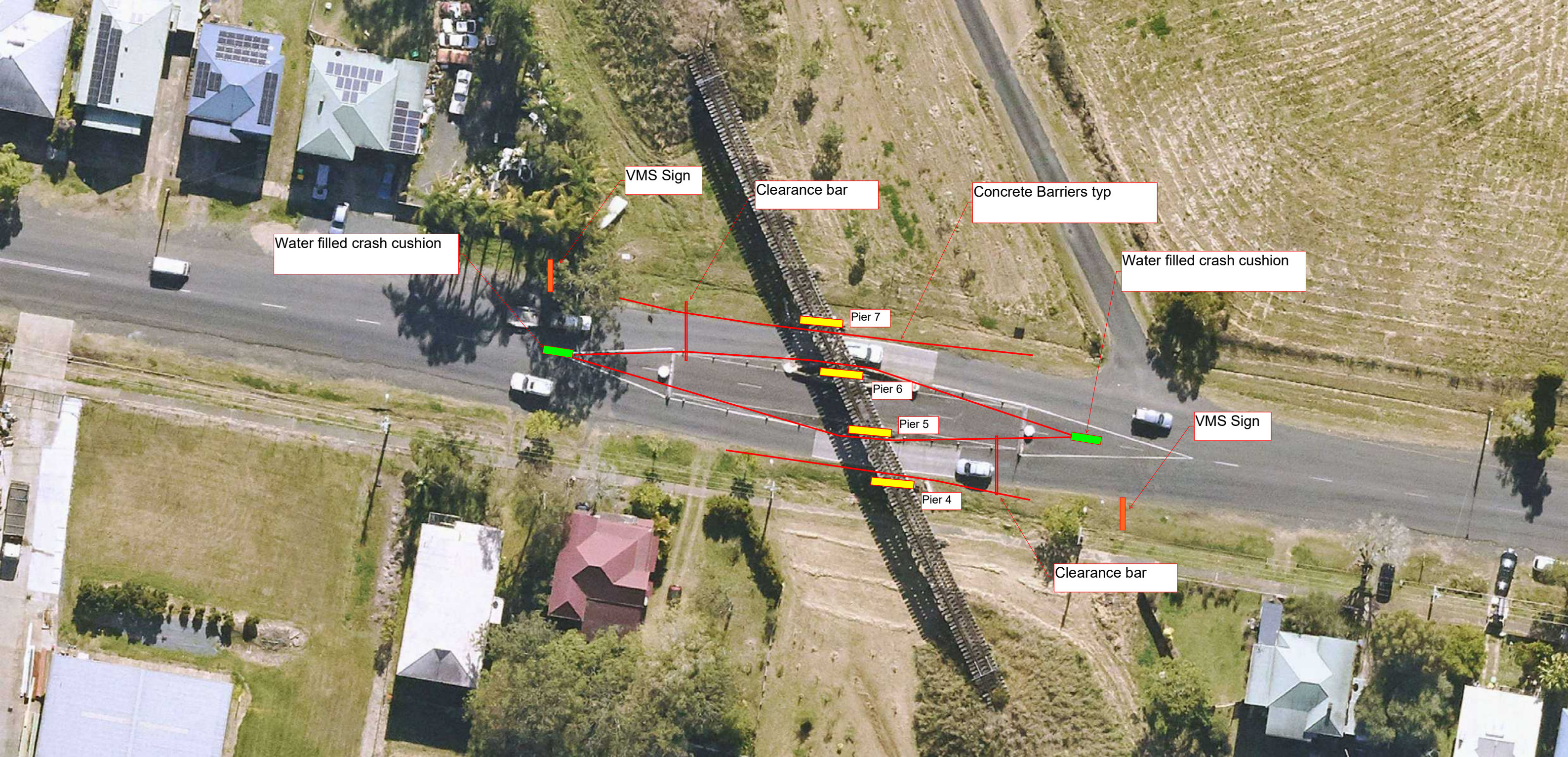
*CANNOT BE RELIED UPON TO CARRY LOAD SAFELY, NEEDS COMPLETE INDEPENDENT PROPS



PIER -7

*ABC

Attachment 2 – Barrier Layout



Appendix F – Native Title



National Native Title Register Details

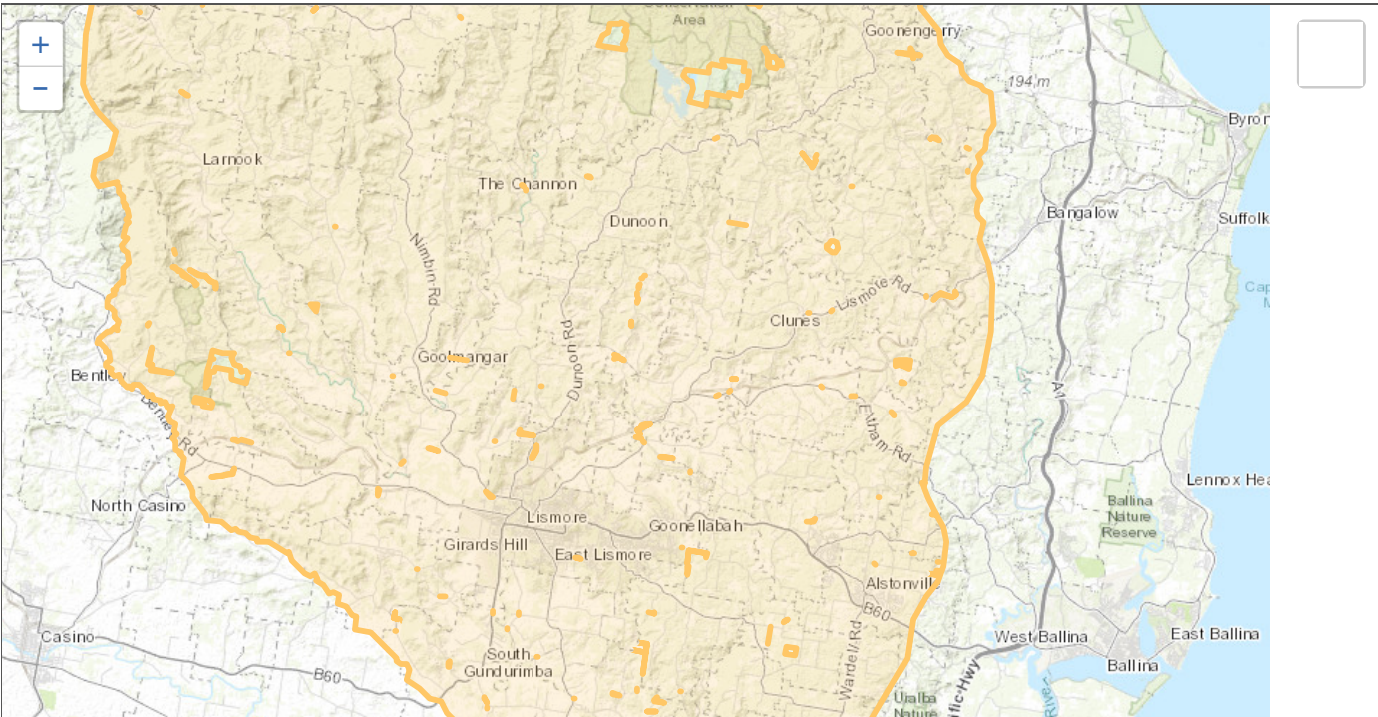
Back to search results

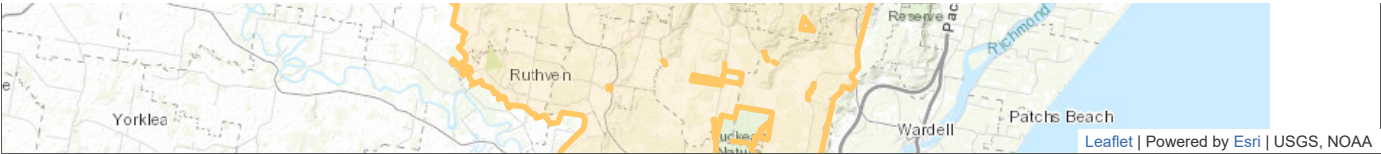
NCD2022/001 - Widjabul Wia-Bal

Tribunal file no.	NCD2022/001
Federal Court file no(s)	NSD1213/2018
Short name	Widjabul Wia-Bal
Case name	Widjabul Wia-Bal v Attorney-General of New South Wales (Section 87 Agreement)
Determination type	Claimant
State or Territory	New South Wales
Legal process	Consent
Determination outcome	Native title exists in parts of the determination area
Representative A/TSI body area(s)	New South Wales
Local government area(s)	Ballina Shire Council, Byron Shire Council, Kyogle Council, Lismore City Council, Richmond Valley Council, Tweed Shire Council
Determination date	19/12/2022
Date/s of effect	19/04/2023
Registered on National Native Title Register	Registered
Registered Native Title Body Corporate	Widjabul Wia-bal Gurrumbil Aboriginal Corporation
Note: current contact details for the Registered Native Title Body Corporate are available from the Office of the Registrar of Indigenous Corporations www.oric.gov.au	

Register extract and attachments

Register extract	NNTRExtract_NCD2022_001.pdf
Register extract attachment/s	NCD2022_001 Schedule 3.pdf NCD2022_001 Schedule 1 - Part 1.pdf NCD2022_001 Schedule 5.pdf NCD2022_001 Schedule 1 - Part 2.pdf NCD2022_001 Schedule 4.pdf NCD2022_001 Schedule 2.pdf





View this map in NTV: **NCD2022/001**

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Appendix G – Consultation

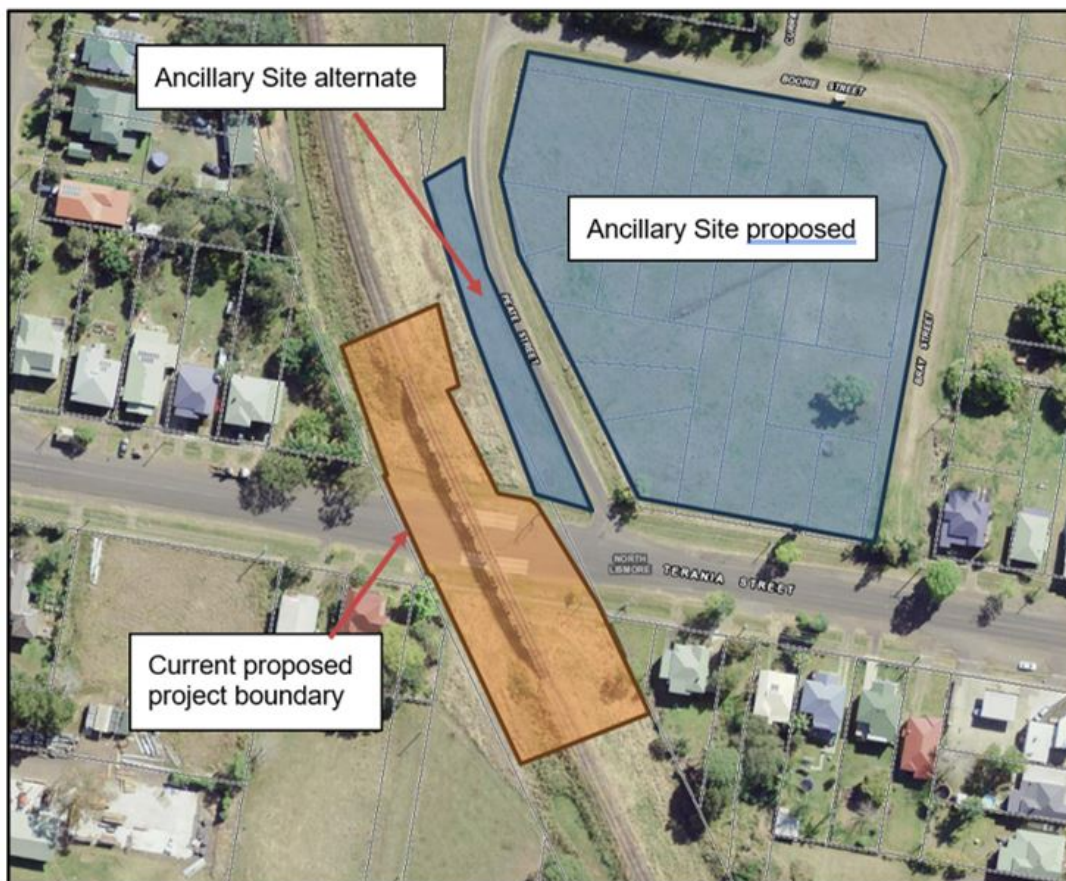
From: Laura Bowen <Laura.Bowen@transport.nsw.gov.au>
Sent: Thursday, 23 May 2024 12:08 PM
To: Olivia Charles; mvaughan@ntscorp.com.au
Cc: Scott Pierce; Lester Piggott; Garry Ferguson
Subject: Courtesy Email - Proposed work Terania St Bridge Demolition

Hi Olivia and Matilda,

I am emailing you as the NTSCORP contacts for the the Widjabul Wia-bal Native Title group. This is a courtesy email to give advanced notice that Transport for NSW (TfNSW) are proposing to undertake Demolition work at Terania St Bridge in Lismore in the coming months. These works are all within the existing road corridor and land owned by the local council and will not impact on Native Title areas. Transport for NSW is providing Widjabul Wia- bal Native Title people with information about all the works proposed to occur around their country.

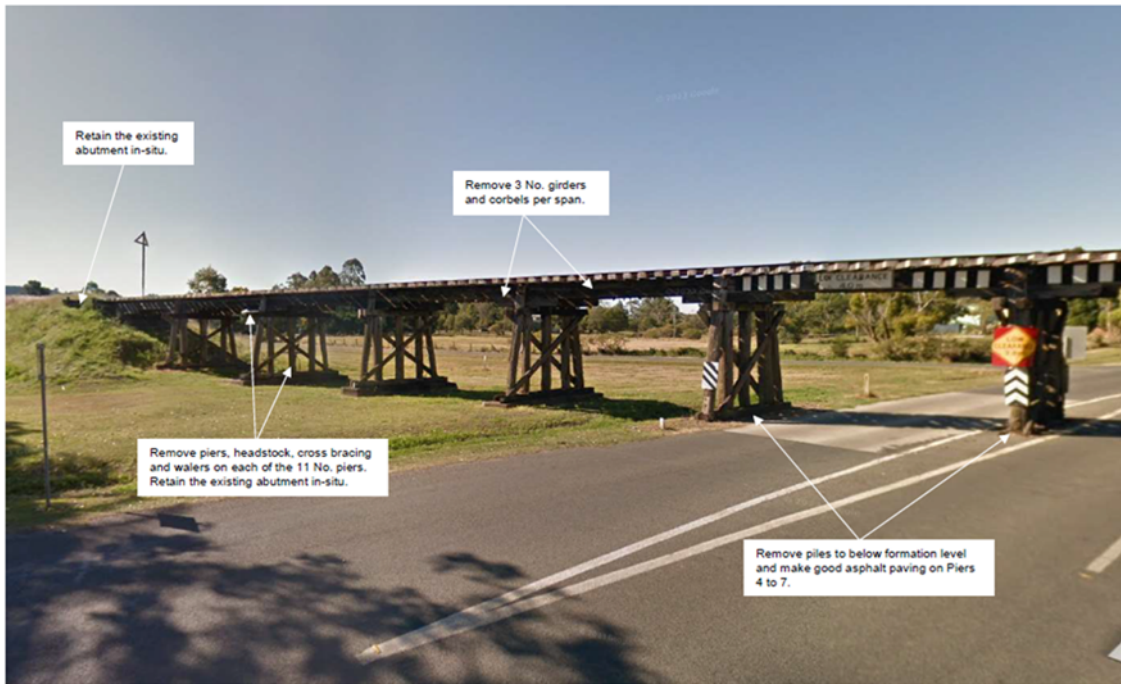
Project name: Terania St Bridge Demolition

Project Location



Project Scope

Key features of the proposed works include:



- Establishment of the Ancillary sites
- Erect exclusion zone/fencing
- Demolish bridge including substructure and superstructure.
- Local earth works to level site to match surrounding topography.
- Any site won material to be re-used as fill to reinstate areas outside of the road reserve.
- Embankment surface to be stabilised with grass vegetation to match existing.
- Reinstatement of the road pavement through the Rail Corridor for Terania Street. Pavement reinstatement required will include granular base material and asphalt, in addition to line marking and signage.
- Removal of traffic calming devices and signage.
- Complete localised rehabilitation of deteriorated pavements along detour routes implemented from road closures. This will be completed by Transport or by Lismore City Council.
- All materials removed (steel and timber) are to be disposed of in accordance with M&D waste guidelines. A recycling and reuse plan will be developed as part of the project documentation. Any salvageable materials will be delivered to a nominated M&D TfNSW storage location.
- Removing all waste from site and rehabilitating the site compounds at the end of the project.

Footprint of project

During development of the Project, TfNSW completed a stage one assessment of the Transport Procedure for Aboriginal Cultural Heritage Consultation and Investigation, otherwise known as the PACHCI.

The PACHCI process is undertaken on Transport projects to ensure compliance with the State of New South Wales cultural heritage requirements and promote state-wide consistency.

The assessment included a search of the AHIMS Register. The search results showed there was one Aboriginal site recorded in or near the Project location. This site is outside of the work area and will not be impacted by the works. The search also showed there were no Aboriginal places have been declared in or near the Project location.

Notwithstanding, TfNSW wants to ensure the Widjabul Wia- bal Native Title people are aware and informed of activities being undertaken within their Country.

Next steps

If you have any further questions or would like to discuss this project with the project team, please feel free to contact me. I am available via email or phone. My number is 0438 721 680.

Laura Bowen
Aboriginal Cultural Heritage Officer – Region North (Grafton)
Customer Strategy & Experience, Customer Strategy & Technology

M 0438 721 680

Transport for NSW
Ground level, 76 Victoria Street GRAFTON NSW 2460



I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

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Appendix H - Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.110
Bus Depots	Does the project propose a bus depot?	No		Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.110

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	No		Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No		Section 2.10
Water usage	Will the works involve connection to a council owned water supply system? If so,	No		Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	will this require the use of a <i>substantial</i> volume of water?			
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No		Section 2.10
Road & footpath excavation	Will the works involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	Yes	Lismore Council has been included in the S60 approval	Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent?	No	Compound areas are on flood liable land but the works are not likely to change flood patterns	Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	No	The works are minor in this context	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	No	Environment and Heritage Group, DPE	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment and Heritage Group, DPE	Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	No	Transport for NSW - Maritime	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?		Rural Fire Service (RFS) [Refer to the NSW RFS publication: <i>Planning for Bush Fire Protection (2006)</i>]	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map?	No	Director of the Siding Spring Observatory	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah?	No	Secretary of the Commonwealth Department of Defence	Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	Section 2.15

Appendix I – Biodiversity search results

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 Plants in selected area Report generated on 8/05/2024 9:29 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Common status	Records	Info
Plantae	Flora	Apocynaceae	1176	<i>Ochrosia moorei</i>		Southern Ochrosia	E1	E	11	
Plantae	Flora	Cunoniaceae	10943	^^ <i>Davidsonia jerseyana</i>		Davidson's Plum	E1,2	E	1	
Plantae	Flora	Doryanthaceae	1020	<i>Doryanthes palmeri</i>		Giant Spear Lily	V,P		1	
Plantae	Flora	Fabaceae (Caesalpinoideae)	8772	<i>Senna acclinis</i>		Rainforest Cassia	E1		1	
Plantae	Flora	Fabaceae (Faboideae)	2833	<i>Desmodium acanthocladum</i>		Thorny Pea	V	V	418	
Plantae	Flora	Fabaceae (Faboideae)	9217	<i>Rhynchosia acuminatissima</i>		Pointed Trefoil	V		3	
Plantae	Flora	Lauraceae	3491	<i>Endiandra hayesii</i>		Rusty Rose Walnut	V	V	1	
Plantae	Flora	Meliaceae	3682	<i>Owenia cepiodora</i>		Onion Cedar	V	V	1	
Plantae	Flora	Menispermaceae	7167	<i>Tinospora smilacina</i>		Tinospora Vine	E1		7	
Plantae	Flora	Menispermaceae	3691	<i>Tinospora tinoporoides</i>		Arrow-head Vine	V		131	
Plantae	Flora	Myrtaceae	11894	<i>Gossia fragrantissima</i>		Sweet Myrtle	E1	E	47	
Plantae	Flora	Myrtaceae	4283	<i>Rhodamnia rubescens</i>		Scrub Turpentine	E4A	CE	21	
Plantae	Flora	Myrtaceae	4284	<i>Rhodomyrtus psidioides</i>		Native Guava	E4A	CE	1	
Plantae	Flora	Myrtaceae	4290	<i>Syzygium hodgkinsoniae</i>		Red Lilly Pilly	V	V	2	
Plantae	Flora	Orchidaceae	6990	^^ <i>Oberonia complanata</i>		Yellow-flowered King of the Fairies	E1,P,2		3	
Plantae	Flora	Orchidaceae	4581	^^ <i>Sarcochilus dilatatus</i>		Brown Butterfly Orchid	E1,P,2		2	
Plantae	Flora	Poaceae	4776	<i>Arthraxon hispidus</i>		Hairy Jointgrass	V	V	868	
Plantae	Flora	Primulaceae	11951	<i>Myrsine richmondensis</i>		Ripple-leaf Muttonwood	E1	E	2	

Plantae	Flora	Proteaceae	5354	<i>Floydia praealta</i>	Ball Nut	V	V	7	
Plantae	Flora	Proteaceae	5432	<i>Hicksbeachia pinnatifolia</i>	Red Boppel Nut	V	V	2	
Plantae	Flora	Proteaceae	9680	<i>Macadamia integrifolia</i>	Macadamia Nut		V	2	
Plantae	Flora	Proteaceae	5446	<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	4	
Plantae	Flora	Ranunculaceae	5494	<i>Clematis fawcettii</i>	Northern Clematis	V	V	13	
Plantae	Flora	Rubiaceae	8297	<i>Randia moorei</i>	Spiny Gardenia	E1	E	4	
Plantae	Flora	Rubiaceae	13561	<i>Triflorensia cameronii</i>	Cameron's Tarennia	E1		5	
Plantae	Flora	Rutaceae	12433	<i>Coatesia paniculata</i>	Axe-Breaker	E1		13	
Plantae	Flora	Santalaceae	5871	<i>Thesium australe</i>	Austral Toadflax	V	V	3	
Plantae	Flora	Tiliaceae	6198	<i>Corchorus cunninghamii</i>	Native Jute	E1	E	6	

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Common status	Records	Info
Animalia	Reptilia	Elapidae	2645	<i>Cacophis harriettae</i>		White-crowned Snake	V,P		2	
Animalia	Aves	Anseranatidae	0199	<i>Anseranas semipalmata</i>		Magpie Goose	V,P		1	
Animalia	Aves	Anatidae	0216	<i>Oxyura australis</i>		Blue-billed Duck	V,P		5	
Animalia	Aves	Anatidae	0214	<i>Stictonetta naevosa</i>		Freckled Duck	V,P		7	
Animalia	Aves	Columbidae	0025	<i>Ptilinopus magnificus</i>		Wompoo Fruit-Dove	V,P		13	
Animalia	Aves	Columbidae	0021	<i>Ptilinopus regina</i>		Rose-crowned Fruit-Dove	V,P		35	
Animalia	Aves	Columbidae	0023	<i>Ptilinopus superbus</i>		Superb Fruit-Dove	V,P		2	
Animalia	Aves	Podargidae	0314	<i>Podargus ocellatus</i>		Marbled Frogmouth	V,P		10	
Animalia	Aves	Apodidae	0334	<i>Hirundapus caudacutus</i>		White-throated Needletail	V,P	V,C,J,K	9	
Animalia	Aves	Ciconiidae	0183	<i>Ephippiorhynchus asiaticus</i>		Black-necked Stork	E1,P		44	
Animalia	Aves	Ardeidae	0196	<i>Ixobrychus flavicollis</i>		Black Bittern	V,P		1	
Animalia	Aves	Accipitridae	0218	<i>Circus assimilis</i>		Spotted Harrier	V,P		2	
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>		White-bellied Sea-Eagle	V,P		30	
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>		Little Eagle	V,P		4	
Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>		Eastern Osprey	V,P,3		1	
Animalia	Aves	Falconidae	0238	<i>Falco subniger</i>		Black Falcon	V,P		1	
Animalia	Aves	Rallidae	0053	<i>Amaurornis moluccana</i>		Pale-vented Bush-hen	V,P		1	
Animalia	Aves	Haematodidae	0131	<i>Haematopus fuliginosus</i>		Sooty Oystercatcher	V,P		1	
Animalia	Aves	Jacanidae	0171	<i>Irediparra gallinacea</i>		Comb-crested Jacana	V,P		123	

Animalia	Aves	Cacatuidae	8862	<i>^Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	V,P,2	V	1	
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P		2	
Animalia	Aves	Strigidae	0248	<i>Ninox strenua</i>	Powerful Owl	V,P,3		2	
Animalia	Aves	Tytonidae	0252	<i>Tyto longimembris</i>	Eastern Grass Owl	V,P,3		1	
Animalia	Aves	Tytonidae	0250	<i>Tyto novaehollandiae</i>	Masked Owl	V,P,3		1	
Animalia	Aves	Tytonidae	9924	<i>Tyto tenebricosa</i>	Sooty Owl	V,P,3		1	
Animalia	Aves	Pomatostomidae	8388	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P		1	
Animalia	Aves	Neosittidae	0549	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P		1	
Animalia	Aves	Monarchidae	0376	<i>Carterornis leucotis</i>	White-eared Monarch	V,P		2	
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>	Koala	E1,P	E	2421	
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		12	
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	965	
Animalia	Mammalia	Molossidae	1329	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V,P		2	
Animalia	Mammalia	Vespertilionidae	1372	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V,P		2	
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>	Southern Myotis	V,P		3	
Animalia	Mammalia	Vespertilionidae	1336	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V,P		32	
Animalia	Mammalia	Vespertilionidae	1361	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V,P		5	
Animalia	Mammalia	Miniopteridae	1346	<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		25	
Animalia	Mammalia	Miniopteridae	3330	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V,P		9	
Animalia	Insecta	Carabidae	1010	<i>Nurus brevis</i>	Shorter Rainforest Ground-beetle	V,3		285	

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Common status	Records	Info
Community				<i>Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion</i>		Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	E3		P	
Community				<i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</i>		Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		E	K	
Community				<i>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland</i>		Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland		E	K	
Community				<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		P	
Community				<i>Grey box-grey gum wet forest of subtropical eastern Australia</i>		Grey box-grey gum wet forest of subtropical eastern Australia		E	K	

Community	<i>Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion</i>	Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion	E3	K	
Community	<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	<i>Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions</i>	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3	K	
Community	<i>Lowland Rainforest of Subtropical Australia</i>	Lowland Rainforest of Subtropical Australia	CE	K	
Community	<i>Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion</i>	Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E3	K	
Community	<i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E3	K	
Community	<i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions</i>	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	E	K	

Community	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	K	
Community	<i>Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions</i>	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	P	
Community	<i>White Gum Moist Forest in the NSW North Coast Bioregion</i>	White Gum Moist Forest in the NSW North Coast Bioregion	E3	K	



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 08-May-2024

[Summary](#)

[Details](#)

[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	65
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:	15
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:	1
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

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

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

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community likely to occur within area	In buffer area only
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	Foraging, feeding or related behaviour likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area

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 may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
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 feature area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area	In feature area
Erythroriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat 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
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may 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 feature area
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 likely to occur within area	In buffer area only
INSECT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area	In buffer area only
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 likely to occur within area	In feature area
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
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Amyema plicatula [81879]	Endangered	Species or species habitat may occur within area	In buffer area only
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat may occur within area	In feature area
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 known to occur within area	In feature area
Coleus nitidus listed as Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat may occur within area	In buffer area only
Corchorus cunninghamii Native Jute [14659]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area	In feature area
Endiandra floydii Floyd's Walnut, Crystal Creek Walnut [52955]	Endangered	Species or species habitat may occur within area	In feature area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Floydia praealta Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat known to occur within area	In feature area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Myrsine richmondensis Purple-leaf Muttonwood, Lismore Muttonwood [83888]	Endangered	Species or species habitat known to occur within area	In buffer area only
Ochrosia moorei Southern Ochrosia [11350]	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 known to occur within area	In feature area
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 feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat known to occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Sophora fraseri [8836]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
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 known to occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat may occur within area	In feature area

REPTILE			
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat likely to occur within area	In feature area

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely 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 known 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 may 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 known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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
Pandion haliaetus Osprey [952]		Species or species habitat known 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
Commonwealth Bank of Australia		
Commonwealth Land - Commonwealth Bank of Australia [11276]	NSW	In buffer area only
Commonwealth Trading Bank of Australia		
Commonwealth Land - Commonwealth Trading Bank of Australia [11269]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia [11271]	NSW	In feature area
Communications, Information Technology and the Arts - Australian Broadcasting Corporation		
Commonwealth Land - Australian Broadcasting Corporation [15759]	NSW	In buffer area only
Commonwealth Land - Australian Broadcasting Corporation [15758]	NSW	In buffer area only
Commonwealth Land - Australian Broadcasting Corporation [15760]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [11274]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11270]	NSW	In feature area
Commonwealth Land - Australian Telecommunications Commission [11273]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence		
Commonwealth Land - Defence Service Homes Corporation [16162]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [11280]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [11281]	NSW	In buffer area only
Defence - LISMORE GRES DEPOT ; 41 RNSWR LISMORE [10061]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Defence Housing Authority [15446]	NSW	In buffer area only
Commonwealth Land - Director of War Service Homes [15943]	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]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 known 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 overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 known 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 likely to occur within area overfly marine area	In feature area
Sterna striata White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area
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
Wilson	Nature Reserve	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 buffer area only
Relocation of Grey-headed Flying Foxes	2006/2985	Controlled Action	Completed	In buffer area only
Not controlled action				
220 Lot Residential Subdivision and Development	2009/4705	Not Controlled Action	Completed	In buffer area only
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.

Appendix J - Habitat suitability assessment

Threatened communities

Threatened Ecological Community	Status		Occurs on site (Y/N)	Test of Significance required? (Y/N)?
	BC Act	EPBC Act		
Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	E	-	N	N
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland	-	E	N	N
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	-	E	N	N
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
Grey box-grey gum wet forest of subtropical eastern Australia	-	E	N	N
Grey Box-Grey Gum Wet Sclerophyll Forest in the NSW North Coast Bioregion	E	-	N	N
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E	-	N	N
Lowland Rainforest of Subtropical Australia	-	CE	N	N
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E	CE	N	N
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E	-	N	N
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	-	E	N	N
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E	-	N	N
White Gum Moist Forest in the NSW North Coast Bioregion	E	-	N	N

Key: E – Endangered; CE – Critically Endangered

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependant on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

Flora

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)?
		BC Act	EPBC Act					
<i>Arthraxon hispidus</i>	Hairy Jointgrass	V	V	868	Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	Y	Low/Medium	N – not present
<i>Clematis fawcettii</i>	Northern Clematis	V	V	13	Drier rainforest, usually near streams	N	Low	N
<i>Coatesia paniculata</i>	Axe-Breaker	E		13	Axe-Breaker is found in dry subtropical rainforest and vine scrub, often along rivers.	N	Low	N
<i>Corchorus cunninghamii</i>	Native Jute	E	E	6	Occurs in ecotones between wet eucalypt forest and dry to dry-subtropical rainforest on sheltered slopes and gullies, and grassy, open forest on exposed slopes and ridges.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)?
		BC Act	EPBC Act					
<i>Davidsonia jerseyana</i>	Davidson's Plum	E	E	1	Lowland subtropical rainforest and wet eucalypt forest at low altitudes (below 300m)	N	Low	N
<i>Desmodium acanthocladum</i>	Thorny Pea	V	V	418	Dry rainforest and fringes of riverine subtropical rainforest	N	Low	N
<i>Doryanthes palmeri</i>	Giant Spear Lily	V	-	1	Occurs on exposed rocky outcrops on infertile soils or on bare rock in a narrow band of vegetation along the cliff-tops and on steep cliff-faces or rocky ledges in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.	N	Low	N
<i>Endiandra hayesii</i>	Rusty Rose Walnut	V	V	1	Sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils.	N	Low	N
<i>Floydia praealta</i>	Ball Nut	V	V	7	Riverine and subtropical rainforest, usually on soils derived from basalt.	N	Low	N
<i>Gossia fragrantissima</i>	Sweet Myrtle	E	E	47	Dry subtropical and riverine rainforest.	N	Low	N
<i>Hicksbeachia pinnatifolia</i>	Red Boppel Nut	V	V	2	Subtropical rainforest, moist eucalypt forest and Brush Box forest	N	Low	N
<i>Macadamia integrifolia</i>	Macadamia Nut	-	V	2	Found in subtropical rainforest, usually near the coast	N	Low	N
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	4	Found in subtropical rainforest, usually near the coast	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)?
		BC Act	EPBC Act					
<i>Myrsine richmondensis</i>	Ripple-leaf Muttonwood	E	E	2	Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil. Known only from a few populations at Coraki, Boatharbour near Lismore, and the Cherry Tree area west of Casino	N	Low	N
<i>Oberonia complanata</i>	Yellow-flowered King of the Fairies	E	-	3	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves	N	Low	N
<i>Ochrosia moorei</i>	Southern Ochrosia	E	E	11	Southern Ochrosia is found in riverine and lowland subtropical rainforest	N	Low	N
<i>Owenia cepiodora</i>	Onion Cedar	V	V	1	Subtropical and dry rainforest on or near soils derived from basalt	N	Low	N
<i>Randia moorei</i>	Spiny Gardenia	E	E	4	Subtropical, riverine, littoral and dry rainforest. In NSW, Hoop Pine and Brush Box are common canopy species	N	Low	N
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	21	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)?
		BC Act	EPBC Act					
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	1	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	N	Low	N
<i>Rhynchosia acuminatissima</i>	Pointed Trefoil	V	-	3	Found in or near dry rainforest dominated by Hoop Pine	N	Low	N
<i>Sarcochilus dilatatus</i>	Brown Butterfly Orchid	E	-	2	Grows on trees in littoral rainforest, subtropical rainforest, dry rainforest and streamside forests, mainly at low to medium (up to 500m) altitudes. Plants favour Hoop Pine as a host.	N	Low	N
<i>Senna acclinis</i>	Rainforest Cassia	E	-	1	Grows in or on the edges of subtropical and dry rainforest	N	Low	N
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	V	V	2	Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils	N	Low	N
<i>Thesium australe</i>	Austral Toadflax	V	V	3	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	N	Low	N
<i>Tinospora smilacina</i>	Tinospora Vine	E	-	7	Dry rainforest and along the boundaries of dry rainforest and dry eucalypt forest.	N	Low	N
<i>Tinospora tinoporoides</i>	Arrow-head Vine	V	—	131	Wetter subtropical rainforest, including littoral rainforest, on fertile, basalt-derived soils.	N	Low	N
<i>Triflorensia cameronii</i>	Cameron's Tarennia	E	-	5	Understorey of dry rainforest, on rocky basalt-derived soils. Only one population is known around (in Lismore).	N	Low	N

Key: CE – Critically Endangered; E – Endangered; V – Vulnerable

Fauna

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
Aves								
<i>Amaurornis moluccana</i>	Pale-vented Bush Hen	V	-	1	Inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests.	N	Low	N
<i>Anseranas semipalmata</i>	Magpie Goose	V	-	1	Shallow wetlands (<1 m deep), large swamps and dams with dense growth of rushes or sedge.	N	Low	N
<i>Calyptrorhynchus lathami</i>	Glossy Black-Cockatoo	V	V	1	Open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur.	N	Low	N
<i>Carterornis leucotis</i>	White-eared Monarch	V	-	2	Rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest.	N	Low	N
<i>Circus assimilis</i>	Spotted Harrier	V	-	2	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	44	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands.	N	Low	N
<i>Falco subniger</i>	Black Falcon	V	-	1	Solitary, active aggressive falcon of open plains and sparse woodland and shrubland, sometimes coastal open areas.	N	Low	N
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	2	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used. Nests in proximity to feeding areas most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Riparian trees often chosen, including species like Allocasuarina.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	1	Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	N	Nil	N
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	V	-	30	Near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts	N	Low	N
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	4	Open eucalypt forest, woodland or open woodland. She oak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	N	Low	N
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V	9	Almost exclusively aerial (above 1000m) but may have a preference for wooded areas.	N	Low	N
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V	-	123	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	N	Nil	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	1	Dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp she-oaks and mangroves.	N	Nil	N
<i>Pandion cristatus</i> (formerly <i>Pandion haliaetus</i>)	Eastern Osprey	V	-	1	Fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	N	Low	N
<i>Oxyura australis</i>	Blue-billed Duck	V	-	5	The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached.	N	Nil	N
<i>Podargus ocellatus</i>	Marbled Frogmouth	V	-	10	Subtropical rainforest spending most time is deep, wet sheltered gullies.	N	Nil	N
<i>Pomatostomus temporalis</i> <i>temporalis</i>	Grey-crowned Babbler	V	-	1	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Ptilinopus magnificus</i>	Wompoo Fruit-dove	V	-	13	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests. The nest is a typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground.	N	Low	N
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove	V	-	35	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	N	Low	N
<i>Ptilinopus superbus</i>	Superb Fruit-dove	V	-	2	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	N	Low	N
<i>Stictonetta naevosa</i>	Freckled Duck	V	-	7	Permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.	N	Nil	N
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	1	Areas of tall grass, including tussocks in swampy areas, grassy plains, swampy heath, cane grass, sedges on flood plains.	N	Nil	N
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	1	Dry, subtropical and warm temperate rainforests and wet eucalypt forests. Nest in large tree hollows.	N	Nil	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Ninox strenua</i>	Powerful Owl	V	-	2	Woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest but can occur in fragmented landscapes. It roosts by day in dense vegetation comprising species such as Turpentine Syncarpia glomulifera, Black She-oak Allocasuarina littoralis, Blackwood Acacia melanoxylon, Rough-barked Apple Angophora floribunda, Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	N	Low	N
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	1	Dry eucalypt forest and woodlands. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	1	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	N	Low	N
Mammalia								
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	12	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	N	Nil	N
<i>Phascolarctos cinereus</i>	Koala	E	E	2421	The Koala inhabits eucalypt forest and woodland. The suitability of forest and woodland communities as habitat for Koalas is influenced by the size and species of trees present, soil nutrients, climate, rainfall and the size and disturbance history of the habitat patches.	N	Low	N
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	965	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	N	Low	N
Microbats								

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	2	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	N	Low	N
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	2	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Y	Moderate	Y – potential roost habitat in bridge
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	25	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Y	Moderate	Y – potential roost habitat in bridge
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	9	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Y	Moderate	Y – potential roost habitat in bridge

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Myotis macropus</i>	Southern Myotis	V	-	3	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.	Y	Moderate	Y – potential roost habitat in bridge
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V	-	32	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured. Roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings.	N	Low	N

Scientific Name	Common Name	Status		Number of records	Habitat Requirement	Site contains suitable habitat (Y/N)	Likelihood of occurrence	Test of Significance required? (Y/N)? (If yes refer Appendix K)
		BC Act	EPBC Act					
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	5	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest; most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	N	Low	N
Reptilia								
<i>Cacophis harriettae</i>	White-crowned Snake	V	-	2	Favours low to mid-elevation dry eucalypt forest and woodland, particularly areas with a varied and well-developed litter layer, where their prey of small lizards may be more abundant	N	Nil	N
Invertebrates								
<i>Nurus brevis</i>	Shorter Rainforest Ground-beetle	E	-	285	Lives in burrows in low elevation rainforest, predominantly drier rainforests	N	Nil	N

Key: CE – Critically Endangered; E – Endangered; V – Vulnerable

Appendix K - Tests of Significance (BC Act)

The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. It is applied as part of the Biodiversity Offsets Scheme entry requirements and for Part 5 activities under the *Environmental Planning and Assessment Act 1979*. The test of significance is set out in s.7.3 of the *Biodiversity Conservation Act 2016* (BC Act).

The following microbat species have been assessed, due to impacts to potential low quality roost habitat within the Terania street bridge:

- Eastern Coastal Free-tailed Bat
- Little Bent-winged Bat
- Large Bent-winged Bat
- Southern Myotis.

(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,*

For all of the subject species, the project would result in the permanent loss of low quality roost habitat within the bridge (which at the time of assessment was unoccupied) which provides opportunistic roost habitat only. The poor quality of roost habitat in the bridge is exacerbated by high light penetration to many splits and cracks which are also vulnerable to the weather. As noted, the bridge was nearly fully submerged during the 2022 flood event. Various other bridge structures occur within a ~1km radius of the site (three other rail underbridges, in addition to Colemans bridge and Fawcetts bridge) which provide similar low quality roost habitat. Further, the stormwater outlet tunnel (~400m in length) on Browns Creek outlet provides high quality roost habitat known to be utilized by Southern Myotis and Bentwing-bats (pers. data).

On this basis, the loss of opportunistic roost habitat at the site represents a minor loss to bridge roosting microbats within the locality and as a result the proposed works are unlikely to have an adverse effect on the subject species such that a viable local 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.***

Not relevant to this assessment.

(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***

The proposed works requires the permanent removal of low quality microbat roost habitat within Terania Street bridge; the loss of this structure represents a minor contraction of opportunistic roost habitat in the locality, where several other similar structures occur.

- (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***

The minor nature of the works would not fragment habitat for any of the subject species with regard to foraging or seasonal movements.

- (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,***

The habitat to be removed is unlikely to be of any significant importance to the subject species in the context of available habitat within the study area.

(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),*

There are no declared areas of outstanding biodiversity value within the locality.

(e) *whether the proposed development or activity constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

A key threatening process is listed in the *Biodiversity Conservation Act 2016* if it:

- adversely affects threatened species or ecological communities
- could cause species or ecological communities to become threatened.

The current list of key threatening processes (KTPs) and whether the proposal constitutes any KTPs, is summarised in **Table K.2**.

Table K.2 Key Threatening Process assessment

Listed Key Threatening Processes (Schedule 4 BC Act)	Is the activity recognised as a key threatening process?		
	Likely	Possibly	Unlikely
Aggressive exclusion of birds by noisy miners (<i>Manorina melanocephala</i>)			✓
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			✓
Bush rock removal			✓
Clearing of native vegetation			✓
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)			✓
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)			✓
Competition from feral honey bees (<i>Apis mellifera</i>)			✓
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			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants (<i>Solenopsis invicta</i>)			✓
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 <i>Phytophthora cinnamomi</i>			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch broom (<i>Cytisus scoparius</i>)			✓
Invasion and establishment of the cane toad (<i>Bufo marinus</i>)			✓
Invasion of native plant communities by African Olive <i>Olea europaea</i> L. subsp. <i>cuspidata</i>			✓
Invasion, establishment and spread of Lantana camara			✓
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the yellow crazy ant (<i>Anoplolepis gracilipes</i> (Fr. Smith) 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 of feral dogs (<i>Canis lupus familiaris</i>)			✓
Predation by the European red fox (<i>Vulpes vulpes</i>)			✓
Predation by the feral cat (<i>Felis catus</i>)			✓
Predation by <i>Gambusia holbrooki</i> Girard, 1859 (plague minnow or mosquito fish)			✓
Predation by the ship rat (<i>Rattus rattus</i>) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>)			✓
Removal of dead wood and dead trees			✓

No KTPs are relevant to the proposal.

Conclusion:

It is the conclusion of this assessment that the proposal is unlikely to result in a significant impact on the local occurrence of the subject entities. Consequently, further assessment in the form of a Species Impact Statement or BDAR is not required.

Appendix L - Contamination search results

Search results

Your search for:LGA: LISMORE CITY COUNCIL

Matched 22 notices relating to 8 sites.

[Search Again](#)

[Refine Search](#)

Suburb	Address	Site Name	Notices related to this site
GOONELLABAH	Bruxner HIGHWAY	Dip 4885 McDermott's	1 current
GOONELLABAH	161 Invercauld ROAD	Former Invercauld Road Cattle Dip	3 former
LISMORE	Cnr John Street & Keen STREET	Lismore Gasworks	6 former
LISMORE HEIGHTS	426 Ballina ROAD	Coles Express Lismore Heights	2 current and 2 former
LISMORE HEIGHTS	22 New Ballina ROAD	Impacted land, below Beardow Street landslide	2 former
SOUTH LISMORE	Caniaba STREET	Lismore Airport	3 former
TERANIA CREEK	Wallace ROAD	Former Izzards Cattle Tick Dip	2 former
TUNCESTER	13 Rifle Range ROAD	Asbestos Waste Burial Site	1 current

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Find us on

Cattle dip site locator

This search retrieved 25 dip sites.
For more information about each dip site, click on the name below.

Dip name	Road	Town/Locality
ANDIES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQxOSZhbGw9MQ%3D%3D)	FREDERICKS ROAD	LISMORE
BELTANA (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQyMCZhbGw9MQ%3D%3D)	CANIABA ROAD	LISMORE
BICES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM0NiZhbGw9MQ%3D%3D)	YEAGERS ROAD	LISMORE
BOORIE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM5MiZhbGw9MQ%3D%3D)	BOORIE CREEK ROAD	LISMORE
BRYANTS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjE0MDMmYWxsPTE%3D)	DONNANS ROAD	LISMORE
BUCKLEYS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjUwNiZhbGw9MQ%3D%3D)	BRUXNER HIGHWAY	LISMORE
BUNGABEE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM2NSZhbGw9MQ%3D%3D)	BUNGABEE ROAD	LISMORE
CROSS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjUwNCZhbGw9MQ%3D%3D)	LAGOON GRASS	LISMORE
DEEGANS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjMyNyZhbGw9MQ%3D%3D)	WOODLAWN ROAD	LISMORE
DIADEM (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjE0NTgmYWxsPTE%3D)	BANGALOW ROAD	LISMORE
FERNSIDE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjMyNiZhbGw9MQ%3D%3D)	KYOGLE ROAD	LISMORE
HOWARDS GRASS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjUxMiZhbGw9MQ%3D%3D)	HOWARDS GRASS	LISMORE
INVERCAULD (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQ0NiZhbGw9MQ%3D%3D)	INVERCAULD ROAD	LISMORE
JBM (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM1MSZhbGw9MQ%3D%3D)	LEYCESTER ROAD	LISMORE
KOPPS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQyMiZhbGw9MQ%3D%3D)	CANIABA ROAD	LISMORE
LOYAL VALLEY (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQxNyZhbGw9MQ%3D%3D)	PELICAN CREEK ROAD	LISMORE
MAIZE GROVE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQ0MCZhbGw9MQ%3D%3D)	SKYLINE ROAD	LISMORE
MCCELLANDS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM4NCZhbGw9MQ%3D%3D)	HEWITT ROAD	LISMORE

MEDLYNS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQxNSZhbGw9MQ%3D%3D)	JOHNSTON ROAD	LISMORE
NEVILLES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjMzOCZhbGw9MQ%3D%3D)	QUILTY ROAD	LISMORE
RODERS (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjE4MTEmYWxsPTE%3D)	RIVERBANK ROAD	LISMORE
RUANES (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQwOCZhbGw9MQ%3D%3D)	THREE CHAIN ROAD	LISMORE
THE BRIDGE (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjM0NCZhbGw9MQ%3D%3D)	ROCK VALLEY ROAD	LISMORE
TIP (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjE2NTcmYWxsPTE%3D)	RIVERBANK ROAD	LISMORE
TUCKI (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator?sq_content_src=%2BdXJsPWh0dHBzJTnBJTJGJTJGYnRjLmRwaS5uc3cuZ292LmF1JTJGRGlwJTJGRGV0YWlscyUyRjQ0OSZhbGw9MQ%3D%3D)	MUNRO WHARF ROAD	LISMORE

Find dip sites

Dip name

Road

Town/Locality

lismore

Council

---select all---

Search

The information contained in this web page is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Industry& Investment NSW or the user’s independent adviser.

Appendix M - Noise estimator results



Distanced Based Assessment (Construction Scenario)

Please pick from drop-down list in orange cells

Noise area category		R2
RBL or LA90 Background level (dB(A))	Day	45
	Evening	40
	Night	35
LAeq(15minute) Noise Mangement Level (dB(A))	Day	55
	Day (OOHW)	50
	Evening	45
	Night	40
Scenario		Structural demolition
Is there line of sight to receiver?		Yes

Steps for Screening Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.

2. Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.

3. Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.

4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. 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 and any gaps would compromise the acoustic integrity of the solid barrier.

6. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background noise measurements to check assumption in Step #2 if:

(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or

(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver

8. Where night works are involved, identify sleep disturbance affected distance.

9. Document the outcomes of these steps.

(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 basis. Please contact a Roads and Maritime noise specialist for more information)

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

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver			LAeq(15minute) noise level above background (LA90)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disutrbanace LAmax 65 dB(A)
			5 to 10 dB(A) Noticeable			10 to 20 dB(A) Clearly audible			20 to 30 dB(A) Moderately intrusive			> 30 dB(A) Highly intrusive						
			Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Affected distance (m)
Undeveloped green fields, rural areas with isolated dwellings	Day	310							N	145	65	N, PC, RO	50	75	N, PC, RO	50	75	
	Day (OOHW)	450				N, R1, DR	310	55	N, R1, DR	145	65	N, R1, DR, PC, SN	50	75	N, PC, RO	50	75	
	Evening	650				N, R1, DR	450	50	N, R1, DR	215	60	N, R1, DR, PC, SN	95	70	N, PC, RO	50	75	
	Night	940	N	940	40	N, R2, DR	650	45	N, PC, SN, R2, DR	310	55	AA, N, PC, SN, R2, DR	145	65	N, PC, RO	50	75	
	Highly Affected	50													N, PC, RO	50	75	170
Developed settlements (urban and suburban)	Day	390							N	165	65	N, PC, RO	60	75	N, PC, RO	60	75	
	Day (OOHW)	585				N, R1, DR	390	55	N, R1, DR	165	65	N, R1, DR, PC, SN	60	75	N, PC, RO	50	75	
	Evening	865				N, R1, DR	585	50	N, R1, DR	255	60	N, R1, DR, PC, SN	105	70	N, PC, RO	60	75	
	Night	1260	N	1260	40	N, R2, DR	865	45	N, PC, SN, R2, DR	390	55	AA, N, PC, SN, R2, DR	165	65	N, PC, RO	60	75	
	Highly Affected	60													N, PC, RO	60	75	200
Propagation across a valley / over water	Day	530							N	205	65	N, PC, RO	60	75	N, PC, RO	60	75	
	Day (OOHW)	810				N, R1, DR	530	55	N, R1, DR	205	65	N, R1, DR, PC, SN	60	75	N, PC, RO	60	75	
	Evening	1215				N, R1, DR	810	50	N, R1, DR	335	60	N, R1, DR, PC, SN	125	70	N, PC, RO	60	75	
	Night	1770	N	1770	40	N, R2, DR	1215	45	N, PC, SN, R2, DR	530	55	AA, N, PC, SN, R2, DR	205	65	N, PC, RO	60	75	
	Highly Affected	60													N, PC, RO	60	75	250



Distanced Based Assessment (Noisiest Plant)

Please pick from drop-down list in orange cells

Noise area category		R2
RBL or LA90 Background level (dB(A))	Day	45
	Evening	40
	Night	35
LAeq(15minute) Noise Mangement Level (dB(A))	Day	55
	Day (OOHW)	50
	Evening	45
	Night	40
Noisiest plant		13.5T Excavator With Hammer
Is there line of sight to receiver?		Yes

Steps for Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.

2. Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.

3. Select the noisiest plant. If not found in drop-down list, refer to 'Source List' and select a representative plant with equivalent sound power level.

4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barriers can be in the form of road cutting, timber lapped and capped fence, shipping container, site office, etc. Substantial solid barriers are barriers greater than 5 metres in height or multiple rows of houses or a sound barrier specifically designed to mitigate construction noise. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

5. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background LA90 noise measurements to check assumption in Step #2 if:

(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or

(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver.

8. Where night works are involved, identify sleep disturbance affected distance.

9. Document the outcomes of these steps.

(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 basis. Please contact a Roads and Maritime noise specialist for more information)

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

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver			L _{Aeq} (15minute) noise level above background (L _{A90})												L _{Aeq} (15minute) 75 dB(A) or greater (Highly affected)			Sleep disutrbance L _{Amax} 65 dB(A)
			5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)						
			Noticeable			Clearly audible			Moderately intrusive			Highly intrusive						
			Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))				
Undeveloped green fields, rural areas with isolated dwellings	Day	315							N	150	65	N, PC, RO	60	75	N, PC, RO	60	75	315
	Day (OOHW)	455				N, R1, DR	315	55	N, R1, DR	150	65	N, R1, DR, PC, SN	60	75	N, PC, RO	60	75	
	Evening	655				N, R1, DR	455	50	N, R1, DR	215	60	N, R1, DR, PC, SN	105	70	N, PC, RO	60	75	
	Night	940	N	940	40	N, R2, DR	655	45	N, PC, SN, R2, DR	315	55	AA, N, PC, SN, R2, DR	150	65	N, PC, RO	60	75	
	Highly Affected	60													N, PC, RO	60	75	390
Developed settlements (urban and suburban)	Day	390							N	170	65	N, PC, RO	70	75	N, PC, RO	70	75	
	Day (OOHW)	590				N, R1, DR	390	55	N, R1, DR	170	65	N, R1, DR, PC, SN	70	75	N, PC, RO	70	75	
	Evening	870				N, R1, DR	590	50	N, R1, DR	260	60	N, R1, DR, PC, SN	110	70	N, PC, RO	70	75	
	Night	1265	N	1265	40	N, R2, DR	870	45	N, PC, SN, R2, DR	390	55	AA, N, PC, SN, R2, DR	170	65	N, PC, RO	70	75	
Highly Affected	70														N, PC, RO	70	75	530
Propagation across a valley / over water	Day	530							N	210	65	N, PC, RO	80	75	N, PC, RO	80	75	
	Day (OOHW)	815				N, R1, DR	530	55	N, R1, DR	210	65	N, R1, DR, PC, SN	80	75	N, PC, RO	80	75	
	Evening	1215				N, R1, DR	815	50	N, R1, DR	340	60	N, R1, DR, PC, SN	130	70	N, PC, RO	80	75	
	Night	1770	N	1770	40	N, R2, DR	1215	45	N, PC, SN, R2, DR	530	55	AA, N, PC, SN, R2, DR	210	65	N, PC, RO	80	75	
	Highly Affected	80														N, PC, RO	80	75

Appendix N - Aboriginal heritage

Laura Day

Date: 17 April 2024

PO Box 5313

East Lismore New South Wales 2480

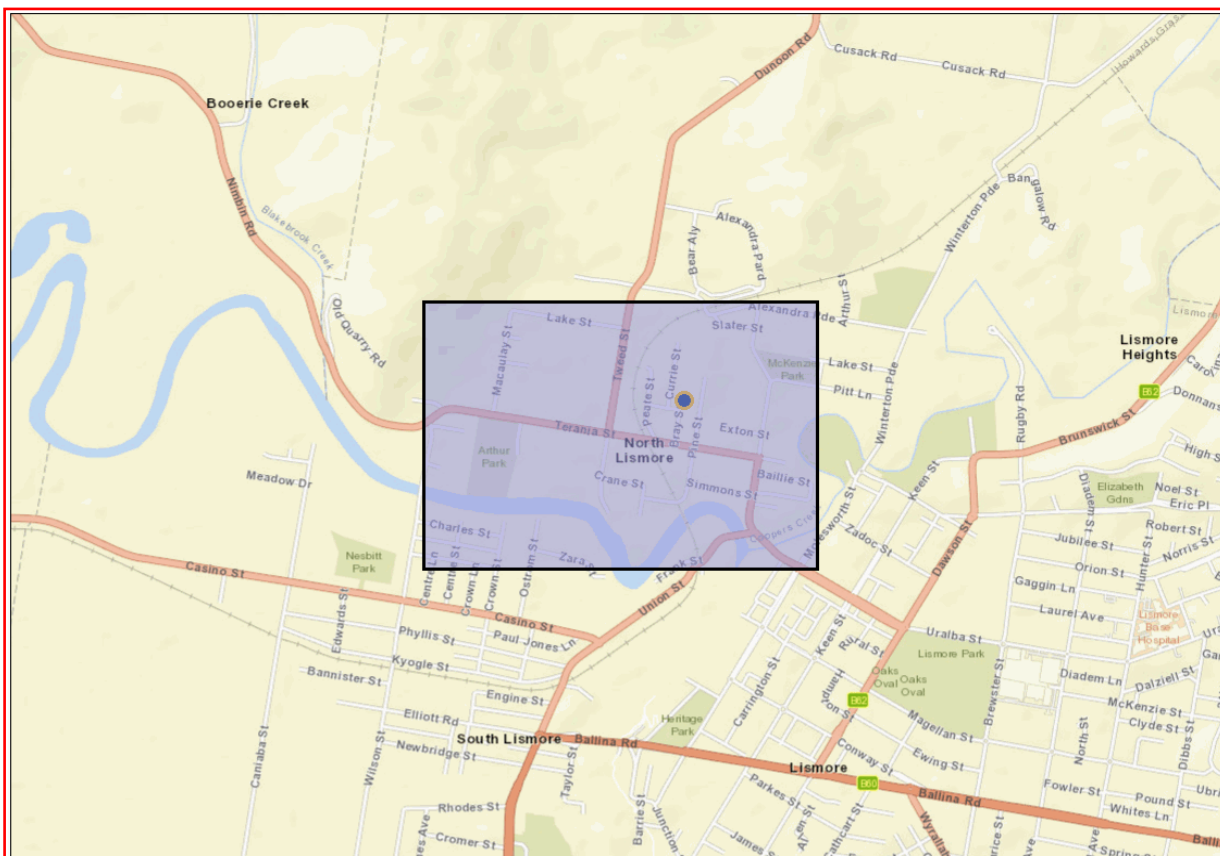
Attention: Laura Day

Email: laura.day@reconeco.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -28.8067, 153.2625 - Lat, Long To : -28.7973, 153.278, conducted by Laura Day on 17 April 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:

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

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

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

Important information about your AHIMS search

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

23 May 2024

Project Manager Scott Pierce
Organisational Unit Project Manager

Dear Scott,

Preliminary assessment results for the project – Terania St Bridge Demolition. Based on Stage 1 of the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI), Desktop Evaluation on this day 21.5.2024

The project, Demolition of the bridge, as described in the Stage 1 assessment, phone call and clarifying emails with the Project manager and Environmental officer was assessed as being unlikely to have an impact on Aboriginal cultural heritage based on the information provided.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area. **One site identified outside the project area.** Ref AHIMS search for location of the site.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to current past disturbance (construction of the bridge).

Safeguard Conditions: Please be vigilant in the consideration for the presence of potential Aboriginal objects when the work commences.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW ***Unexpected Archaeological Finds Procedure***.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely



Laura Bowen
Aboriginal Cultural Heritage Officer– Region Nor

