

McKanes Bridge Capacity Upgrade

Review of Environmental Factors

Roads and Maritime Services | October 2019



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Prepared by AECOM Australia Pty Ltd and Roads and Maritime Services

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Executive summary

The proposal

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the capacity of McKanes Bridge on McKanes Falls Road, South Bowenfels to ensure the bridge can meet the current and future safe operational needs of the road network. McKanes Bridges is one of four McDonald truss bridges left in NSW, and is listed as a Stage Heritage item. Roads and Maritime considers that the retention of this structure would ensure that one of the oldest surviving examples of a McDonald timber truss bridge in NSW is conserved. Conservation would be achieved by strengthening the existing bridge to provide a safer, stronger and more reliable bridge while still preserving the heritage aspects of the original. To facilitate the upgrade of the bridge, it is proposed to close McKanes Falls Road to all traffic for an estimated 12-month period, with a detour in place via Jenolan Caves Road and the Great Western Highway. This proposed detour would add approximately five minutes to travel time.

Key features of the proposal include:

- Restoring McKanes Bridge by retaining the form (the original McDonald truss design and span arrangements) and the fabric (material type) of the existing bridge
- Upgrading critical structural elements of the bridge with visually unobtrusive, superior, and more durable elements.

The upgraded design would include the following:

- Replacing some timber elements with steel
- Replacing some cast or wrought iron elements with steel or modern cast iron
- Strengthening the timber bottom chords of the trusses by adding steel plates
- Replacing the existing timber plank bridge deck with a modern stress-laminated timber (SLT) deck, to eliminate gaps.
- Replacing the existing timber handrails with a modern steel traffic safety barrier system

The proposed method of restoring and upgrading the bridge would be as follows:

- Install a temporary supporting structure that would take the weight of the current bridge.
- Dismantle the current bridge
- Build the replacement bridge
- Remove the temporary supporting structure.

Need for the proposal

McKanes Falls Road (including McKanes Bridge) provides an important alternative North-South road connection between Jenolan Caves Road and the Great Western Highway.

McKanes Bridge currently has a 15 tonne load limit which prevents heavier vehicles up to General Mass Limit (GML) from using the bridge. This load limit constrains access for local rural properties, for example the movement of livestock and agricultural goods, regular waste collection services, and the local school bus route. On occasions when incidents require closure of Jenolan Caves Road, McKanes Falls Road is an authorised emergency traffic detour route, however the current load limit requires vehicles over 15 tonne to detour a far greater distance via Oberon and Bathurst.

The timber side rails do not meet Roads and Maritime requirements for traffic barriers. The condition of the bridge poses a safety hazard to road users while the load limit reduces local and regional efficiency as vehicles over 15 tonnes cannot use this route.

McKanes Bridge has State heritage significance, being listed on the NSW State Heritage Register and Roads and Maritime Section 170 (s170) Heritage Register. A conservation strategy has been developed within the *Timber Truss road bridges - A strategic approach to conservation* (RTA, 2011) which places a high importance on maintaining the heritage values of McKanes Bridge.

In order to continue service for local traffic, improve the capacity for local and regional freight and to preserve the heritage values of a State Heritage Significant item, it is proposed to restore and upgrade McKanes Bridge.

The proposal would also address the following strategic documents and plans:

- Future Transport Strategy 2056 (Transport for NSW, 2018)
- Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018)
- NSW Freight and Ports Plan 2018 – 2023
- Central West and Orana Regional Plan 2036
- NSW 2021: A Plan to make NSW Number One
- National Road Safety Strategy 2011 – 2020 (Australian Transport Council, 2011)
- NSW Government State Infrastructure Strategy
- Rebuilding NSW State Infrastructure Strategy 2014 – Update.

Proposal objectives and development criteria

The objectives of the proposal are to:

- Upgrade the existing bridge to allow safe use by vehicles up to GML standard
- Replace the existing timber side rails with a steel traffic barrier over the full length of the bridge
- Restore the condition of the major structural bridge elements to original condition (by replacement or repair)
- Preserve the heritage form of the bridge (ie truss type)
- The upgrade design is to have as minimal a negative impact to heritage value as possible, while still achieving the above proposal objectives
- Minimise operating costs of the bridge as far as possible while still achieving the proposal objectives.

The development criteria for the proposal include:

- Provide an upgraded bridge on the same road alignment as the existing bridge
- Provide a bridge that complies with current design codes and is capable of supporting and improving access for all vehicles up to GML standard.
- Maintain the heritage significance of the bridge.

Options considered

The options considered for the proposal include:

- Option 1: “Do Nothing”
- Option 2: Like for like replacement
- Option 3: Upgrade truss capacity only
- Option 4: Upgrade truss capacity and traffic barriers
- Option 5: Demolish and replace bridge
- Option 6: Convert the bridge to a pedestrian bridge.

Option 4 was selected as the preferred option as it best met all the objectives of the proposal and the strategic need to improve freight access.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for road infrastructure and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (EP&A Act)*. Development consent from council is not required. This review of environmental factors (REF) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Roads and Maritime Western Region. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (EP&A Act)*.

The bridge is located within the boundary of the Sydney Drinking Water Catchment under *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (SDWC SEPP)*. Clause 12 of the SEPP requires consideration of whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity.

A neutral or beneficial effect assessment was conducted and concludes that the proposal will have a neutral effect on water quality.

Community and stakeholder consultation

Roads and Maritime has consulted government organisations such as Lithgow City Council, NSW Department of Primary Industries (DPI) – Fisheries and the NSW State Emergency Service (SES) during the planning phase of the proposal.

The community and affected residents would be notified of the temporary traffic diversion during the construction period. Community and stakeholder consultation would continue during the public display of this REF, and during the construction of the proposal.

Environmental impacts

Site investigations, quantitative desktop investigations and an Aboriginal cultural heritage assessment have been carried out to assess, manage and mitigate potential impacts of the proposal. The key areas of investigation included non-Aboriginal heritage, landscape and visual impacts, traffic and transport, noise and vibration, biodiversity, water quality and flooding.

The key potential environmental impacts of the proposal include:

- Loss of non-Aboriginal heritage value
- The removal of several mature trees
- Detour of traffic and increased travel times during construction due to the road closure
- Altered visual amenity of the proposal area during construction
- Water quality risks to Coxs River during construction.

Justification and conclusion

The proposal is subject to assessment under Division 5.1 of the EP&A Act. This REF has examined and considered all matters affecting or likely to affect the environment by reason of the proposed activity.

The proposal is considered to be consistent with Government strategic planning at Commonwealth, State and regional levels as it would lead to improved efficiency and safety of the road network. While there would be some environmental impacts as a consequence of the proposal, these impacts have been

avoided or minimised wherever possible through design and site-specific safeguards (Chapter 6 and Section 7.2).

This REF has concluded that the adverse impacts and risks of the proposal would be outweighed by the longer-term benefits of providing improved access, reduced traffic disruption due to less frequent maintenance, and improved safety for all road users. On balance, the proposal is therefore considered justified.

This REF has also concluded the proposal is not likely to significantly affect the environment and, therefore, an environmental impact statement and assessment under Part 5.2 of the EP&A Act is not required. Additionally, there would be no significant impacts to matters of national environmental significance or to the environment of Commonwealth land and as such the proposal was not referred to the Australian Government Department of the Environment and Energy.

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1. Introduction

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

1.1 Proposal identification

Roads and Maritime Services NSW (Roads and Maritime) is proposing to undertake works to restore and upgrade the capacity of the existing McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels (the proposal). McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway. A capacity upgrade of the bridge superstructure is required to ensure the bridge can continue to meet both the needs of the local community and the current and future safe operational needs of the road network.

McKanes Bridge was built in 1893 over the Coxs River and is a 54.86 metre-long, two-span McDonald timber truss bridge. The bridge is located within the Lithgow local government area (LGA) and is about eight kilometres south of the township of Lithgow. It is listed under the Roads and Maritime Section 170 (s170) Heritage Register as having State heritage significance as it is one of the remaining four McDonald timber truss road bridges in NSW. The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users.

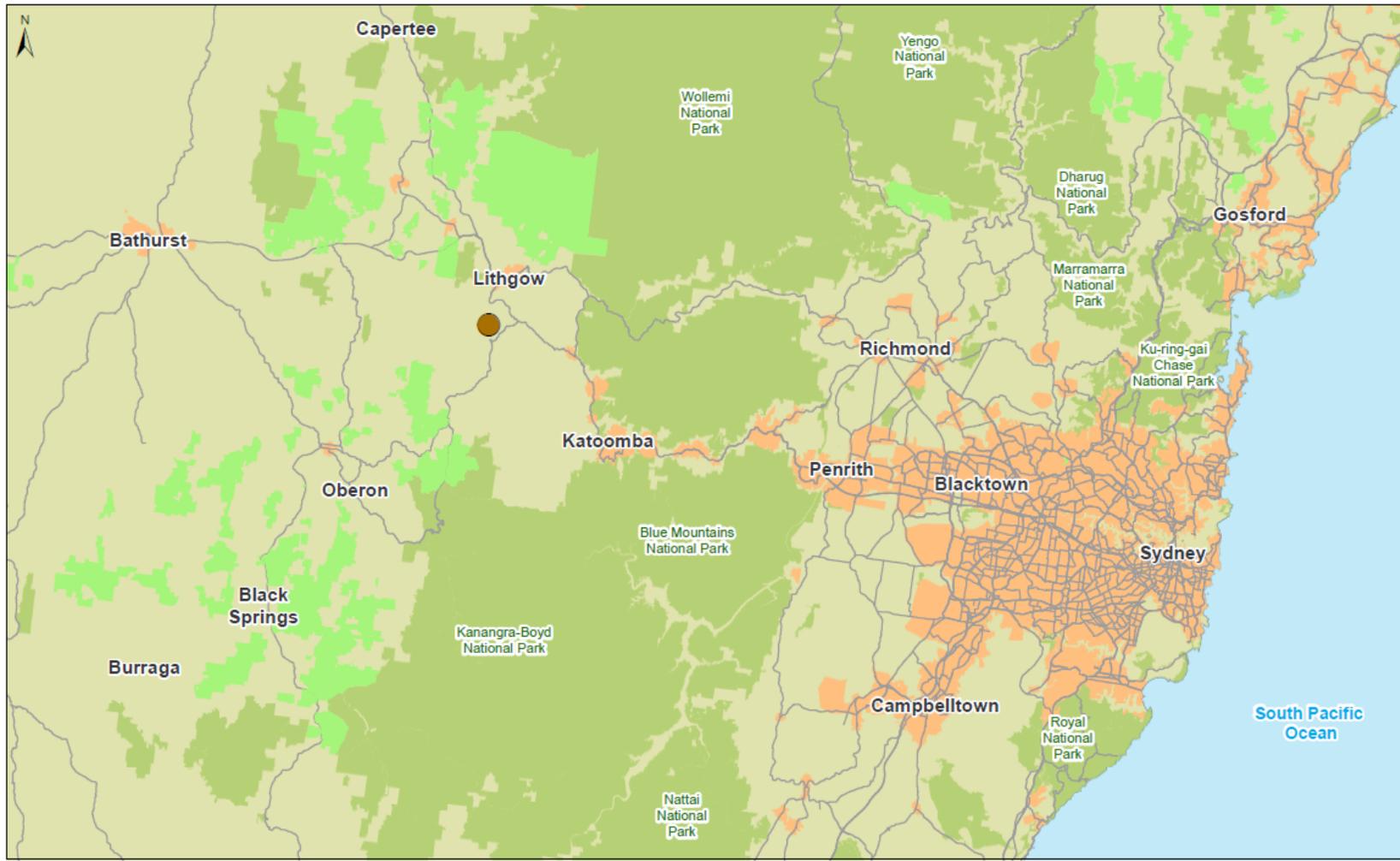
The proposal is part of the Bridges for the Bush Program, which is a NSW Government commitment to providing ongoing safe service levels and improving road freight productivity in regional NSW by replacing or upgrading bridges at 17 key locations. The proposal is required to improve the existing condition of the bridge and to allow access to vehicles up to General Mass Limits (GML) to support the movement of freight in regional NSW, while still retaining the heritage value of the structure.

The proposal would involve replacement of the truss spans of the bridge on the same alignment as the existing structure, while retaining the existing road geometry. The key features of the proposal would include:

- Removal of regrowth vegetation including several mature trees for the relocation of overhead power lines that cross Coxs River directly above McKanes Bridge
- Installation of a temporary secure compound at both ends of the bridge, including a suitable area for:
 - Construction plant and materials
 - Activities such as shaping new bridge elements
 - Construction office and amenities
 - Stockpiles.
- Provision of a temporary detour for all traffic via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal (adding about five minutes to travel time)
- Transfer of the existing bridge self-weight to a supporting structure and systematic dismantling of the bridge superstructure
- Systematic construction of the new bridge superstructure, including:
 - Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.43 metres long each (for a total bridge length of 54.86 metres)
 - Retention of the existing road geometry
 - Reduction in carriageway width to 4.2 metres between kerbs
 - Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck

- Provision of new steel traffic barriers
- Reconstruction of the concrete backing walls to both stone abutments
- Application of rock armouring scour protection to the northern abutment of the bridge
- Provision of a new maintenance monorail system
- Preservation of the State heritage significance of the bridge
- Improvement of safety and access for road users.

The location of the proposal can be seen in Figure 1-1 and Figure 1-2. Chapter 3 describes the proposal in more detail.



- Proposal location
- National Parks and Wildlife Estate
- State roads
- State Forest
- Built up areas

Location of the proposal
 B1302 McKanes Bridge Capacity Upgrade
 13/05/2019
 60558931
 Fig. **1-1**

0 5 10 20 Kilometers

Figure 1-1: Location of the proposal

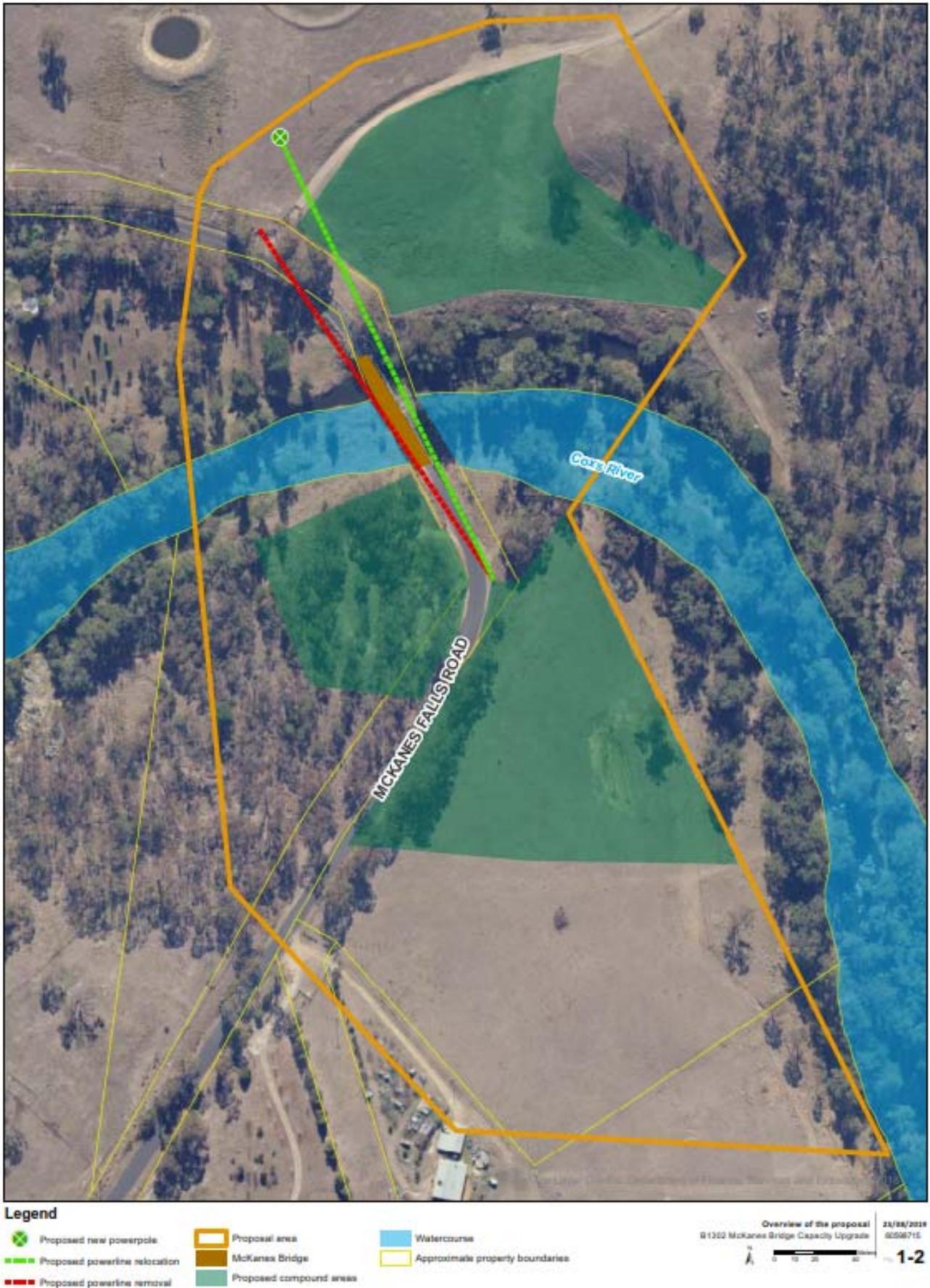


Figure 1-2: Overview of the Study Area

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Roads and Maritime Western Region. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (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 clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *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* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act including that Roads and Maritime examines and takes 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 to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the *Biodiversity Conservation Act 2016* (BC Act) and/or *Fisheries Management Act 1994* (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 whether 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 Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

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

McKanes Falls Road and McKanes Bridge facilitate north-south travel between Jenolan Caves Road and the Great Western Highway, which in turn provides a northbound connection to the Castlereagh Highway, as well as an eastbound connection to the Bells Line of Road Corridor.

McKanes Bridge has been identified to be in poor structural condition and is operating at a substandard load capacity. This prohibits vehicles over 15 tonne from crossing the bridge as they exceed the current load limit, thus limiting the ability of road vehicles to utilise McKanes Falls Road corridor to transport goods. The timber elements of the bridge have been identified to be deteriorating, with some features being substandard, such as the timber side rails which do not meet Roads and Maritime criteria to be considered traffic barriers.

The bridge is listed on Roads and Maritime s170 Heritage Register as having State significance. Given the need to balance meeting current load limits and the needs of the community and local traffic, while also maintaining the heritage value of the structure, it is proposed to restore and upgrade the superstructure of the existing bridge, rather than a full replacement. The local community has generally been supportive of preserving the existing bridge.

Identified within the *Timber Truss road bridges – A strategic approach to conservation* (RTA, 2011), the McKanes Bridge conservation strategy is centred on replacing components of the bridge following a heritage sympathetic design in order to maintain McKanes Bridge as the oldest McDonald truss bridge in NSW.

The upgrade of the existing bridge superstructure would meet the proposal objectives (refer to Section 2.3.1) and is expected to assist in the following:

- Improvement in road user safety by the replacement of the existing timber side rails with traffic barriers designed to Roads and Maritime standards
- Enhanced access for vehicles up to GML standard due to the increased bridge load capacity
- Reduced long-term costs of bridge maintenance due to the replacement of the bridge superstructure with all-new materials and in accordance with design standards
- Retention of heritage values of the bridge.

The proposal would also address the following NSW and Australian strategic documents and plans:

- Future Transport Strategy 2056 (Transport for NSW, 2018)
- Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018)
- NSW Freight and Ports Plan 2018-2023
- Central West and Orana Regional Plan 2036
- NSW 2021: A Plan to make NSW Number One
- National Road Safety Strategy 2011-2020 (Australian Transport Council, 2011)
- NSW Government State Infrastructure Strategy
- Rebuilding NSW State Infrastructure Strategy 2014 – Update.

2.1.1 Future Transport Strategy 2056

Future Transport Strategy 2056 is NSW Government's vision for the next 40 years of transport in NSW and is a result of the review of the *NSW Long Term Transport Master Plan*. The purpose of the strategy is to guide integrated transport and land use planning across regional NSW and Greater Sydney. Set out in the strategy are short, medium and long-term transport and customer outcomes to provide better and safer journeys for all transport customers.

The Future Transport Strategy will be supported by a suite of issue-specific and place-based plans that focus on the role transport plays in the land use, tourism and economic development of towns and cities. Plans under the strategy that have been finalised include; *Greater Sydney Services and Infrastructure Plan*, *Regional NSW Services and Infrastructure Plan* and the *Road Safety Plan*.

A key priority and direction under the Future Transport Strategy relates to movement and place; balancing the efficient movement of people and goods with the liveability of places on the transport network.

The proposal is consistent with the *Future Transport Strategy 2056* as the proposed upgrade will provide reliable and safe transport to the local community and regional centres and improve freight movement by catering for heavier loads.

2.1.2 Regional NSW Services and Infrastructure Plan

The *Regional NSW Services and Infrastructure Plan* is a sub-plan of the *Future Transport Strategy 2056* which sets out the NSW Government's blueprint for transport in regional NSW. The plan outlines the vision and customer outcomes that the government will use to go about its detailed transport planning in each region and also support its future decision making.

The plan has made a focus to improve east-west connectivity, as well as north-south, to open up areas west of the Great Dividing Range to the east and vice-versa. This will provide improved connectivity between the coastal population and inland as well as critical freight linkages, including connections to inland rail and ports.

2.1.3 NSW Freight and Ports Plan 2018-2023

The *NSW Freight and Ports Plan 2018-2023* is a supporting plan to the *Future Transport Strategy 2056* and aligns with other key NSW Government plans, including the *State Infrastructure Strategy* and NSW Regional Plans.

The direction of the plan is for government and industry to collaborate on clear initiatives and targets to make the NSW freight task more efficient and safer, so NSW can continue to move and grow. The key objectives include economic growth, an increase in efficiency, connectivity and access, greater capacity and improved safety and sustainability. To achieve the objectives over 70 initiatives will be actioned through the implementation of the plan. The proposal objectives are consistent with that of the NSW Freight and Ports Plan.

The proposal is anticipated to improve the efficiency of McKanes Falls Road by increasing the structural load capacity of McKanes Bridge which will enable vehicles up to GML standard to use this connection. The proposal would also improve the safety of the road by restoring the superstructure of the bridge and providing upgraded traffic barriers.

2.1.4 Central West and Orana Regional Plan 2036

The *Central West and Orana Regional Plan 2036* is a 20-year blueprint for the future of the region. The vision for the plan is to create and lead a diverse regional economy in NSW. The plan has four main goals:

- The most diverse regional economy in NSW
- A stronger, healthier environment and diverse heritage
- Quality freight, transport and infrastructure networks
- Dynamic, vibrant and healthy communities.

A capacity upgrade of the bridge superstructure is required to ensure the bridge can provide ongoing safe service levels and meet the current and future operational needs of the road network. The proposal to upgrade McKanes Bridge would support its significance in the western region of NSW and would allow for improved vehicle access.

2.1.5 NSW 2021: A Plan to make NSW Number One

A Plan to Make NSW Number One (NSW 2021 Plan) (NSW Department of Premier and Cabinet, 2011) is the NSW Government's 10-year strategic business plan which sets priorities for action and guides resource allocation to deliver economic growth and critical infrastructure throughout NSW. The NSW 2021 Plan places emphasis on investing in and delivering an efficient and effective transport system including road infrastructure that will relieve congestion, improve safety and expand capacity on road corridors.

The proposal directly addresses three objectives relating to transport and infrastructure identified in the NSW 2021 Plan. These are:

- Improves the efficiency of the road
- Reduction of travel times
- Improves the safety of roads.

The proposal is anticipated to improve the efficiency of McKanes Falls Road by increasing the structural load capacity of McKanes Bridge, thereby allowing access to vehicles over 15 tonnes that currently cannot use McKanes Falls Road and McKanes Bridge. This improved access will benefit local rural properties and businesses. The safety of all road users would also be improved via the upgrading of side rails to traffic barriers. As such, the proposal's objectives are consistent with the NSW 2021 Plan.

2.1.6 National Road Safety Strategy 2011-2020

The *National Road Safety Strategy 2011–2020* (Australian Transport Council, 2011) aims to reduce death and serious injury on Australian roads. A target of this strategy is to reduce fatalities and crashes on roads by at least 30 per cent between 2011 and 2020.

The intent of 'safe roads' is to ensure roads are designed and maintained to reduce the risk of crashes occurring and to lessen the severity of injury if a crash does occur. 'Safe roads' aims for all new and upgraded road infrastructure to be designed, constructed and operated in accordance with Safe System principles. It also aims to modify infrastructure funding guidelines and agreements to increase the safety benefits resulting from expenditure on roads.

The proposal would assist this strategy by providing an upgraded superstructure of a bridge which has been identified as being in structurally poor condition. The proposal would see the upgrade of McKanes Bridge to meet current standards and ensure safety is improved for all vehicles using the connection.

2.1.7 NSW Government State Infrastructure Strategy

The *NSW Government State Infrastructure Strategy 2012 – 2032: First Things First* (Department of Premier and Cabinet, 2012) is a strategy to plan and fund the infrastructure that the NSW Government delivers. The plan states that investment is needed to ensure sufficient road capacity is available and is utilised effectively, particularly along the motorway network.

The proposal would help fulfil the regional infrastructure priorities in chapter 5 of the *State Infrastructure Strategy 2012 – 2032* by improving local transport networks. The proposal would assist this strategy by providing an upgraded superstructure of a bridge which has been identified as being in structurally poor condition.

2.1.8 Rebuilding NSW State Infrastructure Strategy 2014 – Update

The *Rebuilding NSW State Infrastructure Strategy 2014 – Update* (NSW Department of Premier and Cabinet, 2015) is the NSW Government's response to the recommendations made by Infrastructure NSW in the *State Infrastructure Strategy 2012 – 2032* (Infrastructure NSW, 2012). This 20-year strategy identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth in NSW.

This strategy states the freight industry is critical to the NSW economy and by 2031 the volume of traffic carrying freight in NSW will nearly double. The investment in better roads would deliver an economic dividend to regional communities through improved access to employment opportunities and regional businesses more readily attracting business investment. Regional road upgrades were a prominent theme in the Rebuilding NSW consultation. The improved road safety and efficiency objectives of the proposal are consistent with the priorities of this strategy.

The upgraded bridge will cater for vehicles up to GML standard, and is therefore expected to increase the efficiency of movement of these loads and improve economic productivity.

2.2 Existing infrastructure

McKanes Bridge

McKanes Bridge was built in 1893 and is a two-span McDonald timber truss bridge. Each span is 27.43 metres long, making the total bridge length 54.86 metres. The bridge is a single lane with a width of 4.5 metres between the timber side rails. The bridge spans are supported by a central reinforced concrete pier and stone abutments. The central pier was constructed in 1987 after the original masonry structure suffered severe damage in a flood the previous year. The bridge is shown in Figure 2-1.

The bridge is constructed of mostly timber structural elements including longitudinal timber decking with laminated timber bottom chords, timber beams supported on abutments and a central pier, timber trusses, rails and cross girders (Figure 2-2). The bridge also contains brittle cast iron components that can be subject to fatigue failure.

A structural assessment was carried out by Roads and Maritime Bridge Engineering in 2017. The assessment found general deterioration of structural timber elements and concluded that the current bridge is in poor structural condition and is operating at a substandard load capacity. As a precautionary measure, a temporary load limit of 4.5 tonne was placed on the bridge until temporary repairs were made, which allowed the load limit to be increased to 15 tonnes. During the period when the 4.5 tonne limit was in place, the local school bus and waste collection services were prevented from crossing the bridge.

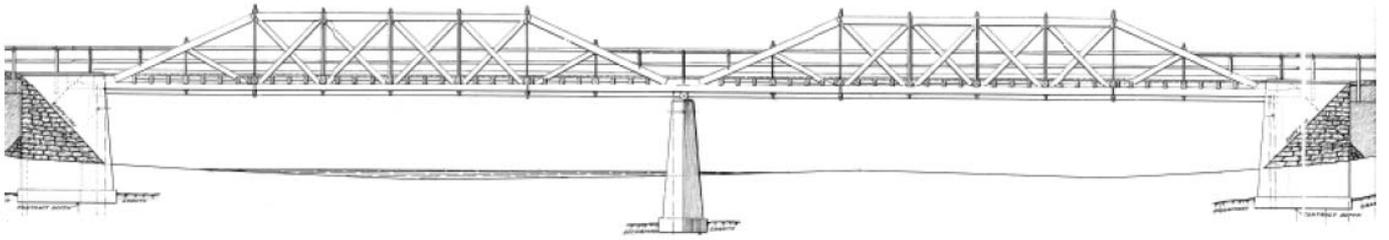


Figure 2-1 McKanes Bridge side profile showing bridge spans as existing



Figure 2-2 McKanes Bridge showing current timber decking

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Upgrade the existing bridge to allow safe use by vehicles up to GML standard
- Replace the existing timber side rails with a steel traffic barrier over the full length of the bridge
- Restore the condition of the major structural bridge elements up to original condition (by replacement or repair)
- Preserve the heritage form of the bridge (ie truss type)
- The strengthening design is to have as minimal a negative impact to heritage value as possible, while still achieving the above proposal objectives
- Minimise operating costs of the bridge as far as possible while still achieving the proposal objectives.

2.3.2 Development criteria

The development criteria for the proposal include:

- Provide an upgraded bridge on the same road alignment as the existing bridge
- Provide a bridge that complies with current design code and is capable of supporting and improving access for all vehicles up to GML standard
- Maintain the heritage significance of the bridge.

2.3.3 Urban design objectives

Urban design objectives for the proposal include:

- Minimise visual impacts to the existing character of the setting
- Respect the heritage values of the existing structure
- Design for low maintenance.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

Roads and Maritime has investigated multiple options for McKanes Bridge which would address the existing structural and safety issues. This was supported by the structural assessment carried out by Roads and Maritime in 2017.

The assessment found that the current bridge is in poor structural condition operating at a substandard load capacity and identified general deterioration of structural timber elements. The structural assessment determined the bridge was not suitable for use by vehicles other than light vehicles up to 4.5 tonnes, which prevented heavier vehicles such as the school bus and waste collection vehicles from using the bridge. The assessment recommended some immediate maintenance actions that subsequently allowed the load limit

to be raised to 15 tonnes. However this current load limit still prohibits heavier vehicles up to GML standard from crossing the bridge and limits the ability of local road freight to utilise McKanes Falls Road.

The options considered as part of the proposal are described below in Section 2.4.2 and an options analysis is provided in Section 2.4.3.

2.4.2 Identified options

Six options were considered as part of the proposal, including the “Do Nothing” option. These options included:

- Option 1: “Do Nothing”
- Option 2: Like for like replacement
- Option 3: Upgrade truss capacity only
- Option 4: Upgrade truss and traffic barrier load capacity
- Option 5: Demolish and replace bridge
- Option 6: Convert the bridge to a pedestrian bridge.

The options considered are described below:

Option 1: “Do Nothing”

The “Do Nothing” option involves retaining the existing bridge.

Routine and minor maintenance activities would be undertaken as well as routine inspections. The advantage of this option is that it is the lowest cost option. However, the “Do Nothing” option does not meet any of the proposal objectives; it would allow the bridge condition to continue to deteriorate, and without adequate traffic safety barriers.

Option 2: Like for like replacement

This option involves replacing the existing bridge components as a ‘like for like’ style replacement.

The advantages of this option include less stringent heritage approvals, reduced costs and preserving the heritage of the bridge in its current design. However, Option 2 does not meet all the proposal objectives, the bridge load capacity would remain unsuitable for GML vehicles and the bridge would remain without adequate traffic safety barriers.

Option 3: Upgrade truss capacity only

This option involves upgrading the load capacity of the timber trusses and the replacement of other timber elements to steel. Minor changes to the truss bottom chords would be required and brittle cast iron elements would also be replaced with steel.

This option meets most of the proposal objectives and would create a good possible heritage outcome for the bridge. It would also address some of the current capacity and safety issues that are affecting its ongoing use. However, Option 3 does not meet all the proposal objectives and the bridge would remain without adequate traffic safety barriers.

Option 4: Upgrade truss capacity and traffic barriers

This option involves upgrading the load capacity of the timber trusses, as well as providing traffic safety barriers, and the replacement of certain timber elements to steel. Minor changes to the truss bottom chords would be required and brittle cast iron elements would also be replaced with ductile cast iron and steel.

This option meets the proposal objectives with minimal heritage impact. The bridge load capacity would be suitable for vehicles up to GML standard, and with the addition of an upgraded traffic safety barrier system.

The disadvantage of this option is that it has a greater heritage impact than the like for like replacement option.

Option 5: Demolish and replace the bridge

This option involves demolishing the existing timber truss bridge and replacing it with a modern steel or concrete bridge.

The advantages of this option are that the safety objectives would all be met, and the new bridge would far exceed the requirements for GML vehicles. A new replacement bridge would allow two lanes of traffic instead of one, and would require less frequent maintenance. However, the existing McKanes bridge would have to be delisted from the State Heritage Register if it were to be demolished, and all value of a State significant heritage item would be lost if it was replaced.

Option 6: Convert the bridge to a pedestrian bridge

This option involves closing the existing bridge to vehicle traffic and constructing a new bridge adjacent to the existing, leaving the existing timber bridge accessible for pedestrian use only.

The advantages of this option are similar to that of Option 5, in that it would meet all the safety objectives and the new bridge would satisfy the requirements for GML vehicles. A new bridge would allow two lanes of traffic and would require less maintenance.

The disadvantage of Option 6 is that in addition to the large capital costs required to build an entirely new bridge, significant and ongoing costly maintenance and periodic rebuilding of the existing bridge would be required, as the timber elements continue to age and decay. Further, the bridge would lose heritage value as it would no longer be used for its original intended purpose, to carry vehicle traffic.

An analysis of the options is provided below in Section 2.4.3.

2.4.3 Analysis of options

Table 2-1 provide an analysis of the proposals options and how each performs against the proposal objectives.

Table 2-1: Analysis of the options against the proposal objectives

Proposal objectives	Options					
	Option 1 – “Do Nothing”	Option 2 – Like for like replacement	Option 3 – Upgrade truss capacity only	Option 4 - Upgrade truss capacity and traffic barriers	Option 5 - Demolish and replace the bridge	Option 6 - Convert the bridge to a pedestrian bridge
Upgrade the existing bridge to allow safe use by vehicles up to GML standard, and replace the existing timber side rails with a steel traffic barrier.	<input checked="" type="checkbox"/> Objective not met Option 1 would not provide a bridge load capacity safe for GML vehicles, and it would not provide a steel traffic barrier across the bridge.	<input checked="" type="checkbox"/> Objective not met Option 2 would not provide a bridge load capacity safe for GML vehicles, and it would not provide a steel traffic barrier across the bridge	<input checked="" type="checkbox"/> Objective not met Option 3 would provide a bridge load capacity that could cater for GML vehicles, however would not provide a steel traffic barrier across the bridge.	<input checked="" type="checkbox"/> Objective met Option 4 would provide a bridge load capacity that could cater for GML vehicles and provide upgraded traffic barriers.	<input checked="" type="checkbox"/> Objective met Option 5 would provide a bridge load capacity that could cater for GML vehicles.	<input checked="" type="checkbox"/> Objective met Option 6 would provide a bridge load capacity that could cater for GML vehicles.
Restore the condition of major structural bridge elements up to original condition (by replacement or repair).	<input checked="" type="checkbox"/> Objective not met Option 1 would allow the bridge elements to continue to deteriorate.	<input checked="" type="checkbox"/> Objective met Option 2 would restore all deteriorated bridge elements.	<input checked="" type="checkbox"/> Objective met Option 3 would restore all deteriorated bridge elements.	<input checked="" type="checkbox"/> Objective met Option 4 would restore all deteriorated bridge elements.	<input checked="" type="checkbox"/> Objective not met Option 5 involves demolishing the bridge not restoring it.	<input checked="" type="checkbox"/> Objective not met The conversion of the bridge to a pedestrian bridge would not involve restoring the deteriorated bridge elements.

Proposal objectives	Options					
<p>Preserve the heritage form of the bridge (ie truss type).</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Option 1 would preserve the heritage form of the bridge.</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Like-for-like replacement of bridge elements would preserve the heritage form of the bridge.</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Option 3 would result in the loss of some fabric associated with the heritage value of the bridge, however it would assist in the long-term preservation of the bridge.</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Option 4 would result in the loss of some fabric associated with the heritage value of the bridge, however it would assist in the long-term preservation of the bridge.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 5 would result in the loss of a State heritage bridge asset.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Heritage value would be lost as the timber bridge would no longer be used for what it was intended for.</p>
<p>The strengthening design is to have as minimal a negative impact to heritage value as possible, while still achieving the above proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 1 does not involve a strengthening design.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 2 would have minimal negative impact to heritage value but does not meet the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 3 would have minimal negative impact to heritage value but does not meet the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Option 4 would have a minimal negative impact to heritage, and still achieves the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 5 has the highest heritage impact of all options.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 6 would result in a loss of heritage value and does not achieve the other proposal objectives.</p>
<p>Minimise operating costs of the bridge as far as possible while still achieving the proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 1 is the lowest cost option in the short term but does not achieve the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 2 would have reduced design costs but does not meet the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 3 would still require ongoing maintenance on the traffic rails and does not achieve the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective met</p> <p>Option 4 minimises whole of lifecycle costs while upgrading all deteriorating bridge elements, and still achieves the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>Option 5 has the lowest bridge asset lifecycle costs of all options but does not achieve the other proposal objectives.</p>	<p><input checked="" type="checkbox"/> Objective not met</p> <p>The existing bridge would still require ongoing maintenance to be suitable for use by pedestrians and cyclists and does not achieve the other proposal objectives.</p>

2.5 Preferred option

Option 4 – upgrade truss capacity and traffic barriers received the highest score and was selected as the preferred option as it best met all the objectives of the proposal and the strategic need to improve the capacity and safety of the bridge.

Roads and Maritime’s preferred upgrade option would retain the essential Heritage-significant form and fabric of the bridge whilst generally upgrading critical bridge elements with visually unobtrusive, structurally superior and more durable elements. The preferred option aligns with the overarching Conservation Management Plan for Timber Truss Road Bridges (RMS, 2018) and the bridge specific conservation strategy for McKanes Bridge.

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.

3.1 The proposal

Roads and Maritime proposes to restore and upgrade the capacity of McKanes Bridge over Coxs River, South Bowenfels. McKanes Bridge is a 54.86 metre long, one lane of traffic, McDonald truss bridge, which was built in 1893. An overview of the proposal area is shown in Figure 1-2 . The key features of the proposal area are shown in Figure 3-1 and Figure 3-2.

Key features of the proposal would include:

- Removal of regrowth vegetation including several mature trees for the relocation of overhead power lines that cross Coxs River directly above McKanes Bridge
- Installation of a temporary secure compound at both ends of the bridge, including a suitable area for:
 - Construction plant and materials
 - Activities such as shaping new bridge elements
 - Construction office and amenities
 - Stockpiles.
- Provision of a temporary detour for all traffic via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal (adding about five minutes to travel time)
- Transfer of the existing bridge self-weight to a supporting structure and systematic dismantling of the bridge superstructure
- Systematic construction of the new bridge superstructure, including:
 - Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.43 metres long each (for a total bridge length of 54.86 metres)
 - Retention of the existing road geometry
 - Reduction in carriageway width to 4.2 metres between kerbs
 - Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck
 - Provision of new steel traffic barriers
 - Provision of a new maintenance monorail system
 - Application of rock armouring scour repair to the northern abutment of the bridge
 - Reconstruction of the concrete backing walls to both stone abutments
- Preservation of the State heritage significance of the bridge
- Improvement of safety and access for road users.



Figure 3-1: Key features of the proposal



Figure 3-2 Key features of the bridge design

3.2 Design

3.2.1 Design criteria

The design criteria for the upgrade to McKanes Bridge include the following:

- A restored and upgraded bridge on the same alignment as the current bridge
- A one lane bridge with a width of 4.2 metres between the rails
- A two span bridge using McDonald trusses.

A typical cross section for the bridge is shown in Figure 3-3. The long section is shown in Figure 3-4. The proposed bridge concept design is provided in Appendix D.

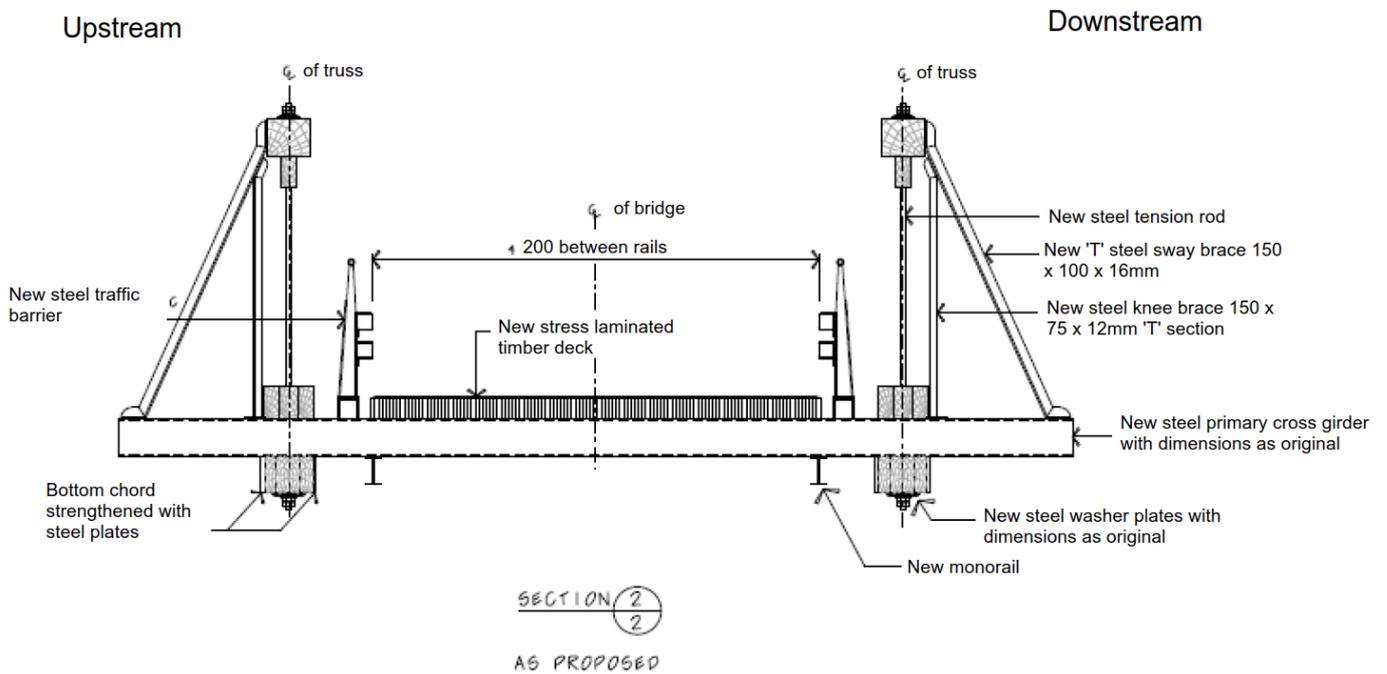


Figure 3-3 Typical cross section, proposed upgrade of McKanes Bridge

From South Bowenfels

To Jenolan Caves Road

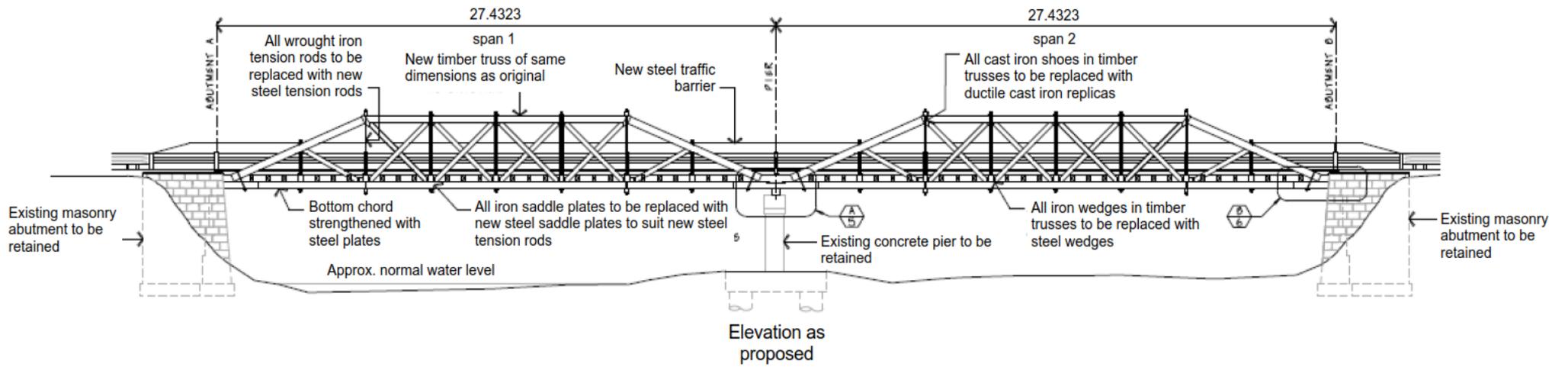


Figure 3-4 Long section, proposed upgrade of McKanes Bridge

3.2.2 Engineering constraints

Key engineering constraints associated with the proposal include:

- Floodplain, flood levels and hydraulic performance of the bridge in a flood are not to alter the existing flood characteristics. Any temporary in-stream structures during flooding must not result in inundation of the upstream catchment area
- Tie ins with existing road levels on either side of the bridge
- Existing utilities, including overhead power lines which would require relocation
- The retention of the existing bridge foundations, which were assessed as structurally adequate for the proposed upgrade.

3.2.3 Major design features

Bridge Superstructure

A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs of the road network. The capacity upgrade will broadly be based on the original design in appearance, but with a subtle change to strengthening details. The proposal retains the essential form and fabric of the bridge whilst generally upgrading structurally critical bridge elements with visually unobtrusive, structurally superior and more durable elements.

The bridge has two spans consisting of timber McDonald trusses, both spans are 27.43 metres in length (Figure 3-5). The proposal would include the replacement of the existing truss spans with new strengthened truss spans. All cast iron shoes in the timber trusses would be replaced with ductile cast iron replicas. All wrought iron tension rods would be replaced with new steel tension rods as well as all iron saddle plates to suit the new steel tension rods.

The strengthening design includes replacing some timber elements with steel, including new steel traffic barriers, continuous bottom chord over both spans strengthened with external steel plates, new steel sway braces to be strengthened with knee braces and new steel washer plates. The cross girders would consist of primary steel cross girders and secondary timber cross girders. New maintenance monorails would be installed under deck.

The timber decking of the current bridge would be replaced with a SLT deck to reflect the fabric and function of the original. The proposed upgraded bridge will retain the same alignment and basic geometry of the original. The road width over the bridge would be reduced to 4.2 metres between the rails of the traffic barriers.

The heritage concept sketches in Figure 3-3 and Figure 3-4 have been prepared to meet as much as is feasibly possible the original intent of the McDonald truss design, whilst also respecting, retaining or reinstating, to the greatest extent possible, the features that distinguish a McDonald truss from other timber truss bridge designs.



Figure 3-5 One span of McKanes Bridge

3.3 Construction activities

Construction of the proposal would be carried out by Roads and Maritime with direct-delivery workforce and a limited number of contractors working under Roads and Maritime supervision. The general work methodology and other construction activities are summarised in the following sections. The actual construction method may vary slightly from the description in this chapter as a result of factors such as on-site conditions identified during pre-construction activities, ongoing refinement of the detailed design, weather conditions and consultation with property owners.

3.3.1 Work methodology

The proposed upgrade will retain the same alignment and basic design geometry of the original bridge, and therefore the footprint is unchanged. The proposal footprint is shown in Figure 1-2, which allows for the current bridge alignment, site compounds, and working area for construction plant and materials.

The methodology for upgrading the bridge is as follows:

Early works

The existing overhead powerline would be relocated to the downstream side of the bridge, preferably before site mobilisation occurs, in order to avoid posing a hazard to cranes during the proposed work.

Site establishment and mobilisation

This work would be undertaken with McKanes Falls Road remaining open to traffic, with some short-term closures being necessary to facilitate crane lifts. The traffic control plan (TCP) and site compounds would be established. Foundations would be constructed for the temporary bridge supports which would be located on either side of the two existing abutments and on top of the existing reinforced concrete pilecap at the central pier. The temporary support trestles at each abutment and at the central pier would be erected using cranes located near either abutment and using small cranes from within the dry portion of the Coks River bed. As part of the temporary support structure, suspended access scaffolds would be installed to allow construction workers to perform work on and under the bridge.

Sections of fabricated temporary truss assemblies would be transported to site and bolted together. A large all-terrain mobile crane would be used to lift each of the four fabricated trusses onto the temporary

supports. It is anticipated that the crane would be located in the dry section of the waterway on the upstream side of the bridge.

Temporary cross girders would be installed between the upstream and downstream temporary trusses and packed up underneath the existing timber bridge structure. This activity may require the use of a crane within or around the waterway of Cocks River. Hydraulic jacks would be used to transfer the existing bridge loads onto the temporary structure. It would then be confirmed that the full dead load of the bridge has been transferred to the new temporary structure.

Road Closure and Traffic Diversion

Once the existing bridge is fully supported on the temporary structure, the traffic detour would be implemented which would divert all public vehicles to the detour route via Jenolan Caves Road (refer to Figure 3-6). Subsequent construction work would generally be carried out during daytime standard working hours (as outlined in Section 3.3.2), however the traffic detour route would remain in place 24 hours per day until the work on McKanes Bridge has finished and it is open to traffic. The detour is anticipated to last for approximately 12 months, and the route would be signposted on Jenolan Caves Road and McKanes Falls Road.

Demolition of existing bridge

The existing bridge structure would be dismantled in a systematic order which is from the top of the trusses down to the deck level. Then removing the deck structure and replacing it with a temporary decking system to allow construction traffic access. This may require crane(s) in the dry areas of the waterway of the Cocks River.

Existing timber would be stockpiled within the secure site compound until being removed for recycling via a contractor of the Roads and Maritime Bridge Timber Recycling Panel Contract.

Once the existing timber bridge has been fully dismantled, construction of the new structure using all-new material would commence.

Construction of the new bridge

A significant feature of the new design is the flat steel plate along both outside edges of the timber bottom chords. This would be introduced in sections and site welded at every joint to make four continuous plates, each about 56 metres long. Following welding, the plates would be painted for durability.

Assembly of the new bridge structural members would continue until the trusses are complete. This also may require the use of a crane(s) to be located in the dry areas of the Cocks River waterway.

Scour repair in the form of rock armouring would be applied to the northern abutment to reduce the effects of scour in a large flooding event. The rock armouring would be placed on top of the existing material which consists of soil and rock outcrops.

The concrete backing walls behind each of the existing stone abutments would be removed and reconstructed.

The new SLT deck would be constructed in-situ and the new steel traffic barrier system would be installed. To preserve the new deck timber and provide a surface suitable for vehicles, the deck would then receive a seal. The new bridge dead load would then be transferred from the temporary support structure until the trusses are self-supporting. The entire fabricated steel truss temporary support system would be removed, in reverse of the installation method.

Final roadworks and landscaping

Ancillary work such as application of asphalt, installation of the steel guardrail on approaches, line-marking and installation of new signage would be completed.

Open to traffic and site and compound demobilisation

McKanes Bridge would be reopened to traffic and the detour route and associated signage would be removed. The site compounds and construction plant would be demobilised and the areas utilised for site compounds would be restored.

3.3.2 Construction hours and duration

The proposal has an expected duration of 15 months, of which the road closure would have a duration of approximately 12 months. This does not include delays caused by weather.

The construction hours for the proposal will be carried out within Roads and Maritime standard construction hours as outlined below:

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

Some out-of-hours work may be required on occasion for deliveries or critical tasks such as crane lifts or concrete work.

3.3.3 Plant and equipment

The following plant and equipment will be used at various stages throughout the proposal:

- Rigid truck with hiab crane
- Rigid tipper trucks
- Concrete trucks
- Hook-bin trucks
- Prime mover and semi-trailers
- Mobile cranes – both Franna and all-terrain type
- Crawler crane, likely <100T capacity
- Large diesel generator
- Mobile welding equipment
- Crawler hydraulic hammer for guardrail work
- Asphalt paver
- Smooth-drum rollers
- Crawler excavators approx. 20-30T
- Manitou-type all-terrain forklift
- Demountable sheds/offices and change rooms
- On-site tool containers and storage sheds
- Ablution/Toilet blocks
- Light vehicles (eg 4WD dual cab utes)
- Box trailers
- VMS boards.

3.3.4 Earthworks

As the proposal is limited to the replacement of the bridge superstructure, no major earthwork activities are anticipated to be required. Some minor earthworks will be required as part of the installation of the temporary works support foundations, to install the new rock armour around the abutment, and to remove and reconstruct the concrete backing walls at each stone abutment. As identified within Section 3.3.3, mobile craneage would be used in the dismantling and replacement of the superstructure. The cranes would generally be situated on the existing roadway, in the dry sections of the waterway, and on the banks of the Coxs River; due to the land gradient, some minor earthworks may be required to achieve appropriate access and footing for the cranes.

3.3.5 Source and quantity of materials

The source and quantity of materials would be determined during the detailed design phase of the proposal and would be sourced from local suppliers where practicable.

The proposal would require pre-fabricated materials including, but not limited to:

- Truss timber – all brand new sawn hardwood sourced generally from the mid-north coast of NSW areas. This timber is a scarce resource and very difficult to procure – often taking years to find suitable timber of the very large dimensions and lengths required by the McDonald truss design.
- Deck timber – all brand new hardwood
- Mild Steel plate – all brand new
- Cast Iron – all brand new, sourced locally in Australia or off-shore
- Protective Coating – sourced locally from a top-tier supplier.

3.3.6 Traffic management and access

Road and access closures

To facilitate the replacement of the bridge superstructure, the existing McKanes Bridge would be temporarily closed to traffic during the construction period. Weather permitting, this is expected to be approximately 12 months.

There are approximately 37 properties, mostly residential, along McKanes Falls Road on the Great Western Highway (northern) side of the bridge, and approximately 9 rural properties on the Jenolan Caves Road (southern) side of the bridge. It is proposed to close McKanes Falls Road to all public traffic at the bridge, and to implement a detour route for the duration of the removal and reconstruction of the bridge, via Jenolan Caves Road and the Great Western Highway at Hartley (refer to Figure 3-6). This diversion would add approximately five minutes to the usual travel time via McKanes Falls Road.

Construction vehicle movements

Construction vehicles would access the work area on the northern side of the bridge via the Great Western Highway and along McKanes Falls Road. Construction vehicles would access the work area on the southern side of the bridge via the Great Western Highway and along Jenolan Caves Road. It is estimated that there would be 20 vehicle movements per day per side of the bridge. This number is expected to be 50:50 light vehicles (such as 4WD) and larger construction traffic eg Franna crane, rigid truck etc.

The construction vehicle movements are considered to be negligible when compared with the existing average daily traffic volumes.

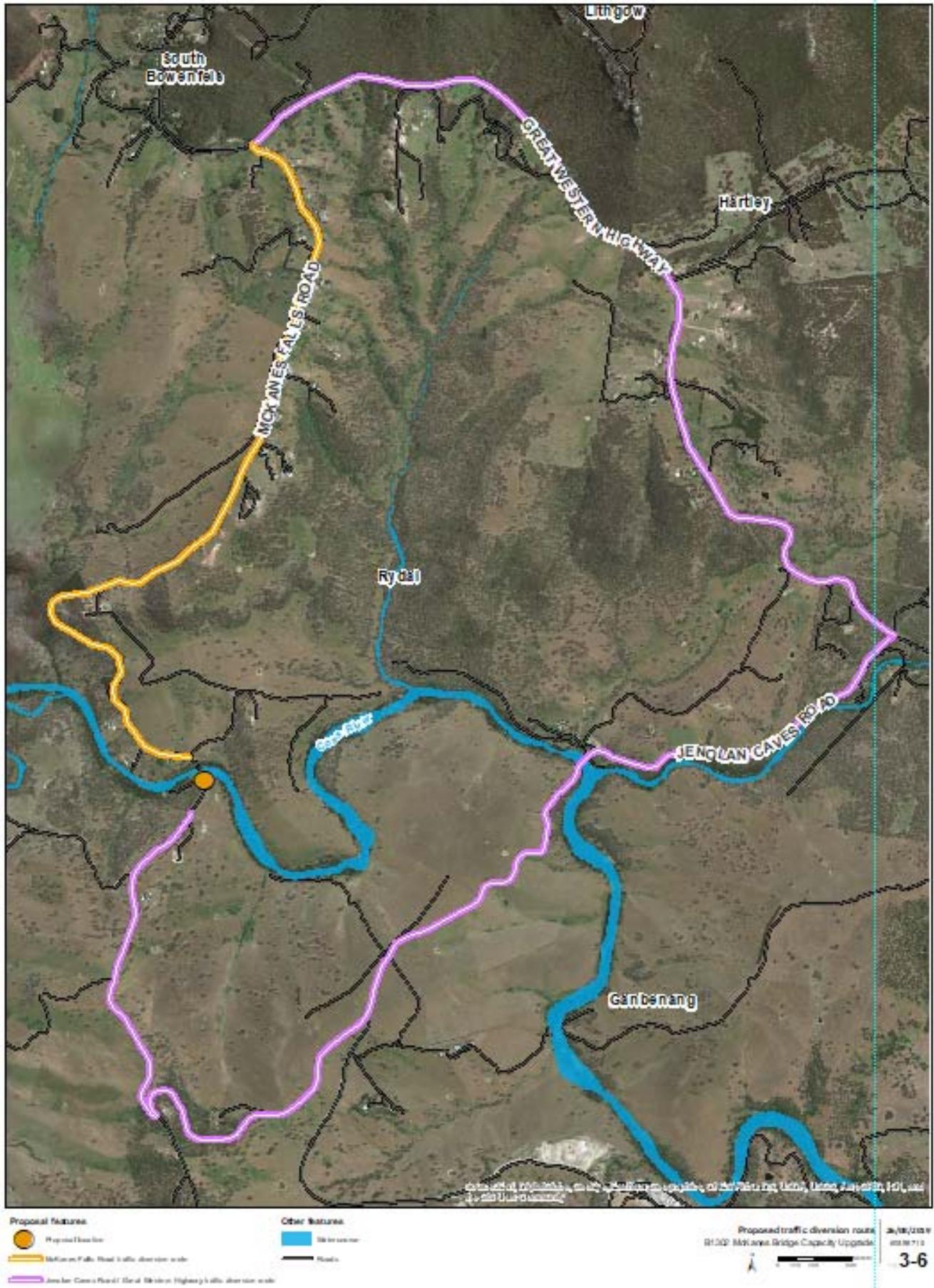


Figure 3-6 Proposed traffic diversion route

3.4 Ancillary facilities

A secure temporary compound is proposed at both ends of the bridge and would include a suitable area for:

- Construction plant and materials
- Activities such as shaping new bridge elements
- Construction office and amenities
- Stockpiles.

The proposal footprint including the bridge alignment and site compounds are shown in Figure 1-2. The hours of operation are discussed in Section 3.3.2.

It is also proposed that sections of the road corridor within the identified footprint could be used for the parking of vehicles, storage of materials and equipment and for working areas. This would be most likely during the proposed closure period of McKanes Falls Road and would be restricted to the section of road between the last property access driveways either side of the bridge, to maintain resident access.

3.5 Public utility adjustment

There is a high voltage overhead power line that runs diagonally directly over the bridge which would be relocated as part of the proposal to improve the vertical clearance of the bridge. The relocation would include the decommissioning of the existing power line and the establishment of a new powerline at a higher elevation and a new power pole as shown in Figure 3-1.

Some regrowth vegetation and mature trees within the proposed powerline relocation alignment would need to be removed. Potential impacts to these trees are discussed in Section 6.1.

Utility location would be required for some Telstra communications underground utilities near McKanes Bridge which would need to be located and marked for avoidance during the proposed construction activities.

3.6 Property acquisition

The proposed bridge structure lies within the existing road corridor. No land acquisition is required.

During the construction period, temporary site compounds are proposed to be placed on either side of the bridge. The northern site compound would be located on 495 McKanes Falls Road (Lot 100 DP 1064154) and the southern site compounds would be placed on 539 McKanes Falls Road (Lot 1 DP 876394), and on Crown Land (Lot 1 DP 1093659) located to the south west of the bridge; this area has historically been used by Roads and Maritime bridge crews when performing maintenance at the bridge. Access to the bridge abutment at the Lithgow end may be required via 484 McKanes Falls Road (Lot 1 DP 708461). Landholder consultation would be carried out, and agreements entered into with the owners of these properties prior to construction.

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

The NSW EP&A Act and its associated regulations provide the framework for assessing environmental impacts and determining planning approvals for developments and activities in NSW. The EP&A Act also establishes State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) which may include provisions relevant to the proposal.

The proposal does not require development consent under Part 4 of the EP&A Act due to permissibility in State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) (refer to Section 4.1.1 below) and is not classified as State significant infrastructure under Division 5.2. Therefore, the proposal may be assessed under Division 5.1 of the EP&A Act. Under Part 5 of the EP&A Act, Roads and Maritime is classified as a proponent and a determining authority.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

ISEPP aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the EP&A Act. 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 SEPP (Coastal Management) 2018, SEPP (State and Regional Development) 2011 or SEPP (State Significant Precincts) 2005.

Part 2 of ISEPP 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 ISEPP (where applicable), is discussed in Chapter 5 of this REF.

The northern section of the proposal area is mapped Category 1 Bushfire Prone land. The remaining area is mapped within the vegetation buffer for bushfire prone land. It is noted that the proposal will not require ISEPP consultation with the Rural Fire Service, as the proposal is not defined as development stated in clause 16(2)(f), however safeguards will be included in Section 7.2.

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The bridge is located within the boundary of Sydney Drinking Water Catchment under *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* (SDWC SEPP).

SDWC SEPP relates to the use of land within the Sydney drinking water catchment. Clause 12 of the SEPP requires consideration of whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity. A neutral or beneficial effect assessment (NorBE) is included in Appendix C. The assessment concludes that the proposal will have a neutral effect on water quality.

4.1.2 Local Environmental Plans

Lithgow Local Environmental Plan 2014

The proposal is located within Lithgow LGA. There are two local environmental planning instruments that apply to the Lithgow LGA. These are Lithgow City Local Environmental Plan 1994 (Lithgow City LEP 1994) and Lithgow Local Environmental Plan 2014 (Lithgow LEP 2014). The Lithgow City LEP 1994 remains in force for portions of the Lithgow LGA which are identified as deferred matters on the Lithgow LEP 2014 land zoning maps. No elements of the proposal are proposed on land that is identified as a deferred matter in the Lithgow LEP 2014, therefore no further consideration of the Lithgow City LEP 1994 is required.

Under the Lithgow LEP 2014, the works for the proposal and the proposed ancillary facilities are located within land zoned RU1 Primary Production. Table 4-1 details the objectives of RU1 Primary Production and discusses the proposals consistency with the objectives.

Table 4-1: Lithgow LEP 2014 zoning objectives

Zoning and objectives	Proposal consistency with objectives
<p>RU1 Primary Production:</p> <ul style="list-style-type: none"> • To encourage sustainable primary industry production by maintaining and enhancing the natural resource base • To encourage diversity in primary industry enterprises and systems appropriate for the area • To minimise the fragmentation and alienation of resource land • To minimise conflict between land uses within this zone and land uses within adjoining zones • To enable function centres, restaurants or cafes and appropriate forms of tourist and visitor accommodation to be developed in conjunction with the agricultural uses. 	<p>The proposal is consistent with the objectives of RU1 as the proposal would increase the capacity and strengthen the bridge which would enable heavier loaded vehicles to use the road network and improve road freight productivity.</p> <p>The proposal will help to meet current and future operational needs of the road network.</p>

As discussed in Section 4.1.1, Clause 94 of the ISEPP permits Roads and Maritime, as a public authority, to carry out development for the purpose of a road and/or road infrastructure facilities on any land without consent. As a result, consent from Lithgow City Council is not required for the proposal.

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community consistent with the principles of ecologically sustainable development.

Under the BC Act it is an offence to harm animals and plants; damage areas of outstanding biodiversity value and damage habitat of threatened species or ecological communities. Under Part 2, Division 2 of the Act it is a defence if the harm or damage was necessary for the carrying out of a Division 5.1 EP&A Act activity undertaken in compliance with the determination, or undertaken consistent with a State significant infrastructure approval under Division 5.2 of the EP&A Act.

The BC Act establishes a test to establish whether a proposed development or activity is “likely to significantly affect threatened species.” If an activity under Division 5.1 is likely to significantly affect threatened species then a Species Impact Assessment must be prepared.

A search of the NSW Office of Environment and Heritage (OEH) BioNet Wildlife Atlas database was undertaken on 18 February 2019. A search was also undertaken on the EPBC Protected Matters database on 15 February 2019. The results of both these searches are provided in Appendix E and furthered discussed in Section 6.1.

The proposal is not likely to result in a significant impact on threatened species or ecological communities under the BC Act or EPBC Act and therefore a species impact statement is not required for the proposal.

4.2.2 Fisheries Management Act 1994

The objectives of the *Fisheries Management Act 1994* (FM Act) is to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The FM Act includes provisions for threatened fish and marine vegetation and associated threatening processes and is administered by the NSW Department of Primary Industries (DPI).

The FM Act applies to all waters within the limits of the State, except where Commonwealth legislation applies. Part 7A Division 4 of the FM Act prohibits, without a licence, activities that damage habitats or harm threatened species, populations or ecological communities. The proposal is located on ‘Key Fish Habitat’ as defined by DPI. Activities which may require a permit under the FM Act include, but are not limited to, dredging works, reclamation work and works that would block fish passage.

Temporary in stream structures to be used during construction may fall within the definition of reclamation work:

- (a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or
- (b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge)

Under clause 199 of the Act, a public authority must provide the Minister with 21 days written notice of the proposal.

Clause 219 of the FM Act makes it an offence to obstruct fish passage without a permit issued under clause 200 of the Act. In-stream structures, such as rock platforms or sheet piling, may obstruct fish

passage subject to the extent of works. Consultation is required with DPI – Fisheries on the permit requirements if the construction methodology requires temporary works that obstruct the full width of the river.

A review of the DPI – Fisheries Spatial Data Portal was undertaken on the 18 February 2019. The results are discussed in Section 6.1. The proposal is not likely to result in a significant impact on threatened species or ecological communities under the FM Act and therefore a species impact statement is not required for the proposal.

4.2.3 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides for the conservation of buildings, work, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State. Matters protected under the Act include items subject to an Interim Heritage Order and items listed on the State Heritage Register, the heritage schedules of local council LEPs, and the heritage and conservation registers established under Section 170 of the Act by NSW government agencies (Section 170 Registers). The Act also provides for the protection of archaeological 'relics', being any deposit, object or material evidence that relates to the non-Aboriginal settlement of NSW and is of State or local heritage significance.

The proposal would impact on McKanes Bridge which is a State heritage item under the Lithgow LEP 2014, and is listed on the NSW State Heritage Register (SHR), and Roads and Maritime s170 Heritage Register.

A Statement of Heritage Impact (SoHI) has been prepared for the proposal and consultation undertaken with Lithgow City Council in accordance with the ISEPP. The SoHI is provided in Appendix F and the impacts on State heritage are addressed in Section 6.6.

The proposed works involve changes to significant form and fabric of the bridge, some of which are irreversible and are not covered under the gazetted standard exemptions prepared by the Heritage Council of NSW. Therefore, an approval to conduct the works would be required in accordance with Section 57 of the Heritage Act. An application under Section 60 of the Act would be required in order to undertake the works and the works cannot take place unless approval is given.

4.2.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal relics.

Section 86 of the NP&W Act identifies offences relating to Aboriginal objects, including disturbing land to discover an artefact. Section 87(1) of the NP&W Act requires a permit to be obtained to remove any artefacts, while Section 90(2) requires consent from the Director General of the OEHL to knowingly destroy, deface or damage a relic or Aboriginal place.

Roads and Maritime has completed a Stage 1 due diligence assessment in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The PACHCI is the Roads and Maritime due diligence process to avoid damaging Aboriginal objects. A Stage 1 PACHCI clearance letter is provided in Appendix G. As part of the due diligence assessment a search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken and a site inspection was conducted on 12 December 2018.

There are no known Aboriginal heritage items located within the proposal corridor and the proposal is unlikely to impact on Aboriginal cultural heritage, therefore an Aboriginal Heritage Impact Permit is not required.

4.2.5 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the State's water for the benefit of both present and future generations. The Act controls the extraction and use of water and any activity that is in or near water sources in NSW. It provides for the implementation of water sharing plans that establish rules for sharing a water resource while taking into account the environmental need of the resource. The construction footprint for the proposal is covered by the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources*.

The proposal would not involve extracting surface or groundwater and as such, no further consideration of the WM Act is required.

4.2.6 Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates the carrying out of certain activities on public roads, provides classification of roads and establishes procedures for opening and closing public roads. Section 138 of the Roads Act requires consent to be obtained from the appropriate roads authority for the following works:

- a) erect a structure or carry out a work in, on or over a public road, or
- b) dig up or disturb the surface of a public road, or
- c) remove or interfere with a structure, work or tree on a public road, or
- d) pump water into a public road from any land adjoining the road, or
- e) connect a road (whether public or private) to a classified road.

As the proposal would involve works on a Roads and Maritime asset and on McKanes Falls Road (including temporary closure of the road and applying a detour), Road Occupancy Licences (or equivalent) would be required from RMS and from Lithgow City Council.

4.2.7 Protection of the Environment Operations Act 1997

The NSW *Protection of the Environment Operations Act 1997* (PoEO Act) aims to protect, restore and enhance the environments of NSW and reduce potential risks to human health and the environment. The management of environmental impacts in relation to air, noise and water quality fall under the provisions of the PoEO Act. The PoEO Act identifies a number of pollution offences, including offences relating to:

- Wilful or negligent disposal of waste in a manner that is likely to harm the environment
- Wilful or negligent causing of a substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment
- The pollution of water.

Under the provisions of the PoEO Act, Roads and Maritime is required to notify the NSW Environmental Protection Authority (EPA) if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

Environmental Protection Licences (EPL) are issued under Section 122 of the PoEO Act for various scheduled development and activities. The proposal does not involve undertaking any scheduled activities as listed under Schedule 1 of the PoEO Act, therefore EPL is not required.

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 this 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.

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. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

Findings – nationally listed biodiversity matters (where the strategic assessment applies)

The assessment of the proposal's impact on nationally listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road and/or road facilities and is being carried out by or on behalf of a public authority. Under clause 94 of ISEPP 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.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime'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.

5.1 Consultation approach

Roads and Maritime has consulted with relevant stakeholders during the development of the proposal. The consultation activities carried out as part of the proposal have included ISEPP consultation and government agency consultation. Extensive consultation has taken place over a number of years with OEH regarding the heritage aspects of the proposal. All consultation carried out as part of the proposal is discussed below in this chapter.

Consultation would continue throughout the development of the proposal and into the construction period with potentially affected stakeholders.

5.2 Aboriginal community involvement

All Aboriginal community involvement in Roads and Maritime proposals is governed by the provisions of the Roads and Maritime PACHCI, relevant legislation and guidelines.

PACHCI provides a consistent means of effective consultation with Aboriginal stakeholders regarding activities which may impact on Aboriginal Cultural Heritage and is generally consistent with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010). The stages of the PACHCI process are outlined below in Table 5-1.

Table 5-1: Summary of Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial Roads and Maritime assessment
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

An inspection of the proposal area was undertaken by the Roads and Maritime Services Cultural Heritage Officer in accordance with Stage 1 of the Roads and Maritime PACHCI. The Stage 1 assessment has concluded that the proposal is unlikely to affect Aboriginal Cultural Heritage. The Stage 1 PACHCI is provided in Appendix G.

5.3 ISEPP consultation

Lithgow City Council has been consulted over a number of years during the development of the proposal in accordance with clause 14 and 15 of the ISEPP. Roads and Maritime addressed the full Council on 21 January 2019 to present the proposal and wrote to Lithgow City Council on 24 May 2019 in accordance with the provisions of the ISEPP. Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

State Emergency Services (SES) were also consulted as per requirements of clause 15AA of the ISEPP. Roads and Maritime wrote to SES on 24 May 2019 in accordance with the provisions of ISEPP to advise them of the proposed works in potentially flood liable land.

ISEPP consultation letters are provided in Appendix H.

Issues that have been raised as a result of this consultation are outlined below in Table 5-2.

Table 5-2: Issues raised through ISEPP consultation

Agency	Issue raised	Response / where addressed in REF
Lithgow City Council	No response received at the time of publishing	-
SES	No response received at the time of publishing	-

5.4 Government agency and stakeholder involvement

Various government agencies and stakeholders have been consulted about the proposal, including:

- OEH
- DPI – Fisheries
- NSW Police Force
- WaterNSW
- Jenolan Caves Steering Committee (comprising representatives from Jenolan Caves Trust, National Parks and Wildlife Service, Lithgow City Council, Oberon Shire Council and Roads and Maritime).

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined below in Table 5-3 and provided in Appendix H.

Table 5-3: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
OEH	<p>Extensive consultation has occurred with OEH:</p> <ul style="list-style-type: none"> • 14 April 2016 – OEH responded to initial Section 60 application with a large number of queries, going back to questioning many of the fundamentals of RMS’ approach to this type of upgrade. • January 2017 – OEH advised RMS that the following documents would be required, in order to assess the Section 60 application: <ul style="list-style-type: none"> • Conservation Management Plan (CMP) for all RMS Timber Truss Bridges • CMP for each Timber Truss Bridge Type • CMP for individual Timber Truss Bridge. 	<p>In December 2016, a Preferred Option Report was written, as requested by OEH.</p> <p>In December 2017, a CMP for the bridge was prepared.</p> <p>In February 2018, the overarching CMP was prepared and has been endorsed by OEH.</p> <p>In March 2018, FBE was engaged to prepare a SoHI.</p> <p>These reports are addressed in:</p> <ul style="list-style-type: none"> • Section 2.4 • Section 6.6.3.

Agency	Issue raised	Response / where addressed in REF
	<ul style="list-style-type: none"> March 2017 – Section 60 application was withdrawn by RMS following advice from OEH that McKanes Bridge Section 60 application would require CMP's before OEH would complete an assessment. January 2018 – Site meeting between RMS and OEH was held, where OEH confirmed a Section 60 application for McKanes Bridge could now be resubmitted, accompanied by the individual Construction Environmental Management Plan (CEMP) and a SoHI. 	
DPI – Fisheries	<p>DPI Fisheries requested information on (see full letter attached in Appendix H):</p> <ul style="list-style-type: none"> Blockages to fish passage – requests that the REF consider whether the works may result in any blockage of fish passage. 	The proposal will not block fish passage within the river (refer to Section 3.3.1 and Section 3.3.2).
	<ul style="list-style-type: none"> Maintenance or improvement to the cross-sectional area of a waterway – the REF should describe the proposed works in relation to the cross-sectional area of the waterway. The use of scour protection within the bed of waterways be avoided where possible. 	<p>The proposal works will be restricted to the bridge and abutments and will not alter the cross-sectional area of the waterway.</p> <p>Scour repair will be applied to the northern abutment (refer to Section 6.2.2).</p>
	<ul style="list-style-type: none"> Damage to riparian vegetation – information required on any damage to riparian vegetation, noting that Degradation of Riparian Vegetation along Watercourses is listed as a Key Threatening Process under the FM Act. 	Crane(s) may be required in the waterway (refer to Section 3.3.1). Potential impacts to riparian vegetation would be minimal (refer to Section 6.1).
	<ul style="list-style-type: none"> Bank stabilisation and rehabilitation – information on any destabilisation of the banks with heavy machinery or damage to the bed or banks. 	Safeguard in Section 6.3.3
	<ul style="list-style-type: none"> Removal, realignment of snags - requests information on any proposal to remove, realign or relocate snags (large woody debris). 	No removal or realignment of snags are required for the proposal.
NSW Police Force	<p>A verbal response was received from the Chief Inspector at Lithgow Police Station (13 June):</p> <ul style="list-style-type: none"> No objections to the proposal. Requested a notification prior to construction commencing and the detour being enforced 	An email is to be sent to the Lithgow Police Station by Roads and Maritime prior to the commencement of work.
WaterNSW	WaterNSW requested information on (see full letter attached in Appendix H):	The NorBE assessment is discussed in Section 6.2.2 and

Agency	Issue raised	Response / where addressed in REF
	<ul style="list-style-type: none"> Sydney Drinking Water Catchment – consider whether the activity will have a neutral or beneficial effect on water quality and in corporate current recommended practices 	provided in Appendix C.
	<ul style="list-style-type: none"> The site is in close proximity to water quality monitoring sites on Coxs River – ensure appropriate mitigation measures 	Safeguards in Section 6.2.3 and 6.3.3.
	<ul style="list-style-type: none"> The REF (including any construction environmental management plan) be made available for WaterNSW to assess before it is approved and construction commences 	The REF will be exhibited and made available for WaterNSW to comment. Comments received would be addressed accordingly in the Response to Submissions Report.
	<ul style="list-style-type: none"> RMS continue to consult with WaterNSW for any development that may have impacts on their assets, infrastructure or land 	Roads and Maritime would continue to consult with WaterNSW in regard to matters that may impact on their assets, infrastructure or land (refer to Section 6.2.3).

5.5 Ongoing or future consultation

5.5.1 Display of the REF

This REF will be advertised and placed on public display for 21 days. Roads and Maritime will invite feedback on the proposal from the community and interested parties. Following the display period, a Response to Submissions (RTS) report will be prepared to address feedback received on the proposal and will be made available on the Roads and Maritime project website.

5.5.2 Consultation during the construction period

As identified within Section 6.9.3, a communication plan would be prepared as part of the project development period which would guide consultation activities to be carried out both prior to and during the construction period.

The communication plan would detail consultation requirements to be carried out with the following:

- Lithgow Council regarding the temporary closure of a council road and proposed detour route
- Emergency services in the surrounding area on the timing of the works and the proposed detour route
- The community and landholders on the timing of the works and the proposed detour route
- Landholders which may have a proposed compound site and/or site access point located on their property
- Bus companies that may utilise the McKanes Falls Road corridor on the timing of the works and proposed detour route

- Waste collection service providers.

The consultation would generally be carried out via the following methods:

- Regular updates to the community throughout the remainder of the planning and construction phases
- Development and maintenance of a comprehensive communications register
- Project signage
- A toll free community information line
- A Roads and Maritime email address
- The Roads and Maritime project website.

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 guidelines *Is an EIS required?* (DUAP 1995/1996) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 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

This biodiversity impact assessment has been prepared based on desktop and field surveys undertaken by AECOM. The assessment aimed to identify and assess relevant impacts of the McKanes Bridge upgrade works upon threatened flora and fauna, populations and ecological communities. Given the upgrades to the bridge would be functionally identical in ecological terms, operational impacts have not required assessment. Where ecological impacts have been identified, measures have been proposed to manage these appropriately, employing the mitigation hierarchy of avoid, minimise, mitigate or offset.

For the purposes of this REF, the proposal area refers to those areas that would be directly affected during construction, including the location of any ancillary sites. The proposal area is shown in Figure 1-2. The investigation area refers to the area within a 20 metre buffer of the proposal area and includes areas investigated for general site context and to facilitate assessment of indirect impacts upon biodiversity.

Database searches and literature reviews

Desktop research was undertaken prior to undertaking the site inspection. This included database searches and a review of relevant literature to determine if targeted surveys for specific species were required. Additionally, these searches helped to identify threatened biota known or likely to occur within the proposal area.

The following databases and resources were investigated:

- NSW OEH Atlas of NSW Wildlife Database within a 10 kilometre by 10 kilometre area centred on the proposal area (OEH 2019a)
- Protected Matters Report that documents all Matter of National Environmental Significance (MNES) within a five kilometre radius of the proposal area. MNES include threatened species, communities and migratory species which are listed under the EPBC Act (DoEE 2019)
- NSW OEH, Vegetation Types Database and Threatened Species Profile Database (OEH 2019b)
- NSW DPI Fisheries – Profiles for species, populations and ecological communities (DPI 2019a)
- NSW DPI WeedWise Priority Weeds List (DPI 2019b).

The BioNet database was searched for threatened flora and fauna records from 1980 onwards. This search was undertaken using a 10 kilometre by 10 kilometre area which was centred on the proposal area. This search returned seven threatened ecological communities, one threatened flora species and 24 threatened fauna species listed under the BC Act. No threatened populations were returned.

The Department of the Environment and Energy (DoEE) Protected Matters Database was searched for MNES and other matters protected by the EPBC Act. This search utilised a five kilometre radius search area centred on the proposal area. This search listed three threatened ecological communities, 32 threatened species and 13 migratory species.

Priority weeds are plants that pose a potentially serious threat to primary production or the natural environment. Under the *Biosecurity Act 2015* public authorities have a responsibility to prevent, manage, control or eradicate priority weeds in the region. The proposal area is within the Lithgow City Council LGA. The NSW Weedwise website lists 120 priority weeds within this area.

'Key Fish Habitat' (KFH) includes all marine and estuarine habitats up to highest astronomical tide level (reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. Review of DPI KFH mapping for this area indicates that the Coxs River is Key Fish Habitat (KFH).

State Environmental Planning Policy 44 – Koala Habitat Protection aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. This policy applies only to local government areas listed in Schedule 1 of the policy. Lithgow City Council is not listed on Schedule 1 and as such this policy does not apply in this location.

Field survey

A field survey was undertaken at the site on 5 June 2019 by Jamie McMahon, a qualified and experienced ecologist from AECOM. Conditions during the survey were cold, approximately five degrees and overcast.

The aim of the site inspection was to:

- Inspect vegetation and habitat values likely to be directly affected by the proposed power line realignment
- Confirm the presence or absence of any threatened species or ecological communities
- Inform the assessment of impacts and development of mitigation and management measures to minimise the impact upon biodiversity values as part of the construction of the proposal.

The field survey focused primarily on the power line realignment, though areas in the broader area around the bridge were inspected. The survey was undertaken on foot traversing the full length of the proposed powerline realignment, including both sides of the river. The survey included assessment of vegetation present, as well as opportunistic fauna sightings. Detailed fauna survey was not undertaken, though an assessment of fauna habitat present at the site was carried out.

Based on the commitment for construction to take place without any structures being placed in the stream, an aquatic survey was not undertaken.

The field survey was undertaken over approximately two hours, spent within and around the site. Particular attention was paid to mature vegetation requiring removal to facilitate the power line realignment. Photographs were taken throughout the investigation area.

Limitations

Limitations to the field survey include:

- While a fauna habitat assessment was undertaken, this technique is not an adequate substitute for full fauna surveys. Fauna are capable of inhabiting sub-optimal habitat, and fragmentation, isolation or species density can all influence the presence and distribution of a particular species. Species likelihood of occurrence was informed by considering habitat characteristics and opportunistic sightings
- No aquatic survey was undertaken based upon the low risk of aquatic impacts, providing all commitments in this REF are adhered to
- Detailed Biodiversity Assessment Method plot assessments were not undertaken, though relevant vegetation was surveyed across the proposal area.

6.1.2 Existing environment

Terrestrial biodiversity

The proposal area is located within the South Eastern Highlands Bioregion, at an elevation of about 720 metres above sea level. The biodiversity value in the proposal area is typical of similar agricultural and riparian environments in the local area. That is, it is generally cleared, with emergent vegetation present in areas where grazing is excluded (typically along watercourses).

For the purposes of the biodiversity assessment the proposal area has been separated into the following three areas as follows.

Ancillary facilities

This includes potential laydown and compound areas for use during construction. Two ancillary facilities are proposed, one of either side of the river. These are located on paddocks within adjacent private properties. These sites are currently used for grazing and include a mix of native and exotic grasses. No threatened grasses are considered likely to occur in these locations.

Bridge works area

This includes the area immediately around the bridge and its approaches. The area is generally characterised by riparian vegetation, much of which is degraded from its original composition. This area is typically comprised of mature Swamp she-oak (*Casuarina glauca*) immediately adjacent to the waterway, with native and exotic grasses between the banks and the approaches. An active wombat burrow was identified in this area, near the western side of the northern abutment (upstream side).

Power line realignment area

This includes the area associated with the new alignment of the existing overhead power line, running perpendicular to the river. This crosses part of the bridge works area to the east of the main deck. The vegetation within the riparian zone of this area is as per the bridge works area. Moving away from the riparian zone the vegetation becomes more representative of the surrounding area, with several Apple Box (*Eucalyptus bridgesiana*) and Ribbon gum (*Eucalyptus viminalis*) present.

Fauna

Fauna directly observed in or near the proposal area included White-winged Chough (*Corcorax melanorhamphos*), Superb Fairy Wren (*Malurus cyaneus*) and Australian Raven (*Corvus coronoides*). The proposal area appears to be occupied by Wombats (*Vombatus ursinus*), with an active burrow and scats present throughout the area. Recent scats of Eastern grey kangaroo (*Macropus giganteus*) and Fox (*Vulpes vulpes*) were also present.

Whilst there was no further evidence of the use of the site by native mammals, it is likely that mature trees within the area provide habitat and foraging resources for arboreal mammals such as bats and possums, as well as reptiles and birds.

Threatened species

No threatened flora or fauna species were directly recorded in the proposal area during the field inspection.

Database searches returned several records of threatened species in the vicinity of the proposal area. The closest records were:

- Gang-gang cockatoo (*Callocephalon fimbriatum*), about 470 metres west of the proposal site
- Two records of Silver-leafed Gum (*Eucalyptus pulverulenta*) recorded about 700 metres north and north-west of the proposal area.

Both species are listed as vulnerable under the BC Act. Silver-leafed Gum is also listed as vulnerable under the EPBC Act.

The remaining threatened species returned by database searches are outlined in Table 6-1 below.

Table 6-1: Summary of Bionet (NSW) and Protected Matters (Commonwealth) search results

Scientific Name	Common Name	FM Act	BC Act	EPBC Act
<i>Heleioporus australiacus</i>	Giant Burrowing Frog		V	V
<i>Litoria booroolongensis</i>	Booroolong Frog		E	E
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog		V	V
<i>Actitis hypoleucos</i>	Common Sandpiper			M
<i>Anthochaera phrygia</i>	Regent Honeyeater		CE	CE
<i>Apus pacificus</i>	Fork-tailed Swift			M
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow		V	
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper			M
<i>Calidris ferruginea</i>	Curlew Sandpiper		E	CE, M
<i>Calidris melanotos</i>	Pectoral Sandpiper			M
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo		V	
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo		V	
<i>Daphoenositta chrysoptera</i>	Varied Sittella		V	
<i>Gallinago hardwickii</i>	Latham's Snipe			M
<i>Grantiella picta</i>	Painted Honeyeater		V	V
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		V	M
<i>Hirundapus caudacutus</i>	White-throated Needletail			M
<i>Lathamus discolor</i>	Swift Parrot		E	CE
<i>Monarcha melanopsis</i>	Black-faced Monarch			M

Scientific Name	Common Name	FM Act	BC Act	EPBC Act
<i>Motacilla flava</i>	Yellow Wagtail			M
<i>Myiagra cyanoleuca</i>	Satin Flycatcher			M
<i>Ninox connivens</i>	Barking Owl		V	
<i>Ninox strenua</i>	Powerful Owl		V	
<i>Numenius madagascariensis</i>	Eastern Curlew			CE, M
<i>Petroica boodang</i>	Scarlet Robin		V	
<i>Rhipidura rufifrons</i>	Rufous Fantail			M
<i>Rostratula australis</i>	Painted Snipe (Australian subspecies)		E	E, M
<i>Maccullochella peelii</i>	Murray Cod			V
<i>Macquaria australasica</i>	Macquarie Perch	E		E
<i>Prototroctes maraena</i>	Australian Grayling			V
<i>Acacia bynoeana</i>	Bynoe's Wattle		E	V
<i>Acacia flocktoniae</i>	Flockton Wattle		V	V
<i>Boronia deanei</i>	Deane's Boronia		V	V
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid		V	V
<i>Eucalyptus aggregata</i>	Black Gum		V	V
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum		V	V
<i>Euphrasia arguta</i>			CE	CE
<i>Lepidium hyssopifolium</i>	Aromatic Peppergrass		E	E
<i>Leucochrysum albicans</i> var. <i>tricolor</i>				E
<i>Pultenaea glabra</i>	Smooth Bush-Pea		V	V
<i>Thesium australe</i>	Austral Toadflax		V	V
<i>Paralucia spinifera</i>	Bathurst Copper Butterfly		E	V
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat		V	V
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll		V	E
<i>Dasyurus maculatus maculatus</i>	Spotted-tail Quoll (southeastern mainland population)		V	E
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle		V	
<i>Miniopterus australis</i>	Little Bentwing-bat		V	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat		V	

Scientific Name	Common Name	FM Act	BC Act	EPBC Act
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat		V	
<i>Myotis macropus</i>	Southern Myotis		V	
<i>Petauroides volans</i>	Greater Glider			V
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby		E	V
<i>Phascolarctos cinereus</i>	Koala		V	V
<i>Pseudomys novaehollandiae</i>	New Holland Mouse			V
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox		V	V
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat		V	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat		V	

Endangered Ecological Communities

The EPBC Protected Matters search identified three threatened ecological communities that may occur in the proposal area:

- Natural Temperate Grassland of the South Eastern Highlands (BC Act: not listed, EPBC Act: Critically endangered)
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (BC Act: Endangered, EPBC Act: Critically endangered)
- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (BC Act: Endangered, EPBC Act: Endangered).

Aquatic biodiversity

McKanes Bridge crosses the Coxs River, and as such is within the Coxs River catchment. This section of the Coxs River is listed as Key Fish Habitat by DPI Fisheries (Appendix E). Despite this mapping classification, searches of the NSW DPI Fisheries Spatial Data Portal did not identify any threatened freshwater fish habitat in the area and the river was mapped as "Poor" freshwater fish community status (Figure 6-1).

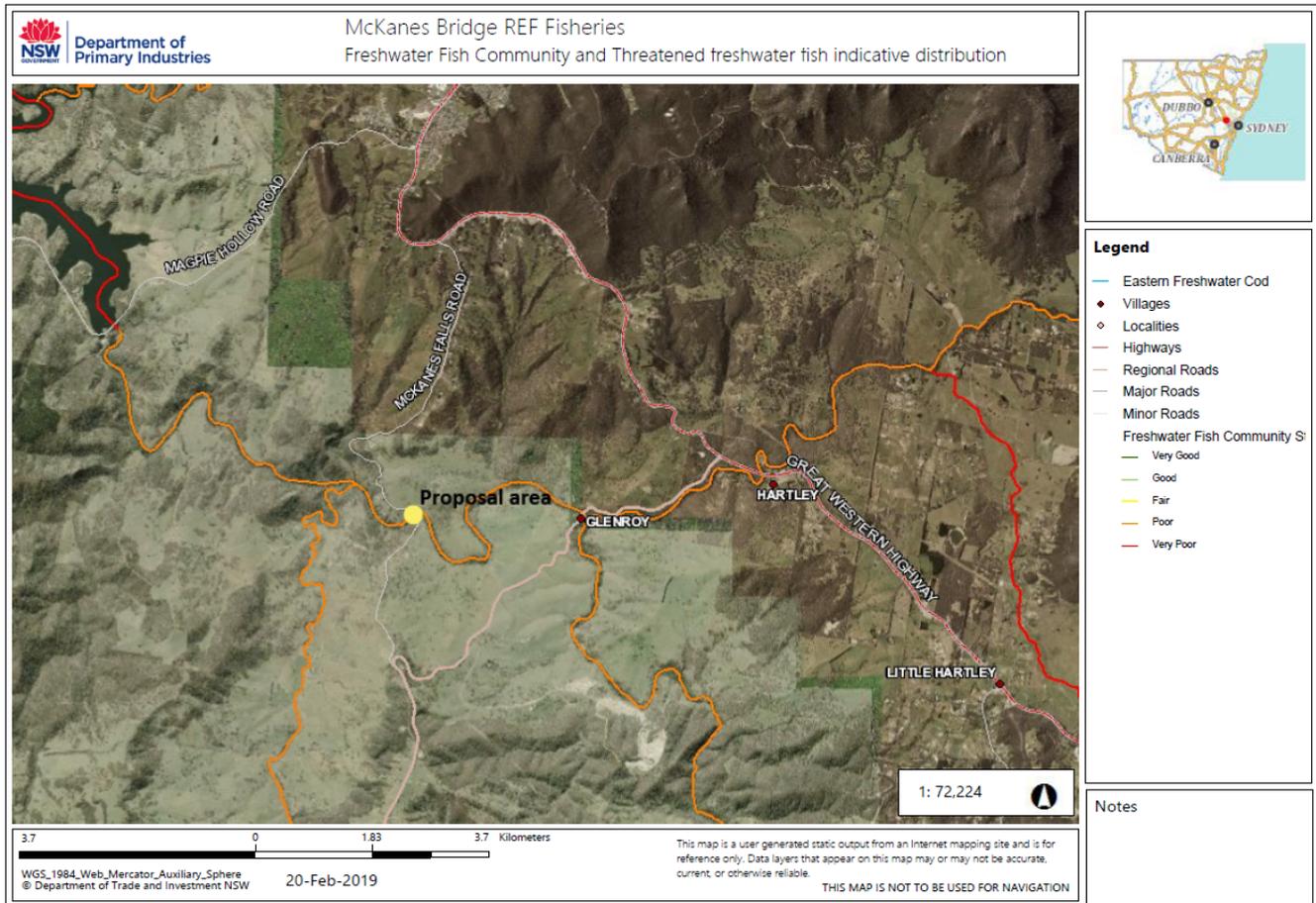


Figure 6-1: McKanes Bridge DPI Fisheries spatial data

Three threatened fish species and three threatened frog species were recognised as potentially occurring or having habitat in the area in the EPBC Protect Matters search, shown in Table 6-1.

Habitat connectivity

Habitat connectivity within and throughout the proposal area is moderate. Whilst vegetation within the road reserve and riparian corridor is moderately vegetated, the location of ancillary facilities and the surrounding agricultural areas have been significantly cleared.

No land in or around the proposal area is listed as critical habitat for any species.

6.1.3 Potential impacts

Vegetation

Ancillary facilities

Vegetation within this area is limited to native and exotic pasture grasses. No removal of canopy species would be required. The temporary occupation of this area would not result in any substantial impacts on biodiversity value.

Bridge works area

Construction of the bridge would not require the removal of any shrub layer or canopy layer vegetation. Provided appropriate mitigation measures are applied biodiversity impact on vegetation would be negligible to minor.

Power line realignment area

Some vegetation within the road reserve and surrounding private property would be removed or trimmed to facilitate the realignment of the power line. Canopy vegetation that would be affected consists of several medium to large Apple box (*Eucalyptus bridgesiana*) and Ribbon gum (*Eucalyptus viminalis*), as well as semi-mature Swamp she-oak (*Casuarina glauca*) individuals adjacent to the waterway. The loss of this mature and semi-mature native vegetation would not be avoidable in this instance. This vegetation is well represented in the area and no threatened species would be affected.

Affected groundcover vegetation would include Bracken fern (*Pteridium* sp.) and a range of native and exotic pasture grasses. Some areas affected by weeds would also be removed, including Blackberry (*Rubus fruticosus* agg.) and Fleabane (*Conyza bonariensis*). No shrub layer vegetation would be affected.

Based on the degree of vegetation removal required and the safeguards proposed, the overall biodiversity impact of the power line realignment would be minor.

The proposal has the potential to aid the spread of weeds during construction, particularly through the removal of environmental weeds currently occupying the front yards of private properties. This impact may be managed through the implementation of standard safeguards.

Fauna and habitat connectivity

As outlined above the proposal would include the loss of some vegetation within the existing road reserve. Whilst none of the trees designated for removal contained hollows they would still provide foraging and roosting opportunities to a range of fauna species. The loss of this habitat value would, in the context of other vegetation remaining within the road reserve and more broadly, be minor. Despite this, it is recommended that the adjacent road reserve is revegetated upon completion of construction to compensate for the loss of these trees.

Given the proposal would not involve any in-stream works, there would be no direct impacts upon KFH. Construction of the proposal has the potential to result in increased sediment runoff into Coxs River. The potential for impacts upon aquatic fauna and key fish habitat is considered to be moderate given the nature of the proposal and the soil types present. This risk would be managed through the implementation of standard soil and water safeguards (refer Section 6.5.4 and Section 1.1).

There is the potential for some resident native fauna to temporarily avoid habitats within and directly adjacent to the proposal area during construction. A particular risk is the existing wombat burrow adjacent to the north-western abutment. Wombats (*Vombatus ursinus*) are largely nocturnal, so given construction would be only carried out between 7am and 6pm at the latest the potential for disruption would be reduced. Despite this, measures should be implemented to reduce the potential for adversely affecting these individuals. These measures are outlined in Section 6.1.4.

The use of machinery and other equipment during construction can increase the risk of accidental spills of fuels, lubricants or paints which can affect the health of the terrestrial and aquatic ecosystems. Construction machinery and vehicles can also disperse weeds throughout the proposal area and can transport aquatic weeds if used in wet areas prior to entering the site.

Provided that management measures as given in Section 7.2 are employed, and that works within the stream bed are avoided, it is considered the proposal would not result in a significant impact on terrestrial or aquatic habitats.

Operation

The upgrades to the bridge would function in a similar manner to the existing structure. There would be no change to lighting or other elements that may affect biodiversity. On this basis there would be no operational biodiversity impact.

Conclusion on significance of impacts

The proposal is not likely to result in significant impact on threatened species or ecological communities or their habitats, within the meaning of the BC Act, FM Act and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to result in significant impact on threatened species, ecological communities or migratory species, within the meaning of the EPBC Act. As such a referral to the Minister for the Environment is not required.

6.1.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	Flora and Fauna Management aspects will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013) Protocols to manage weeds and pathogens. 	Roads and Maritime	Detailed design / pre-construction	Section 4.8 of QA G36 <i>Environment Protection</i>
Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
Biodiversity	All pruning and trimming of trees is to be in accordance with the <i>Australian Standard 4373-2007 Pruning of amenity trees</i> . Pruning of mature trees is to be undertaken by a qualified arborist.	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
Biodiversity – tree protection	Tree protection fencing will be established around the perimeter of any tree requiring a protection zone. If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with <i>AS 4970-2009 - Protection of</i>	Roads and Maritime	Detailed design / pre-construction	Standard safeguard B11

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<i>trees on development sites</i> . Existing fencing and site hoarding may be used as tree protection fencing.			
Biodiversity – Fauna handling	Fauna will be managed in accordance with <i>Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RMS projects</i> (RTA 2011).	Roads and Maritime	Construction	Additional safeguard
Biodiversity – unexpected finds	If unexpected threatened flora or fauna are discovered, works would stop immediately and the <i>RMS Unexpected Threatened Species Find Procedure</i> in the <i>RMS Biodiversity Guideline 2011</i> implemented.	Roads and Maritime	Construction	Standard safeguard B8
Biodiversity	No unnecessary materials or equipment should be stored in the area adjacent to the northern abutment to maintain ground level access for wombats to the eastern side of the bridge.	Roads and Maritime	Construction	Additional safeguard
Biodiversity	Compensatory planting should be implemented to account for mature trees removed as part of the project.	Roads and Maritime	Post-construction	Additional safeguard
Biodiversity	Night time lighting should be minimised to prevent disruption to microbat flyways and foraging along the river	Roads and Maritime	Construction	Additional safeguard

Other safeguards and management measures that would address biodiversity impacts are identified in Section 6.2.3.

6.2 Surface water, groundwater and flooding

6.2.1 Existing environment

Surface water

The proposal is situated within the Sydney Drinking Water Catchment (SDWC) in the Warragamba sub catchment. The Warragamba sub catchment is the largest of Sydney's five drinking catchments, covering an area of 9050 square kilometres. McKanes Bridge passes over Coxs River which forms part of the Hawkesbury-Nepean River system and is one of the major sources of inflows to Warragamba Dam, located about 57 kilometres south-east of the bridge. Note that SDWC remote telemetry is located in the near vicinity of the proposal area. Any off-site discharges are likely to be detected rapidly.

The proposal area is located on a section of Coxs River that has been impacted by extensive agricultural land use and land clearing. The topography of the land around the proposal area is steeply sloping on both approaches to the Coxs River.

Surface water sources surrounding the proposal area are in Table 6-2 with the closest named water sources located about one kilometre from the proposal area.

Table 6-2: Named surface waters surrounding proposal area

Approximate Distance (km)	Name of Water Source	Direction
1.0	Lowther Creek	West
1.0	Whites Creek	North-east
2.0	River Lett	East
5.0	Lake Lyell	North-west

Groundwater

The proposal area is located within the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources*. The Greater Metropolitan Region groundwater sources are located on the east coast of NSW, covering an area of about 32,500 square kilometres. There are 13 groundwater sources recognised in the region. The proposal area is in the Coxs River Fractured Rock Groundwater Source which covers an area of about 1700 square kilometres.

A search of groundwater bores in the proposal area was completed using the Australian Government's Australian Groundwater Explorer on 15 February 2019 (Appendix I). The search found two ground water bores within one kilometre of the proposal area namely GW072164.1.1 and GW105812.1.1. Both bores were about 800 metres south of the proposal area and used for household water supply purposes. GW105812.1.1 is an active monitoring bore. GW072164.1.1 did not return any information on the status of the bore.

A search of the Australian Government's Groundwater Dependent Ecosystem Atlas was completed on 15 February 2019 (Appendix I). The search recognised the site to be a moderate to high potential terrestrial groundwater dependent ecosystem (GDE), and a moderate potential aquatic GDE. Coxs River Fractured Rock Groundwater Source includes significant GDEs such as Jenolan Caves, which is located about 30 kilometres south of the proposal area.

Flooding

The proposal area is not mapped on the flood planning map in Lithgow LEP 2014 (see Appendix I). The original central pier of the bridge was lost during a flood event in 1986-87. A Scour Depth Memorandum - McKanes Bridge over Coxs River was prepared by Roads and Maritime in 2014 (refer to Appendix J) and consisted of hydrological information for the proposal area. The memo indicated that during a 100 year Annual Reoccurrence Interval (ARI) flood event the existing bridge deck is expected to be overtopped by about 330mm

A hydraulic study was conducted by Roads and Maritime which calculated flow discharge for McKanes Bridge and modelled flood levels and velocities through the bridge opening (Table 6-3).

Table 6-3: Peak flow rates, flood levels and flow velocity

Existing	2 year	5 year	10 year	20 year	50 year	100 year
Flow (m ³ /s)	180	280	360	490	665	850
Flood Level (m)	713.15	713.63	713.96	714.47	714.97	715.39
Velocity (m/s)	2.16	2.55	2.82	3.16	3.65	4.15

6.2.2 Potential impacts

Construction

Surface water

Given the outlook for ongoing drought conditions, possible constraints to the availability of water for construction purposes would be managed within sustainable limits of the proposal area and catchment. It may be necessary to reduce or limit some construction activities if water supply is heavily constrained. Advice would be sought from the Regional (Program) Environment Manager if water supply becomes impacted.

A suspended access scaffold would be hung from the temporary structural support system to allow bridge workers to work on and under the bridge. The foundations of the temporary support structure would be located outside of the normal river channel, and it is therefore considered unlikely that the proposal would result in loss of areas of aquatic habitat, or present barriers to fish movements within the river. There is potential that erosion processes could mobilise sediments and disperse them into the river during scour repairs to one of the abutments and the removal of vegetation. This can result in increased turbidity levels within the water column and disrupt photosynthesis in aquatic plants if light penetration is reduced. Sediment can also smother aquatic habitat.

A site-specific Erosion and Sediment Control Plan would be prepared by a Qualified Soil Conservationist prior to construction and would detail the safeguards used to control erosion and sedimentation. Standard erosion controls would be implemented as listed in the safeguards in Section 6.2.3 to mitigate the potential impacts of sedimentation from exposed soils. To reduce the risk of stockpile materials being mobilised into the environment, the stockpile would be appropriately bunded and as such, the secure stockpile is not anticipated to impact upon surface waters.

The proposed work requires petrol or diesel powered plant which uses fuels, lubricants and hydraulic fluids. Solvents and paints may also be used. A spill of these materials could pollute the river and nearby surface waters, and potentially groundwater resources. An Environmental Work Method Statement (EWMS) would be developed to manage potential spills for all plant and equipment working directly above the Coxs River, with a capacity to hold more than 20 litres of a single type of fuel, lubricant or hydraulic fluid. A spill kit would be kept on standby to quickly isolate and capture any spills and all refuelling would take place within a bunded area.

Groundwater

The proposal is not expected to impact upon groundwater as there will be no extraction or drilling which may intercept groundwater.

Flooding

The proposal would involve the installation of a temporary structural support system. The foundations and supporting trestles for this structure are located immediately adjacent to the existing bridge abutments and piers, and therefore this structure is not considered likely to contribute to a change in flooding patterns or levels.

Operation

Surface water

The proposal is not expected to impact upon surface waters in the operational phase as the proposal is consistent with the current operation of the road corridor.

Groundwater

The proposal is not expected to impact upon groundwater during the operation of the bridge as the proposal is consistent with the existing operations.

Flooding

The proposed bridge rehabilitation works would not significantly change the bridge dimensions. The proposal would involve a replacement of the existing truss spans of the bridge on the same alignment as the existing structure and retention of the existing road geometry. Therefore, no new structures would be built that would contribute to a change in flooding patterns. In order to mimic the historical design of the bridge and maintain its heritage character, the deck height will remain consistent with the historical deck height. This means there will be no worsening of the 100 year ARI overtopping levels of the existing bridge, once the upgrades are completed.

Scour repair would be applied to the northern abutment in the form of rock armouring. Rock armouring would be placed on top of the existing material which consists of soil and rock outcrops. This would help to reduce the effects of scour and assist in making the bridge more resilient to large flooding events. There would be no changes in proposed flow, flood level and velocity values, or the surrounding catchment area.

Conclusion of the NorBE Assessment

SDWC SEPP relates to the use of land within the Sydney drinking water catchment. In accordance with clause 12 of the SEPP, Roads and Maritime is required to consider whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity.

The proposal is not expected to significantly impact surface water or ground water as a result of the works. The mitigation measures listed in Section 6.2.3 will help to reduce any potential impacts.

From the qualitative assessment undertaken, the proposal is expected to have a neutral effect on water quality.

6.2.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface water	A CEMP will be prepared and implemented. The CEMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution including an incident management plan and describe how these risks will be addressed during construction in accordance with <i>Managing Urban Stormwater: Soils and Construction Vol 1 and 2A Installation of services</i> (the Blue Book) (Landcom 2004, DECC and Water NSW 2008).	Roads and Maritime	Detailed design / pre-construction	Section 2.1 of QA G38 <i>Soil and Water Management</i>
Surface water	A site-specific Erosion and Sediment Control Plan/s will be prepared by a qualified and experienced Soil Conservationist 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.	Roads and Maritime	Detailed design / Pre-construction	Section 2.2 of QA G38 <i>Soil and Water Management</i>
Surface water	An EWMS will be developed to manage potential spills for all plant and equipment working over the Coxs River, with a capacity to hold more than 20 litres of a single type of fuel, lubricant or hydraulic fluid. An emergency spill kit is to be kept on site at all times and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site. The spill kit must be readily accessible at the work area(s) and in site compounds. All workers will be advised of the locations of spill kits and trained in their use.	Roads and Maritime	Construction	Additional safeguard
Surface water	Water for construction activities will be managed within sustainable limits of the area and catchment. It may be necessary to reduce or limit some construction activities if water supply is heavily constrained. The	Roads and Maritime	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Regional (Program) Environmental Manager will be consulted for direction, if water supply is impacted.			
Surface water	Emergency contacts will be kept in an easily accessible location on vehicles, plant and site office. All workers will be advised of these contact details and procedures.	Roads and Maritime	Construction	Additional safeguard
Flooding	Any changes in bridge design of a structural nature are to be investigated for potential changes to flood characteristics. This includes changes to upstream and downstream water levels, velocities and direction	Roads and Maritime Project Manager	Detailed design	Additional safeguard

Other safeguards and management measures that would address surface and groundwater, and flooding impacts are identified in Section 6.3.3.

6.3 Soils

6.3.1 Existing environment

The topography of the land around the proposal area is steeply sloping on both approaches to the Cocks River. McKanes Bridge is located at about 720 metres Australian Height Datum (AHD) which is at a low point compared to the surrounding environment. The surrounding elevation includes multiple peaks rising upwards of around 1200 metres AHD.

The geology of the proposal area is documented by the Katoomba 1:100 000 Sheet Survey (1992). The geology of the area is quaternary alluvial derived sands and gravels derived largely from Carboniferous granites and Devonian metasediments (principally quartzite).

The NSW OEH eSPADE soil map tool classes the soils to be earthy sand which have high permeability and are well drained. The area is dominated by shallow to moderately deep well drained alluvial sands and gravels along current stream channels, small terraces and alluvial flats.

The Lithgow LEP does not include any maps identifying the presence of acid sulfate soils (ASS). According to the Australian Soil Resource Information System the area has a low probability of ASS being present.

Asbestos is naturally occurring and can typically be found in rock, sediment or soil. NSW has been mapped depending on the probability of naturally occurring asbestos (NOA) being present. The proposal area is unlikely to present NOA as it has not been identified as a low, medium or high potential region within the NOA map (refer to Figure 6-2).

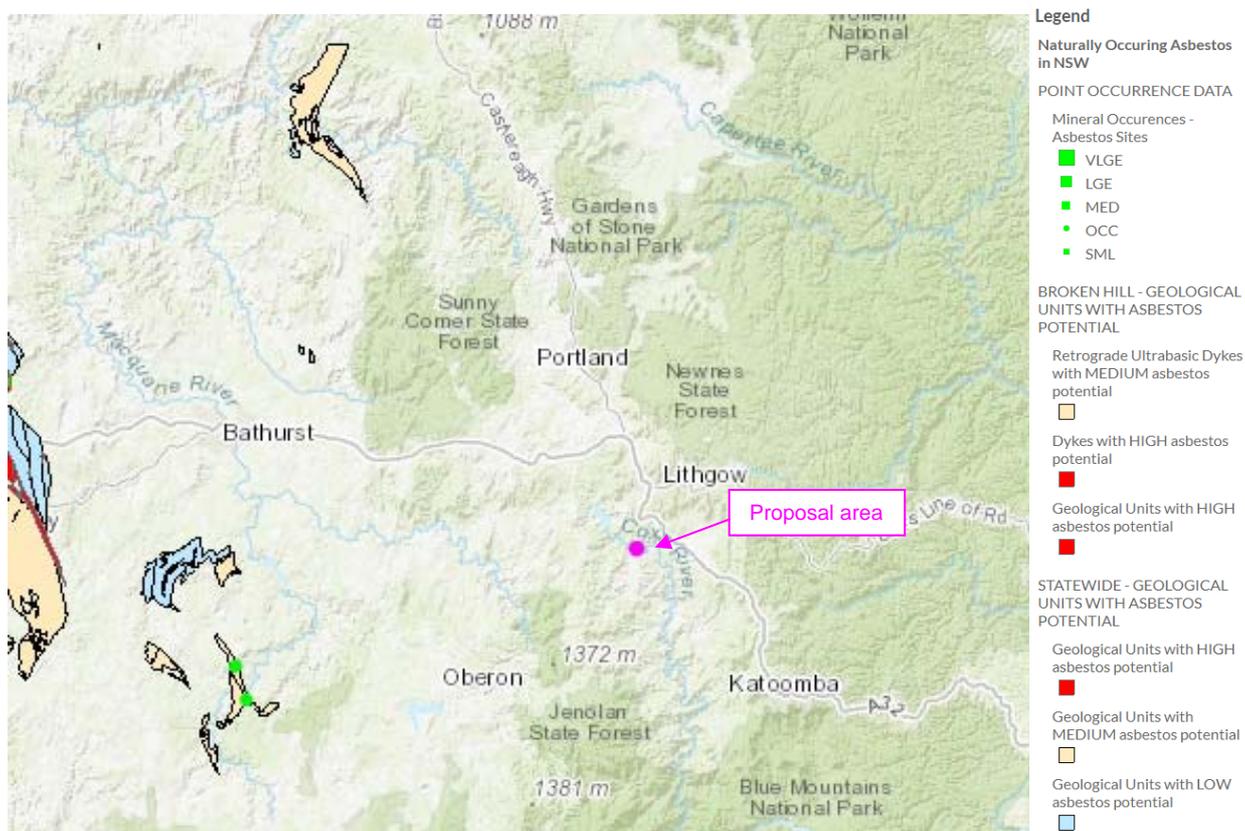


Figure 6-2 Naturally occurring asbestos surrounding the proposal area

6.3.2 Potential impacts

Construction

There would be limited interaction with soils or impacts to soil as the proposal is generally restricted to the existing bridge structure. The main activities which may impact on soils include the following:

- Establishment of the temporary construction compound sites which may result in exposed surfaces and vehicle tracking of dust
- Vegetation clearing around the bridge substructure to enable construction of foundations for the temporary bridge supports
- Local excavation behind both abutments to enable reconstruction of the concrete backing walls
- Use of cranes on the banks of the Coks River to replace the trusses which may disturb the soil and result in mobilisation of sediment
- Power pole removal and installation which would require minor earthworks.

Throughout the duration of construction works, standard erosion and sedimentation controls would be implemented as listed in the safeguards in Section 6.3.3 to mitigate the potential impacts to soils as a result of the proposal.

Operation

The operation of the proposal is not likely to result in any significant impacts on soils, landscape, topography or geology. The risk of soil erosion during operation would be minimal as all areas impacted during construction would be sealed or rehabilitated and landscaped to prevent soil erosion from occurring.

6.3.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil	Site-specific Erosion and Sediment Control Plan(s) will be prepared and implemented as part of the CEMP. Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Roads and Maritime	Construction	Standard safeguard EIA-P05-G01-T02
Soil	Erosion and sediment control measures are not to be removed until the work is complete, and areas are stabilised.	Roads and Maritime	Construction	Standard safeguard EIA-P05-G01-T02
Soil	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Roads and Maritime	Construction	Standard safeguard EIA-P05-G01-T02

Other safeguards and management measures that would address soil impacts are identified in Section 6.2.3.

6.4 Traffic and transport

6.4.1 Existing environment

McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway. McKanes Falls Road is two-lanes and heads south from Lithgow off the Great Western Highway and connects with Jenolan Caves Road. McKanes Falls Road is about seven kilometres long with the bridge located about five kilometres along the road from the Great Western Highway.

McKanes Falls Road is a local two-lane two-way undivided road with no shoulders. It has a 15 tonne load limit and a posted speed of 80 kilometres per hour.

McKanes Falls Road does not carry high volumes of traffic. Primary use is by light vehicles, with very limited use by heavier vehicles up to the current bridge load limit of 15 tonne (such as the school bus service), pedestrians and cyclists. Approximately 600-700 vehicles per day cross over McKanes bridge in both directions.

There are approximately 37 properties, mostly residential, along McKanes Falls Road on the Great Western Highway (northern) side of the bridge, and approximately 9 rural properties on the Jenolan Caves Road (southern) side of the bridge. There are no other nodes of transport infrastructure in the surrounding area. McKanes Falls Road is on occasion used by the NSW Police Force to detour traffic in the event of an accident requiring Jenolan Caves Road to be closed. Under those circumstances, any vehicles exceeding the current 15 tonne load limit is required to travel via Oberon and Bathurst to regain the Great Western Highway, which could extend the travel time to Lithgow by up to two hours.

6.4.2 Potential impacts

Construction

The construction period would require additional light and heavy vehicle movements to facilitate deliveries and removal of construction materials and wastes to and from the proposal area and associated site compounds, as well as construction personnel vehicle movements. It is estimated that there would be 20 vehicle movements per day per side of the bridge. This number is expected to be split evenly between light vehicles (4WD) and larger construction traffic eg a Franna crane or rigid truck.

The proposal would result in a change in traffic flow as McKanes Falls Road is proposed to be closed for the duration of the removal and reconstruction of the bridge, anticipated to be about 12 months, not including any weather-related delays. The proposed road closure would temporarily detour all through traffic via Jenolan Caves Road and the Great Western Highway at Hartley, which would add about five minutes travel time. The proposed traffic diversion route is shown in Figure 3-6. Access for residents and rural properties on McKanes Falls Road would remain available, from either the Great Western Highway or Jenolan Caves Road, but only as far as the closed bridge, throughout the proposed detour period.

During the proposed road closure period, access would not be possible for any emergency services to cross the Cocks River, and in the event of any emergency requiring Jenolan Caves Road to be closed, the NSW Police Force would not be able to detour any traffic through McKanes Falls Road.

Operation

The upgrade of McKanes Bridge would enable ongoing safe service levels of McKanes Falls Road as part of the road network. The proposal would improve road safety for all vehicles, including cyclists, and would

improve the ability of heavier vehicles up to GML standard to utilise McKanes Falls Road to transport goods locally and regionally in NSW.

On the occasion that McKanes Falls Road is used as an official emergency detour for traffic, the proposal would allow all vehicles within those limits, including GML vehicles, to take such a detour. The upgrades would also mean less maintenance is required on the bridge removing the need for temporary detours during maintenance works.

6.4.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (Roads and Maritime, 2018) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2018). The TMP will include:</p> <ul style="list-style-type: none"> • 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 • requirements and methods to consult and inform the local community of impacts on the local road network • a response plan for any construction traffic incident • 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. 	Roads and Maritime	Detailed design / Pre-construction	TCaWS Manual, QA Spec G10
Traffic and transport	A Road Occupancy Licence would be required for all work impacting on traffic flows, including closures, prior to that work commencing.	Roads and Maritime, Lithgow City Council	Preconstruction	Additional safeguard
Traffic and transport	Transport companies, emergency services and any bus companies will be notified of the proposed impact due to partial road closure 14 days prior to works commencing.	Roads and Maritime	Pre/construction	Additional safeguard

6.5 Noise and vibration

6.5.1 Existing environment

The existing noise environment was calculated using the Roads and Maritime's Construction Noise and Vibration Assessment Guideline and the construction noise estimator on 25 February 2019 (Appendix K).

The proposal site is in a rural landscape, surrounded by open agricultural land. It is believed that a number of rural and residential properties along McKanes Falls Road are 'weekenders' that are not permanently occupied. The closest residential receiver to the study area is about 150 metres to the west of the proposal area along McKanes Falls Road. There are seven other rural residential properties within one kilometre of the proposal area (see Figure 6-3). The closest noise source to the proposal area would be the Great Western Highway which is about 3.6 kilometres north of the bridge. The Great Western Highway carries around 16,000 annual average daily traffic (AADT) compared to McKanes Falls Road which carries around 600-700 AADT.

The construction noise estimator was used to identify an appropriate background noise level (L_{A90}) and Noise Management Level (NML) for each time period of proposed works. Based on the surrounding rural landscape, a noise category level of R0 was used in the construction noise estimator. Table 6-4 shows the background noise level (L_{A90}) and the NMLs applicable to the proposal. The most appropriate residential receiver category was considered to be 'Undeveloped green fields, rural areas with isolated dwellings'.

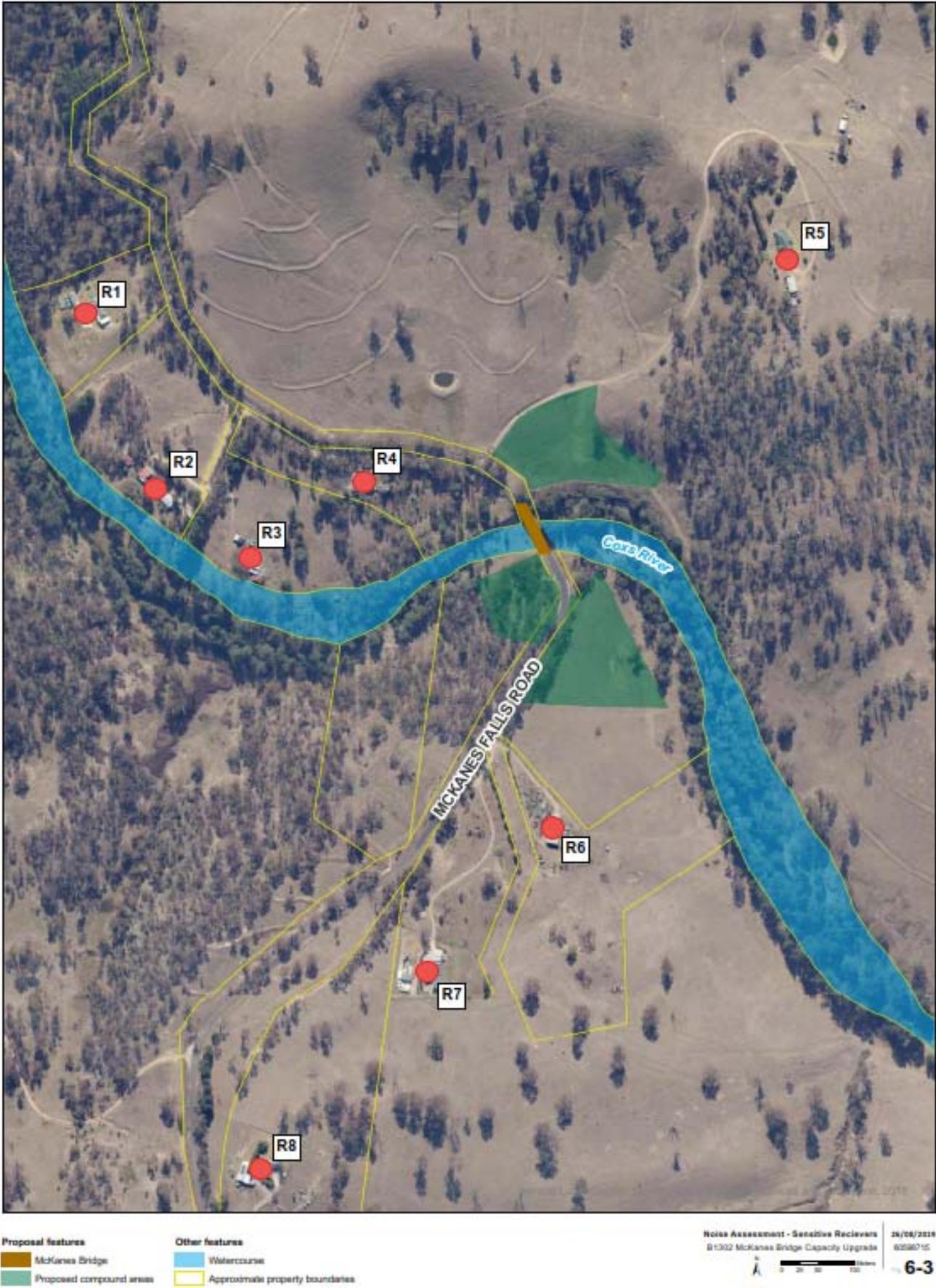


Figure 6-3: Noise Assessment – Sensitive Receivers

Table 6-4: Background noise level and NML for the proposal

Noise area category		R0
RBL or L _{A90} Background level (dB(A))	Day	30
	Evening	30
	Night	30
L _{Aeq} (15 minutes) Noise Management Level (dB(A))	Day	40
	Day (OOHW)	35
	Evening	35
	Night	35

6.5.2 Criteria

Construction noise criteria

The NSW EPA *Interim Construction Noise Guideline* (ICNG) is the principal guidance for the assessment and management of construction noise in NSW.

The ICNG recommends that projects which involve works occurring over longer periods of time, lots of equipment and/or stages of works be assessed quantitatively. This involves predicting noise levels due to construction activities at nearby receivers using environmental noise modelling software and comparing it to the noise management levels provided in Section 4 of the ICNG.

Where an exceedance of the noise management levels is predicted, the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practises to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details.

Where construction noise levels reach 75 dB(A), residential receivers can be considered as 'highly noise affected' and the proponent should, in consultation with the community, consider restricting hours to provide respite periods.

6.5.3 Potential impacts

Construction

During construction the noisiest plant is anticipated to be the chainsaw used in the dismantling of the current bridge superstructure, and in the shaping of new timber to be installed in the upgraded bridge. Using the noisiest plant-based scenario for 'Chainsaw', the noise estimator tool produced predicted noise levels at different locations for various receivers. To assist with the assessment common residential receivers were grouped into noise catchment areas (NCA). NCAs are the areas that are affected by the same works and located at similar distances from the noise generating activity. The NCA affected distances (or the distances up to which noise levels are expected to exceed the NML) are recorded in Table 6-5 together with the predicted noise levels.

Table 6-5: NCA affected distances and the predicted noise levels for the proposal area.

Noise area category	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (25m) – in line of sight	40	75	N, PC, RO
	NCA2 (120m) – in line of sight	40	60	N
	NCA3 (250m) – in line of sight	40	50	N

*N= notification (letterbox drop or equivalent), PC= phone calls and RO= Respite offer

Following a review of the catchment distances, it is evident that no residential receivers are located within NCA1 or NCA2. One residential receiver (R4) is located within NCA3 (see Figure 6-4). These are maximum predicted noise levels which are only anticipated to be during the dismantling of the existing bridge superstructure.

Using the distance-based scenario for ‘Compound site establishment’ and ‘Compound operation’, the noise estimator tool was used to assess impacts of the compound site on residential receivers. The NCA affected distances (or the distances up to which noise levels are expected to exceed the NML) are recorded in Table 6-6 and Table 6-7 together with the predicted noise levels.

Table 6-6: NCA distances and the predicted noise levels for compound site establishment.

Noise area category	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (35m) – in line of sight	40	75	N, PC, RO
	NCA2 (170m) – in line of sight	40	60	N
	NCA3 (360m) – in line of sight	40	50	N

*N= notification (letterbox drop or equivalent), PC= phone calls and RO= Respite offer

For the ‘Compound site establishment’ scenario, no residential receivers are located within NCA1. Two residential receivers (R4 and R6) are located within NCA2 and three residential receivers (R3, R5 and R7) are located within NCA3 (see Figure 6-5).

Table 6-7 NCA affected distances and the predicted noise levels for compound operation.

Noise area category	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (20m) – in line of sight	40	75	N, PC, RO
	NCA2 (115m) – in line of sight	40	60	N
	NCA3 (250m) – in line of sight	40	50	N

*N= notification (letterbox drop or equivalent), PC= phone calls and RO= Respite offer

No residential receivers are located within NCA1 or NCA2 for the ‘Compound operation’ scenario. Two residential receivers (R4 and R6) are within NCA3 and two residential receivers (R3 and R5) are partially within NCA3 (see Figure 6-6).

Recommended additional mitigation measures

The above three tables identify recommended additional mitigation measures as provided by the Roads and Maritime Construction Noise Estimator Tool. As no receivers were within NCA1 for any of the scenarios, N Notification was the only recommended additional mitigation measure for the affected receivers within (refer to Table 6-5 to Table 6-7).

Noise impacts to the residential receivers would be mitigated through implementing standard mitigation measures and the additional mitigation measure of N Notification (or equivalent). It is recommended to notify receivers R1 to R8 as identified within Figure 6-3 of the proposed work, at least seven calendar days before work commences.

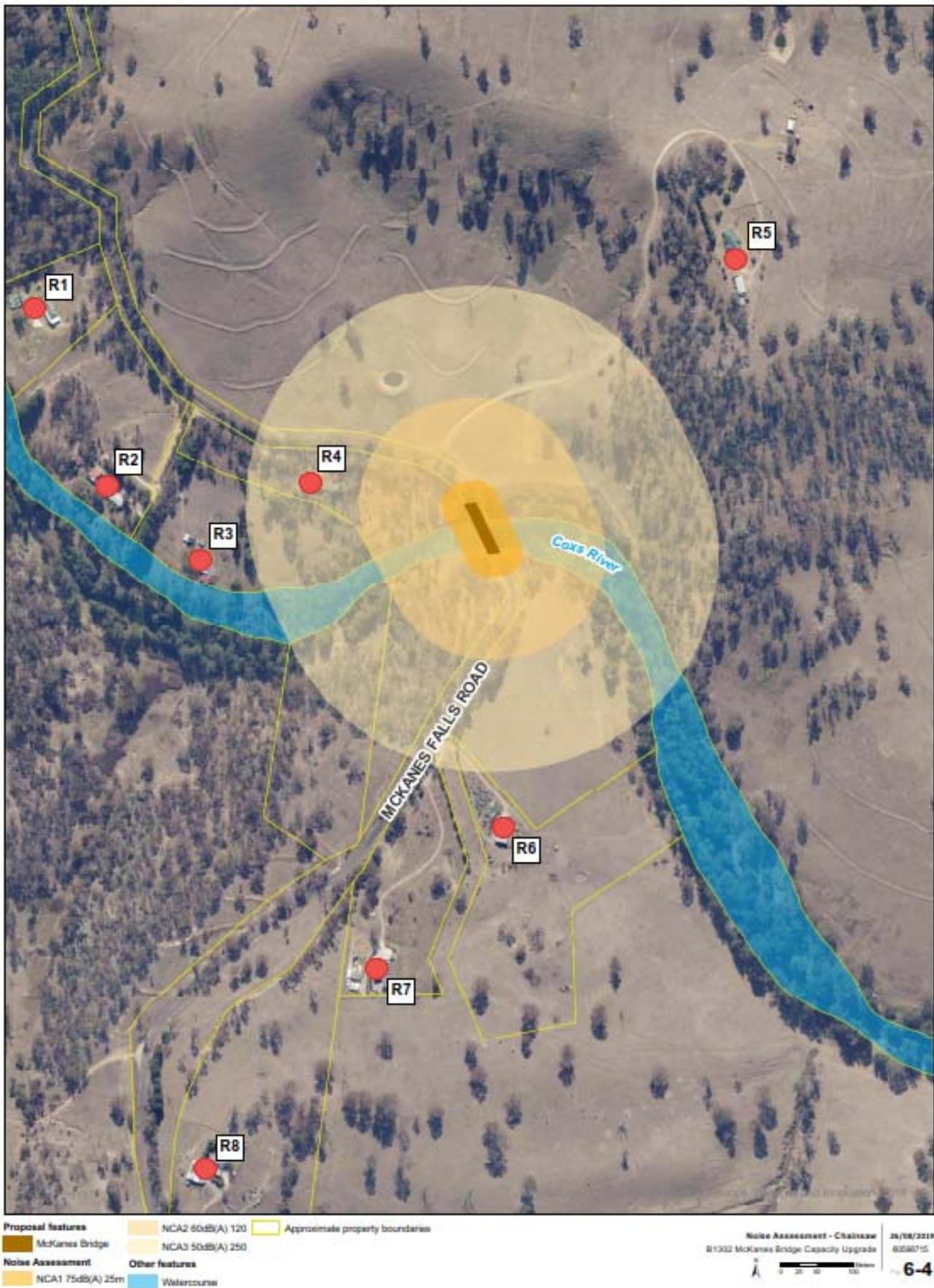


Figure 6-4: Noise Assessment - Chainsaw

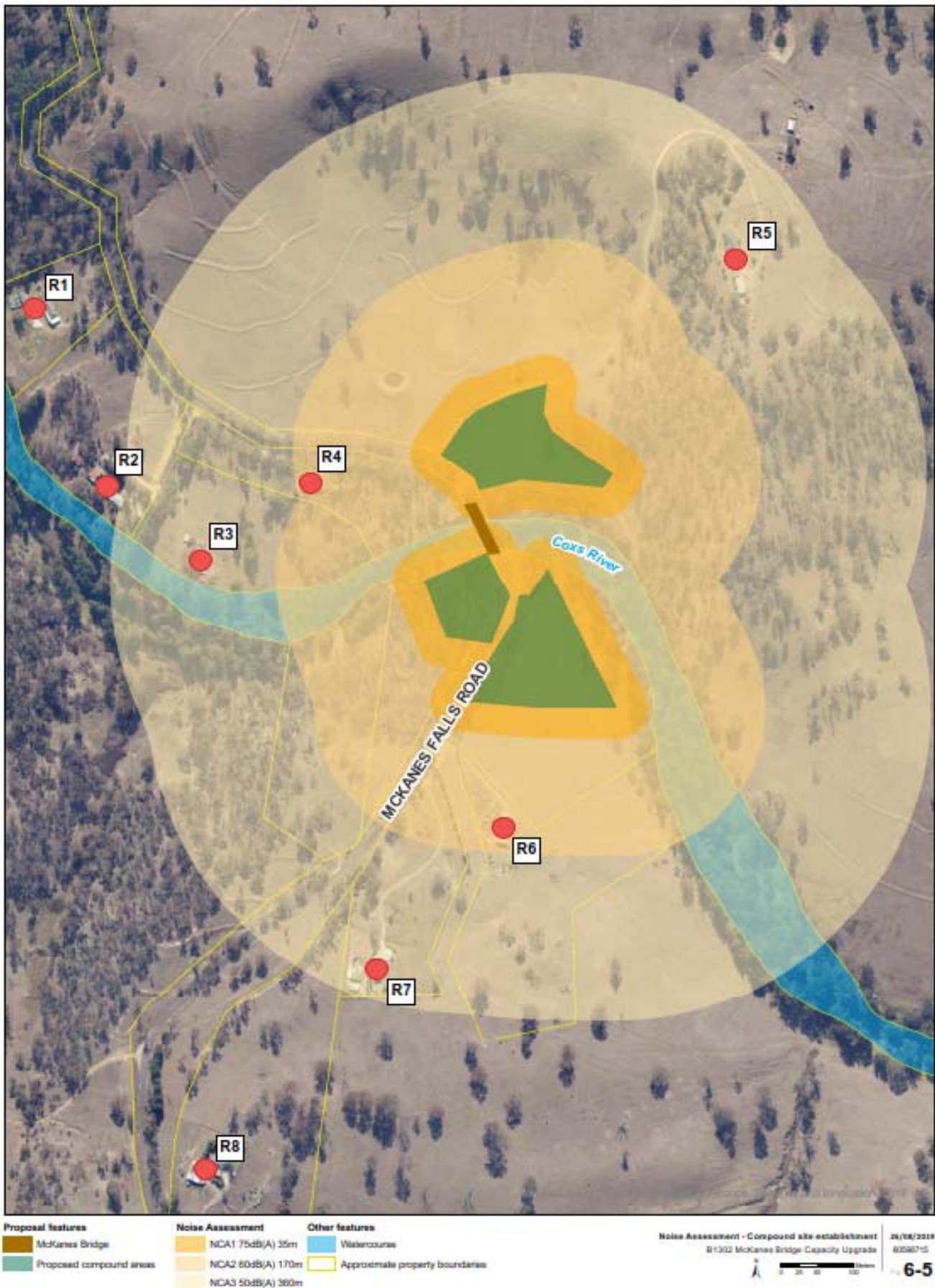


Figure 6-5: Noise Assessment – Compound Site Establishment

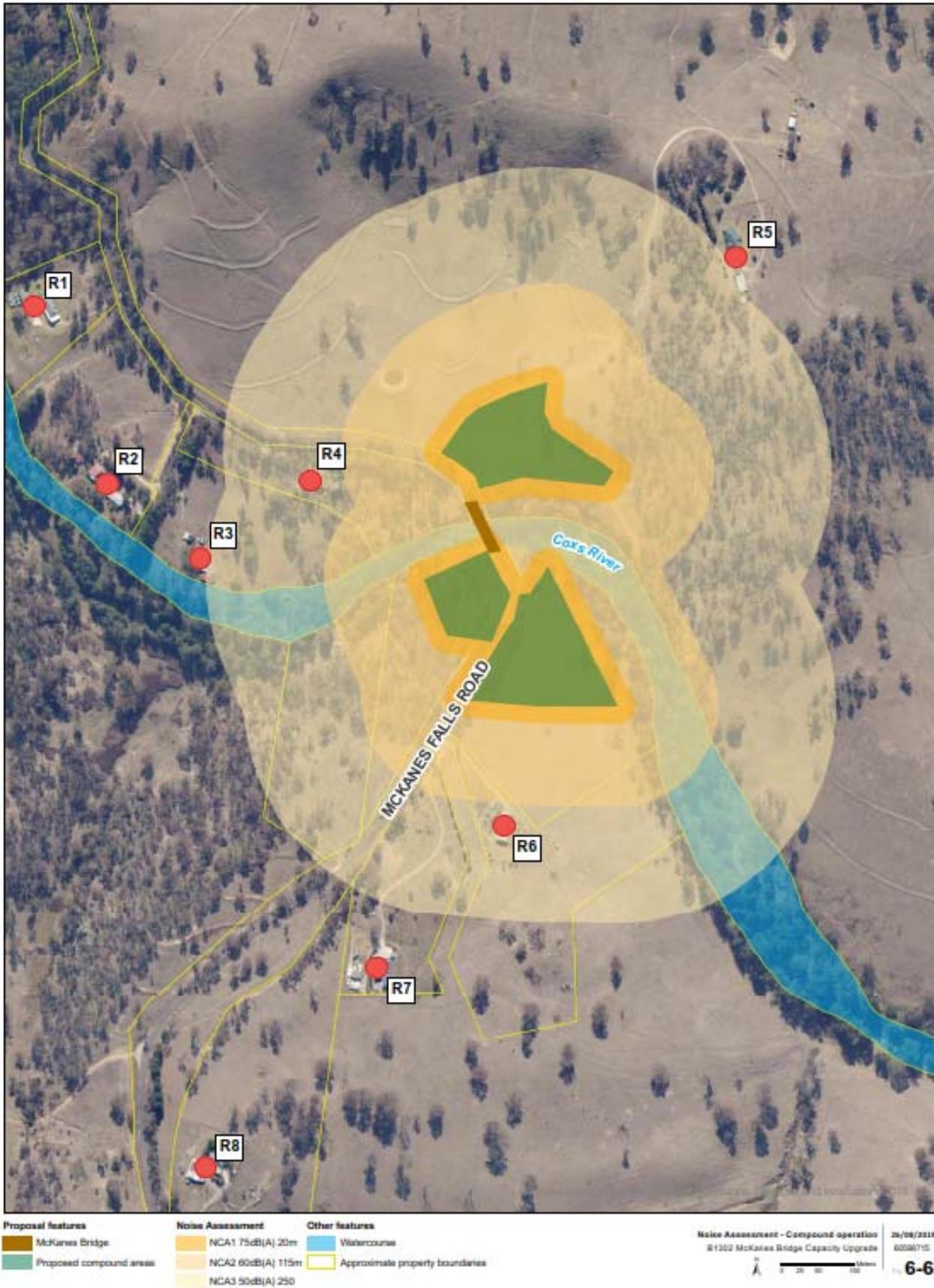


Figure 6-6: Noise Assessment – Compound Operation

Operation

The proposal would not significantly increase the volumes of traffic, traffic composition, traffic behaviour, or change the alignment of the current road. There is not likely to be any changes to the current operating noise environment.

6.5.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	Noise and Vibration Management will be prepared and implemented as part of the CEMP and generally follow the approach in the Interim <i>Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify: <ul style="list-style-type: none"> all potential significant noise and vibration generating activities associated with the activity feasible and reasonable mitigation measures to be implemented 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. 	Roads and Maritime	Detailed design / pre-construction	Section 4.6 of QA G36 <i>Environment Protection</i>
Noise and vibration	All sensitive receivers likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. To ensure consistent communication with affected receivers, it is recommended to notify receivers R1 to R8 (as identified within Figure 6-3) of the proposed work. The notification will provide details of: <ul style="list-style-type: none"> the project construction period and construction hours contact information for project management staff complaint and incident reporting how to obtain further information. 	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
Noise and vibration	Works will be carried out during normal work hours (ie 7am to 6pm Monday to Friday; 7am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts.	Roads and Maritime	Construction	Additional safeguard

6.6 Non-Aboriginal heritage

A SoHI was prepared in June 2018. A copy of the report is provided in Appendix F with a summary of the findings provided below.

6.6.1 Existing environment

Searches of the following databases and registers were undertaken on 14 February 2019:

- State Heritage Register
- NSW Roads and Maritime Section 170 Register
- Lithgow LEP 2014
- National Heritage List
- The Commonwealth Heritage List.

The results of the database searches are provided in Table 6-8 and in Appendix L.

Table 6-8: Statutory and non-statutory listings

Heritage Listing	Status
State Heritage Register	Listed
NSW Roads and Maritimes' Section 170 Register	Listed
Lithgow Local Environmental Management Plan 2014	Listed as item A077
National Heritage List	Not listed
The Commonwealth Heritage List	Not listed

A condition assessment site inspection was undertaken on the bridge in 2017. The SoHI was prepared consistent with the NSW OEH (2002) Statements of Heritage Impact guidelines. In November 2018, archival recording using photogrammetry was undertaken at the bridge using aerial drones and captured full imagery of all parts of the bridge structure. A 3-D model of the bridge has been created from this data.

Timber truss road bridges were extensively used in NSW because of the high quality of local hardwoods and the shortage of steel during the early decades of settlement of the State. Timber truss bridges were developed and refined in Australia to achieve the highest level of timber bridge construction for the time of their design. McKanes Bridge was one of the last McDonald timber truss bridges built in NSW, being at the very juncture of the cessation of the construction of McDonald trusses in 1894. The bridge is associated with John A. McDonald, designer of the McDonald Truss and a significant figure in bridge design and construction in NSW. McDonald truss is an important recognisable design in the evolution of timber truss bridges in NSW. In March 1998 there were seven McDonald truss road bridges remaining in NSW, McKanes Bridge being one of two with a 27.43 metre span and one of two in a double span configuration. McKanes Bridge is now the longest span surviving McDonald truss bridge in NSW.

McKanes Bridge also has a historical link with the evolution of the local community. The probable association with Archibald McKane and his involvement with Mitchell's third expedition also adds some significance to the crossing itself.

There is a historic engineering marker stone installed by Engineers Australia at the Jenolan end (south) of the bridge (see Figure 6-7). This marker stone is not anticipated to be impacted by the proposal.



Figure 6-7: Engineering marker stone located at the Jenolan end of McKanes Bridge (left of road). Source: Google Maps

McKanes Bridge is considered of State heritage significance. There are no known adjacent heritage items that contribute to the heritage significance of McKanes Bridge.

6.6.2 Potential impacts

Construction

The bridge was assessed in 2017 and found to be in poor condition. A number of options were considered to keep and maintain or replace the bridge as described in Section 2.4 and in the SoHI. The alternative options for the bridge did not meet all the proposal objectives and performed poorly in maintaining the heritage significance of the bridge as noted in Section 2.4. A capacity upgrade to the bridge superstructure has been adopted as the preferred option. McKanes Bridge, which has State heritage significance, will have structural elements upgraded to increase load capacity and strengthen the bridge.

A summary of the significance grading and heritage impact for individual components of the bridge are in Table 6-9.

Table 6-9: Summary of Heritage Impacts from the SoHI

Truss component	Significance grading*	Heritage impact*
Trusses		Overall Minor
Timber		
Top chords	Exceptional	Low
Bottom chords and butting blocks	Moderate	Minor
Principals and diagonals	High	Low
Cross girders	Little	Moderate
Metalwork		

Truss component	Significance grading*	Heritage impact**
Tension rods	Moderate	Low
Cast iron shoes	High	Low
Sway braces	High	Minor
Deck and railing		Overall minor
Decking	Intrusive	Minor
Railing	Little	Minor
Monorail	Nil	Nil
Substructure		Overall Low
Abutments (masonry)	High	Low
Pier (concrete)	Little	Minor positive

*Significance grading by Roads and Maritime, **Heritage impact assessment by FBE on behalf of Roads and Maritime

The overall heritage impacts have been assessed as a minor negative impact. Many aspects of the work are reversible except for the replacement of potentially original metal components, examples of which Roads and Maritime proposes to retain for testing purposes and analysis to determine details such as metallurgic composition and condition (see Section 6.6.3).

Operation

The restoration and upgrade will broadly be based on the original design in appearance, but with a subtle change to strengthening details. The proposal retains the essential form and fabric of the bridge whilst generally upgrading structurally critical bridge elements with visually unobtrusive, structurally superior and more durable elements. The main structural and visual difference will be the replacement of potentially original metal components, examples of which Roads and Maritime proposes to retain for testing and further detailed analysis (Section 6.6.3). The strengthening design includes replacing some timber elements with steel, replacing cast and wrought iron components with steel or new castings, modifying the bottom chord of the trusses, replacing the current timber decking with a SLT deck, supplementing the existing sway braces with steel knee braces and installing a steel traffic barrier across the truss spans. The proposal would enable Roads and Maritime to retain the bridge's State heritage significance as a rare example of a McDonald timber truss bridge providing a vital piece of road infrastructure while still performing the function for which it was originally designed and built.

6.6.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	<i>The Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered.	Roads and Maritime	Detailed design / pre-construction	Section 4.10 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Work will only re-commence once the requirements of that Procedure have been satisfied.			
Non-Aboriginal heritage	<p>An Archival recording will be implemented including 3D mapping (laser scanning) prior to works commencing on the bridge.</p> <p>Examples of metal components in good condition will be retained for detailed inspection, testing and analysis.</p>	Roads and Maritime	Pre-construction	Additional safeguard

Other safeguards and management measures that would address non-Aboriginal heritage impacts are identified in Section 6.8.3.

6.7 Aboriginal cultural heritage

6.7.1 Existing environment

A Stage 1 assessment was undertaken in accordance with the PACHCI. The PACHCI involves a staged approach to comprehensively review potential impacts to Aboriginal cultural heritage as a result of Roads and Maritime activities. An AHIMS search was carried out and a site inspection was conducted on 12th December 2018. A Stage 1 PACHCI clearance letter is provided in Appendix G.

Lithgow is in the area of coverage of the Bathurst Local Aboriginal Land Council (LALC). The traditional owners of the Lithgow area are the Wiradjuri people. However, it is believed that Lithgow was a place of junctions and meetings for the Gundungurra and Wiradjuri people.

Over two centuries ago, the crossing of the Blue Mountains by British explorers enabled a wave of pastoral settlers into the shared land of the Gundungurra and Wiradjuri people. When the settlers started to cross they brought with them sheep and cattle and began to carve out huge pastoral runs.

The proposal area is located in a disturbed rural landscape. The land surrounding the proposal area has been historically disturbed for agricultural purposes and cleared for grazing land.

The AHIMS search did not identify any Aboriginal sites or places in the study area. The archaeological potential of the study area is considered low given the site context and results of data base searches.

6.7.2 Potential impacts

Construction

The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects and places within the proposal area. The Stage 1 PACHCI assessment has concluded that the proposal is considered unlikely to harm known Aboriginal objects or places of cultural heritage significance. A Stage 2 PACHCI is therefore not required for the proposal.

The proposal area has previously been disturbed by farming practices, bridge construction and continuous bridge maintenance activities. Minor earthworks would be undertaken as part of the proposal. Excavation would be in previously disturbed areas including around the bridge abutments. Regrowth vegetation and some mature trees would need to be removed for the relocation of an overhead powerline, however none were recorded on the AHIMS system.

Operation

The proposal is not expected to impact on any items of Aboriginal heritage or cultural values when it is operational.

6.7.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	<i>The Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015)	Roads and Maritime	Detailed design / pre-construction	Section 4.9 of QA G36 <i>Environment</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime 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.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>			<p><i>Protection</i></p>

6.8 Landscape character and visual impacts

6.8.1 Existing environment

The proposal area is located in a disturbed rural landscape and passes over Coxs River which is a major waterway. The riparian vegetation of the river is of medium dense coverage consisting of native and introduced species. Beyond the riparian vegetation is cleared agricultural land used for extensive grazing and farmland.

The bridge is of State heritage significance, and the local community has been supportive of preserving the existing bridge. Roads and Maritime has made a commitment to retain the bridge as a functioning bridge in recognition of its individual heritage significance and also as an example of a McDonald timber truss bridge. The proposed works would result in a minor reduction in the heritage integrity of the bridge as discussed in Section 6.6.

6.8.2 Potential impacts

Construction

Landscape character

The proposal would require additional light and heavy vehicle movements to facilitate deliveries and removal of construction materials and wastes to and from the proposal area and associated site compounds, as well as construction personnel vehicle movements. Given the rural landscape setting, these features are not expected to alter the landscape character surrounding the proposal area.

Visual amenity

During construction, a significant temporary supporting structure would be erected along both sides of the bridge. This would resemble a two-span steel truss bridge, with access scaffold platforms suspended beneath it. The process of dismantling the existing bridge and rebuilding the upgraded bridge has an estimated duration of 12 months, meaning that on initial consideration, the current visual amenity would be altered for that same period of time. The presence of the temporary supporting structure, which although steel rather than timber, would nevertheless resemble a two-span truss bridge, may provide some similar visual amenity to that of the existing bridge. Together with the limited access to the proposal area during this time, the form of the temporary supporting structure may somewhat mitigate the altered visual amenity during the construction period.

Temporary site compounds are proposed to be placed on either side of the bridge. The compound sites and work areas would be secured by fencing for reasons of security and public safety. McKanes Bridge would be closed to the public for the duration of the bridge removal and reconstruction, which would greatly reduce the number of visual receivers. Closing McKanes Bridge to the public would also increase the safety of road users while construction of the bridge is underway. A small number of rural properties are located around the proposal area, therefore landscape impacts and the altered visual amenity due to the construction work are considered to be minor.

Operation

Landscape character

The capacity upgrade would broadly be based on the original design in appearance, but with a subtle change to strengthening details. The strengthening details are discussed in Section 6.6.2. The changes to the bridge would be seen in the context of the original bridge structure. There is not anticipated to be any other impacts to landscape character or visual amenity as a result of the operation of the proposal.

6.8.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	Landscaping is to be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2008</i> .	Roads and Maritime	Construction	Additional safeguard
Landscape character and visual impacts	Works to be carried out in accordance with EIA-N04 <i>Guideline for Landscape Character and visual impact assessment</i> .	Roads and Maritime	Construction	Additional safeguard

Other safeguards and management measures that would address landscape character and visual impacts are identified in Section 6.6.3.

6.9 Property, land use and socio-economic

6.9.1 Existing environment

The proposal is located within the Lithgow LGA. The land use surrounding the proposal area was determined by reviewing the Lithgow LEP 2014 and aerial photography.

Property and land use

The proposal area is zoned RU1 Primary Production and is surrounded by Primary Production and RU2 Rural Landscape zonings. The land is generally used for extensive grazing.

McKanes Bridge is in the suburb of South Bowenfels, however McKanes Falls Road to the south of the Bridge crosses into the suburb of Hartley. There are two private property driveways located near the northernmost extent of the proposal footprint, and one at the southernmost extent of the proposal footprint (see Figure 3-1). There are seven rural residential properties within one kilometre of the proposal area.

Socio-economic

The proposal area falls in the suburbs of South Bowenfels and Hartley. The north of the proposal area and the bridge is in the south east corner of South Bowenfels, and the proposal area to the south of the bridge is in Hartley.

According to the latest census from the Australian Bureau of Statistics (ABS), the population in South Bowenfels in 2016 was 1162 people, with 507 of these people employed. The population of Hartley was 409 people with 204 people employed. Given the rural context of the area, the most common method of travel to work was by car as a driver (70 per cent in both suburbs).

Industry employment data from the 2016 census is shown in Table 6-10.

Table 6-10: Top employment in the suburbs of South Bowenfels and Hartley

Industry	Industry of employment, top responses (%)	
	South Bowenfels	Hartley
Coal mining	14.0	6.1
Local Government Administration	4.1	6.1
Hospitals (except Psychiatric Hospitals)	3.6	3.7

6.9.2 Potential impacts

Construction

Impacts on property and land use will occur from the commencement of construction. During construction, temporary impacts to property and land use will occur as a result of ancillary construction facilities, such as stockpile sites and site compounds, disruptions to power from the movement of the powerline and alterations to local roads and property accesses.

During the construction period, temporary site compounds are proposed to be placed on either side of the bridge. The northern site compound would be located on 495 McKanes Falls Road and the southern site

compounds will be placed on 539 McKanes Falls Road and on Crown land (Lot 1 DP 1093659) to the south west of the bridge.

As mentioned in Section 6.9.1, most employed people in both South Bowenfels and Hartley drive a vehicle to their place of work. Road users would be impacted by the need to utilise the proposal's construction detours via Jenolan Caves Road and the Great Western Highway at Hartley. Detours would be in place for the 12 month construction period and would add around five minutes to travel times.

Operation

Once operational, the upgraded bridge would be able to support heavier vehicles and improve local and regional freight movement. The bridge would also provide a safer and better connection for all road users, including the school bus service, pedestrians, and cyclists.

6.9.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	<p>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):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, stakeholders, emergency services and businesses including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Roads and Maritime	Detailed design / pre-construction	Standard Safeguard
Private Property access	Potentially affected residents will be consulted prior to any short-term obstruction of access. Works will be timed around requirements for access where feasible.	Roads and Maritime	Construction	Additional safeguard

Other safeguards and management measures that would address property, land use and socio-economic impacts are identified in Section 6.4.3.

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Air Quality	<p>A review of the NSW EPA PoEO Public register indicates that there are no licenced air quality emissions sources in or around the proposal area. The closest licenced source is the Austen Quarry which is located about 4.5 kilometres south east of the proposal. The Great Western Highway is about 3.5 kilometres north of McKanes Bridge.</p> <p>The proposal area is in open farm land, surrounded by agricultural and rural landscape. The closest residential receiver to the study area is about 150 metres to the west of the proposal area along McKanes Falls Road. There are six other residential properties within one kilometre of the proposal area. There are no childcare or healthcare facilities in the study area.</p>	<p>Potential construction impacts include:</p> <ul style="list-style-type: none"> • Particulates from activities such as grinding, sawing and welding. These activities will mainly occur during the dismantling of the existing bridge superstructure • Dust from earthworks and exposed earth surfaces. The extent of earthworks and soil stockpile requirements is comparatively small. Key earthworks include possible impacts due to scour repair work required at one of the abutments • Stockpiles may include stockpiles of earth as well as waste stockpiles during the bridge dismantling. Stockpiles may generate dust • Transportation of waste materials can result in dust impacts if loads are not covered. • There would be emissions from construction vehicle exhausts. <p>The proposal would be unlikely to affect the existing air environment in the operational phase.</p>
Contamination and hazardous materials	<p>A review of the NSW EPA Contaminated Lands Register and the List of contaminated sites notified to the EPA was conducted on 18 February 2019. Both searches did not identify any contaminated sites within the proposal area or in the immediate vicinity.</p>	<p>The construction plant and equipment and general construction work for the bridge would require the use of a variety of substances, such as hydrocarbon fuel, lubricants, solvents and paints.</p> <p>There is potential for accidental spills of these substances to occur and result in contamination impacts to terrestrial, aquatic and groundwater environments. The activities where there is potential for accidental spills to</p>

Environmental factor	Existing environment	Potential impacts
	<p>The bridge itself is part of an operational road corridor and is situated within primary production rural landscape. Older bridge structures, conduits and utilities may occasionally contain potentially hazardous materials. The existing bridge may contain limited quantities of lead-based paint on some of the original metal fittings, and the truss timber may have CCA (Copper-Chrome-Arsenate) treatment.</p>	<p>occur include, but are not limited to:</p> <ul style="list-style-type: none"> • Use of plant and equipment on temporary structural support system (suspended access scaffold) • Refuelling and maintenance of plant and equipment • The use of paints on the proposed upgraded sections of the bridge.
Waste	<p>Roads and Maritime is committed to ensuring responsible management of unavoidable waste and to promoting the reuse of such waste through appropriate measures in line with the resource management hierarchy principles embodied in the <i>Waste Avoidance and Resource Recovery Act 2001</i>.</p> <p>The resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> • Avoidance of unnecessary resource consumption • Resource recovery (including reuse, reprocessing, recycling and energy recovery) • Disposal. <p>No significant waste streams are produced by operation of the existing bridge.</p>	<p>Waste streams likely to be generated during construction include:</p> <ul style="list-style-type: none"> • Bridge materials from the existing bridge including timber and steel • Packaging and general waste from construction staff • Redundant sediment and erosion controls • Chemicals and oils remaining following construction activities <p>The largest quantities of waste likely to be generated would be the waste left over from the dismantling of the existing bridge superstructure. This would mainly be timber which would be recycled via a contractor of the Roads and Maritime Bridge Timber Recycling Panel Contract.</p> <p>The proposal is for the upgrade of an existing bridge superstructure. There is not expected to be any increase in operational waste as a result of the proposal.</p>

6.10.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	<p>Air Quality Management will be prepared and implemented as part of the CEMP. AQM will include, but not be limited to:</p> <ul style="list-style-type: none"> • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or 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. 	Roads and Maritime	Detailed design / pre-construction	Section 4.4 of QA G36 <i>Environment Protection</i>
Contamination and hazardous materials	<p>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 Roads and Maritime Environment Manager and/or EPA.</p>	Roads and Maritime	Detailed design / Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
Contamination and hazardous materials	<p>A site-specific emergency spill plan will be developed and include spill management measures in accordance with the Roads and Maritime <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 Roads and Maritime and EPA officers).</p>	Roads and Maritime	Detailed design/Pre-construction	
Contamination and hazardous materials	<p>The storage of chemicals and hazardous materials would be conducted in accordance with the relevant Material Safety Data Sheets (MSDS) and in accordance with requirements of the <i>Environmentally Hazardous Chemicals</i></p>	Roads and Maritime	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<i>Act 1985.</i>			
Waste	<p>Waste Management will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. <p>Waste Management will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Roads and Maritime	Detailed design / pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>

6.11 Cumulative impacts

There is a requirement under clause 228(2) of the EP&A Regulations to take into account any cumulative environmental impacts of the proposed works with other existing or planned future activities. Cumulative impacts have the potential to arise from the interaction of individual components within the proposed site and the effects of the proposal with other projects.

6.11.1 Study area

The proposal area is located in the suburb of South Bowenfels, on the western outskirts of Lithgow, in the western region of NSW. The proposal area is in a disturbed landscape, immediately surrounded by rural and agricultural lands. Lithgow central business district is located about 8 kilometres north of the proposal area and the towns of Katoomba and Bathurst about 30 kilometres south and 50 kilometres west respectively.

6.11.2 Broader program of work

The proposal is part of the Bridges for the Bush Program, which is a NSW Government commitment to improving road freight productivity in regional NSW by replacing or upgrading bridges at 17 key locations. The Bridges for the Bush Program includes two priority programs:

Program 1 – Higher Mass Limit (HML) bridge restrictions

- Replace or upgrade the next five high priority HML deficient bridges on State roads.

Program 2 – Heritage Timber Truss Bridges

- Replacement of six heritage timber truss bridges (to HML standard) and upgrade six heritage timber truss bridges to provide ongoing safe service levels.

The closest bridge in the Bridges for the Bush Program to McKanes Bridge, is Crookwell Bridge which is over 100 kilometres south of the proposal area. Works on this bridge were completed in 2015, therefore no other bridge works under this Program will impact on the proposal.

6.11.3 Other projects and developments

A search was carried out of Lithgow City Council Development Tracker website for Development Applications (DA)'s submitted between the months of October 2018 to February 2019. The search results show that there were no large DA's submitted to Lithgow City Council within this time frame that would be likely to interact with the proposal and result in cumulative impacts.

The Department of Planning, Industry and Environment's Major Project register was also searched on 20 February 2019. No major projects are located in close proximity to the proposal area. The closest major project was for an extension of Austen Quarry which is located about 4.5 kilometres south east of the proposal.

At the time of preparing this REF, there were no other known major developments near the proposal area.

6.11.4 Potential impacts

The extension of Austen Quarry included an increase in daily product dispatch. The modification was for an increase from a maximum of 200 trucks despatched daily to 300. The application was approved in August

2018. The haul route for the Quarry trucks is along the Great Western Highway and Jenolan Caves Road. During the removal and reconstruction of McKanes Bridge, traffic will be detoured to Jenolan Caves Road. This is expected to be about 600-700 vehicles per day. Construction vehicles for the proposal would also use this route, however half of these vehicles would continue along the Great Western Highway and down McKanes Falls Road to the north side of the bridge. There are expected to be around 20 construction vehicle movements per day on both sides of the bridge, with an even split of light vehicles and larger construction traffic.

A Traffic Management Plan (TMP) would be prepared and implemented as part of the CEMP to mitigate traffic impacts of the proposal. Given the length of time between the approval of the increase in trucks dispatched from Austen Quarry and the implementation of the traffic detour, there is unlikely to be a cumulative traffic impact with Austen Quarry during the construction period of the proposal.

6.11.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts	The CEMP would be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Project manager	Construction	Additional safeguard

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the 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 also listed.

7.1 Environmental management plans (or system)

A number of 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 CEMP would be prepared to describe the safeguards and management measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP would be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Western, prior to the commencement of any on-site works. The CEMP would 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 the QA Specification G36 – *Environmental Protection (Management System)*.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would 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 would 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	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • 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. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN1
GEN2	General -	All businesses, residential properties and other key stakeholders (eg local	Roads and	Pre-construction	Core standard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	notification	councils) likely to be affected by the activity will be notified at least five days prior to commencement of the activity.	Maritime project manager		safeguard GEN2
GEN3	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • The heritage importance of McKanes Bridge • Adjoining residential areas requiring particular noise management measures • Incident management plan and notification requirements • Location of spill kits and use of spill kits • Fire prevention. 	Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN3
GEN4	Community consultation	All complaints will be recorded on a complaints register and attended to promptly.	RMS project manager	Construction	Core standard safeguard GEN4
GEN5	General – minimise environmental impacts during construction	<p>Works and ancillary area will be clearly delineated and marked.</p> <p>Parking of vehicles and storage of plant/equipment is to occur on site compounds. Where this is not possible, vehicles and plant/equipment will be kept away from environmentally sensitive areas and outside the dripline of trees.</p>	Roads and Maritime	Construction	Additional safeguard
GEN6	General – fire safety	<p>A Fire Management Plan will be prepared in accordance with the <i>Rural Fires Act 1997</i> and implemented as part of the CEMP. It will be guided by the NSW Rural Fire Service publication 'Equipment and Machinery Use in Bushfire Prone Areas', and include, but not limited to:</p> <ul style="list-style-type: none"> • Plans showing evacuation methods and routes • Local fire brigade and other emergency services contacts • Location of appropriate fire fighting equipment on site and in vehicles 	Roads and Maritime	Construction	Section 4.5 of QA G36 <i>Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> High fire danger periods and all plant and equipment that require spark arresters List of activities, including cutting, welding or grinding, that must not be undertaken when a total fire ban is proclaimed 			
F1	Biodiversity	<p>Flora and Fauna Management aspects will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013) Protocols to manage weeds and pathogens. 	Roads and Maritime	Detailed design / pre-construction	Section 4.8 of QA G36 <i>Environment Protection</i>
F2	Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
F3	Biodiversity	All pruning and trimming of trees is to be in accordance with the <i>Australian Standard 4373-2007 Pruning of amenity trees</i> . Pruning of mature trees is to be undertaken by a qualified arborist.	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
F4	Biodiversity – tree protection	Tree protection fencing will be established around the perimeter of any tree requiring a protection zone. If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with <i>AS 4970-2009 - Protection of trees on development sites</i> . Existing fencing and site hoarding may be used as tree protection fencing.	Roads and Maritime	Detailed design / pre-construction	Standard safeguard B11

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
F5	Biodiversity – Fauna handling	Fauna will be managed in accordance with <i>Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RMS projects</i> (RTA 2011).	Roads and Maritime	Construction	Additional safeguard
F6	Biodiversity – unexpected finds	If unexpected threatened flora or fauna are discovered, works would stop immediately and the <i>RMS Unexpected Threatened Species Find Procedure</i> in the <i>RMS Biodiversity Guideline 2011</i> implemented.	Roads and Maritime	Construction	Standard safeguard B8
F7	Biodiversity	No unnecessary materials or equipment should be stored in the area adjacent to the northern abutment to maintain ground level access for wombats to the eastern side of the bridge.	Roads and Maritime	Construction	Additional safeguard
F8	Biodiversity	Compensatory planting should be implemented to account for mature trees removed as part of the project.	Roads and Maritime	Post-construction	Additional safeguard
F9	Biodiversity	Night time lighting should be minimised to prevent disruption to microbat flyways and foraging along the river	Roads and Maritime	Construction	Additional safeguard
W1	Surface water	A CEMP will be prepared and implemented. The CEMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution including an incident management plan and describe how these risks will be addressed during construction in accordance with <i>Managing Urban Stormwater: Soils and Construction Vol 1 and 2A Installation of services</i> (the Blue Book) (Landcom 2004, DECC and Water NSW 2008).	Roads and Maritime	Detailed design / pre-construction	Section 2.1 of QA G38 <i>Soil and Water Management</i>
W2	Surface water	A site-specific Erosion and Sediment Control Plan/s will be prepared by a qualified and experienced Soil Conservationist 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.	Roads and Maritime	Detailed design / Pre-construction	Section 2.2 of QA G38 <i>Soil and Water Management</i>
W3	Surface water	An EWMS will be developed to manage potential spills for all plant and equipment working over the Cocks River, with a capacity to hold more than	Roads and	Construction	Additional

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>20 litres of a single type of fuel, lubricant or hydraulic fluid.</p> <p>An emergency spill kit is to be kept on site at all times and maintained throughout the construction work.</p> <p>The spill kit must be appropriately sized for the volume of substances at the work site.</p> <p>The spill kit must be readily accessible at the work area(s) and in site compounds.</p> <p>All workers will be advised of the locations of spill kits and trained in their use.</p>	Maritime		safeguard
W4	Surface water	Water for construction activities will be managed within sustainable limits of the area and catchment. It may be necessary to reduce or limit some construction activities if water supply is heavily constrained. The Regional (Program) Environmental Manager will be consulted for direction, if water supply is impacted.	Roads and Maritime	Construction	Additional safeguard
W5	Surface water	Emergency contacts will be kept in an easily accessible location on vehicles, plant and site office. All workers will be advised of these contact details and procedures.	Roads and Maritime	Construction	Additional safeguard
W6	Flooding	Any changes in bridge design of a structural nature are to be investigated for potential changes to flood characteristics. This includes changes to upstream and downstream water levels, velocities and direction	Roads and Maritime Project Manager	Detailed design	Additional safeguard
E1	Soil	Site-specific Erosion and Sediment Control Plan(s) will be prepared and implemented as part of the CEMP. Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Roads and Maritime	Construction	Standard safeguard EIA-P05-G01-T02
E2	Soil	Erosion and sediment control measures are not to be removed until the	Roads and	Construction	Standard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		work is complete, and areas are stabilised.	Maritime		safeguard EIA-P05-G01-T02
E3	Soil	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Roads and Maritime	Construction	Standard safeguard EIA-P05-G01-T02
T1	Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (Roads and Maritime, 2018) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2018). The TMP will include:</p> <ul style="list-style-type: none"> • 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 • requirements and methods to consult and inform the local community of impacts on the local road network • a response plan for any construction traffic incident • 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. 	Roads and Maritime	Detailed design / Pre-construction	TCaWS Manual, QA Spec G10
T2	Traffic and transport	A Road Occupancy Licence would be required for all work impacting on traffic flows, including closures, prior to that work commencing.	Roads and Maritime, Lithgow City Council	Preconstruction	Additional safeguard
T3	Traffic and transport	Transport companies, emergency services and any bus companies will be notified of the proposed impact due to partial road closure 14 days prior to	Roads and Maritime	Pre/construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		works commencing.			
N1	Noise and vibration	<p>Noise and Vibration Management will be prepared and implemented as part of the CEMP and generally follow the approach in the Interim <i>Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented • 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. 	Roads and Maritime	Detailed design / pre-construction	Section 4.6 of QA G36 <i>Environment Protection</i>
N2	Noise and vibration	<p>All sensitive receivers likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. To ensure consistent communication with affected receivers, it is recommended to notify receivers R1 to R8 (as identified within Figure 6-3) of the proposed work. The notification will provide details of:</p> <ul style="list-style-type: none"> • the project • construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information. 	Roads and Maritime	Detailed design / pre-construction	Additional safeguard
N3	Noise and vibration	<p>Works will be carried out during normal work hours (ie 7am to 6pm Monday to Friday; 7am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts.</p>	Roads and Maritime	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
H1	Non-Aboriginal heritage	<p><i>The Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>	Roads and Maritime	Detailed design / pre-construction	Section 4.10 of QA G36 <i>Environment Protection</i>
H2	Non-Aboriginal heritage	<p>An Archival recording will be implemented including 3D mapping (laser scanning) prior to works commencing on the bridge.</p> <p>Examples of metal components in good condition will be retained for detailed inspection, testing and analysis.</p>	Roads and Maritime	Pre-construction	Additional safeguard
B1	Aboriginal heritage	<p><i>The Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 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 Roads and Maritime 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.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>	Roads and Maritime	Detailed design / pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>
V1	Landscape character and visual impact	Landscaping is to be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2008</i> .	Roads and Maritime	Construction	Additional safeguard
V2	Landscape character and visual impacts	Works to be carried out in accordance with EIA-N04 <i>Guideline for Landscape Character and visual impact assessment</i> .	Roads and Maritime	Construction	Additional safeguard
S1	Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of	Roads and	Detailed design /	Standard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, stakeholders, emergency services and businesses including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Maritime	pre-construction	Safeguard
S2	Private Property access	Potentially affected residents will be consulted prior to any short-term obstruction of access. Works will be timed around requirements for access where feasible.	Roads and Maritime	Construction	Additional safeguard
A1	Air quality	<p>Air Quality Management will be prepared and implemented as part of the CEMP. AQM will include, but not be limited to:</p> <ul style="list-style-type: none"> potential sources of air pollution air quality management objectives consistent with any relevant published EPA and/or 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. 	Roads and Maritime	Detailed design / pre-construction	Section 4.4 of QA G36 <i>Environment Protection</i>
C1	Contamination and hazardous materials	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 Roads and Maritime Environment Manager and/or EPA.	Roads and Maritime	Detailed design / Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
C2	Contamination and hazardous materials	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the <i>Roads and Maritime 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 Roads and Maritime and EPA officers).	Roads and Maritime	Detailed design/Pre-construction	
C3	Contamination and hazardous materials	The storage of chemicals and hazardous materials would be conducted in accordance with the relevant Material Safety Data Sheets (MSDS) and in accordance with requirements of the <i>Environmentally Hazardous Chemicals Act 1985</i> .	Roads and Maritime	Construction	
M1	Waste	<p>Waste Management will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. <p>Waste Management will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Roads and Maritime	Detailed design / pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
I1	Cumulative impacts	The CEMP would be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Project manager	Construction	Additional safeguard

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Heritage Act 1977</i> (s60)	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.	Prior to start of the activity.
<i>Heritage Act 1977</i> (s57)	Exemption notification for restoration to an item on the State Heritage Register from the Director OEH.	Prior to start of the activity.
<i>Roads Act 1993</i> (s138)	Approval under Section 138 of the <i>Roads Act 1993</i> from the appropriate road authority prior to works on roads or closure of lanes.	Prior to start of the activity.

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 Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

8.1 Justification

This REF has assessed the potential social, biophysical and economic impacts of the proposal, as well as the public interest. The proposed upgrade of McKanes Bridge would result in a number of environmental impacts including:

- Loss of non-Aboriginal heritage value
- The removal of several mature trees
- Detour of traffic and increased travel times during construction due to the road closure
- Altered visual amenity of the proposal area during construction
- Water quality risks to Coxs River during construction.

The proposal is consistent with multiple NSW and Australian strategic documents and would support improved freight productivity in the western region of NSW. This REF has concluded that the adverse impacts of the proposal would be outweighed by the long-term beneficial impacts of improved GML vehicle access, increased structural capacity and improved safety for all road users. Therefore, the proposal is considered justified.

8.1.1 Social factors

Social and economic factors have been assessed in Section 6.9 of this REF. The construction works would generally be carried out within the existing road corridor and private property access would be maintained at all times. The temporary construction compound sites would be situated on grassed or previously-disturbed hardstand areas on either side of the bridge and would be contained within secure site fencing.

The proposal would have a long-term, positive effect for the local community through the provision of overall safety benefits for all road users, including cyclist safety. This would be achieved through the new timber deck sheeting proposed which would eliminate the risk of bicycle wheels becoming stuck between gaps in the current timber plank type deck sheeting. This has occurred at McKanes Bridge in the past, resulting in a cyclist being thrown from their bicycle and sustaining serious injuries.

8.1.2 Biophysical factors

Potential environmental impacts as a result of the proposal are described throughout Section 6 of this REF. There is likely to be a minor biophysical impact from the loss of native vegetation and temporary impacts to amenity including water quality, noise and vibration and visual impacts. These impacts are not considered to be significant and would be manageable with the application of the safeguards and management measures as summarised in Section 7.

8.1.3 Economic factors

Roads and Maritime carried out value management exercises as part of the identification of the preferred option. The value management exercises concluded that upgrading the bridge was a more economically viable option than replacing the existing bridge or continuing frequent maintenance. The proposal provides the greatest value and reduces maintenance costs in the long-term.

8.1.4 Public interest

During construction, the public would be likely to experience the following:

- Minor traffic detour (refer to Section 6.4)
- Noise and vibration impacts (refer Section 6.5)
- Visual impacts (refer to Section 6.8).

The duration of these impacts would be limited to the construction period only.

The existing bridge is of State heritage significance and listed under the Roads and Maritime s170 heritage register. Although the bridge would lose some heritage significance through the upgrade, the proposal would provide a benefit and be in the public interest, as it would improve road safety and improve access for local and regional transport. The proposal would ensure that the bridge can continue to be used as a vehicle crossing into the future, thus preserving the heritage value of the structure.

8.2 Objects of the EP&A Act

The consistency of the proposal with the objects of the EP&A Act is provided below.

Object	Comment
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.	<p>The upgrade of the bridge would improve the safety of road users, including cyclists and would provide access for vehicles up to GML standard which would benefit the regional economy.</p> <p>The proposal is consistent with this object.</p>
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is discussed further in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	<p>The proposed upgrade would be constructed on the same alignment as the existing bridge and would not change the land use at the proposal area. Upgrading the existing structure would reduce the long-term maintenance costs associated with the current bridge. The structural upgrade of the bridge would cater for GML vehicles which would increase the efficiency of local and regional freight transport.</p> <p>The proposal is consistent with this object.</p>
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.	<p>The proposal is consistent with this object, as discussed in Section 6.6. The proposal would require clearing of regrowth vegetation and a small number of mature trees. Potential impacts to aquatic biodiversity may occur as a result of construction works, however management measures would be implemented to minimise these impacts. The proposal is not likely to have a significant impact on threatened species, populations or ecological communities or their habitats.</p>
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	An Aboriginal cultural heritage assessment was carried out in accordance with Stage 1 of the Roads and Maritime PACHCI procedure. A Stage 1 PACHCI clearance letter is provided in Appendix G.
1.3(g) To promote good design and amenity of the built environment.	The proposal has been designed in accordance with relevant structural and civil guidelines and is anticipated to improve road safety.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of	Not relevant to the project.

Object	Comment
the health and safety of their occupants.	
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.	Roads and Maritime has carried out community participation throughout the development of the proposal. Consultation would continue throughout the development of the proposal and into the construction period.

8.2.1 The precautionary principle

The precautionary principle states that “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.”

The proposal does not pose a threat of serious or irreversible damage to the environment. The potential impacts described in the REF have been predicted with a reasonable level of scientific certainty. Mitigation and management measures have been proposed based on previous experience with similar projects.

A CEMP would be prepared prior to the construction period commencing which would include specific mitigation measures to reduce environmental impacts.

8.2.2 Intergenerational equity

The intergenerational equity principle states, “the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”. The principle includes both intragenerational equity (within generations) and intergenerational equity (between generations).

The short and long term impacts of the proposed intersection upgrade have been considered and addressed through the development of the concept design and REF and on-balance would benefit both current and future generations.

8.2.3 Conservation of biological diversity and ecological integrity

This principle states that the, “diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival”.

Database searches at both the State and federal level were carried out to determine biodiversity values of the proposal area. Impacts to biodiversity and the overall ecosystem would generally be minor and limited to the construction period. Mitigation measures have been prescribed to reduce impacts to the biodiversity values, both terrestrial and aquatic.

The proposal would have a limited impact on the flora and fauna and would not compromise the biological diversity or ecological integrity of the proposed area.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires that, “costs to the environment should be factored into the economic costs of a project.”

The proposal reflects the natural, social and economic values of the locality. This REF has examined the environmental consequences of the proposal and identified mitigation measures and safeguards to address potential adverse impacts. The value of environmental safeguards implementation was not able to be determined at the time this REF was prepared.

8.3 Conclusion

The proposed upgrade of McKanes Bridge at South Bowenfels 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 NP&W 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 federal 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 noise and traffic impacts and impacts on non-Aboriginal heritage. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve safety for road users, include safety benefits for cyclists, improve access for GML vehicles and reduce on-going maintenance costs associated with the current structure of the bridge. On balance the proposal is considered justified.

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 and 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 or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment and Energy 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.



Simon Murphy

Principal Environmental Planner

AECOM Australia Pty Ltd

Date: 08/10/2019

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.



Tim Stone

Project Manager,

Western Bridges

Date: 08/10/2019

10. References

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Terms and acronyms used in this REF

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
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
EPA	Environmental Protection Authority
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.
FBE	Focus Bridge Engineering
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GDE	Groundwater Dependent Ecosystem
GML	General Mass Limits
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
HML	Higher Mass Limits
INCG	Interim Construction Noise Guideline
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
NCA	Noise catchment area
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PoEO	Protection of the Environment Operations Act

Term / Acronym	Description
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SLT	Stress-laminated timber
SoHI	Statement of Heritage Impact
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a) Any environmental impact on a community?</p> <p>The proposal would result in short-term minor impacts to the local community as a result of noise and traffic detours and disruptions.</p> <p>The proposal involves the upgrade of McKanes Bridge, which is of State heritage significance. As discussed in Section 6.6, the SoHI identified that the bridge is one of only four remaining McDonald Truss bridges in NSW. The upgrade will be based on the original design in appearance with subtle changes to strengthening details. Mitigation measures would be implemented including archival recording and modelling of the bridge prior to work commencing and retaining potentially original metal components of the bridge to be displayed in a Roads and Maritime moveable heritage collection.</p> <p>The proposal would improve safety for motorists and cyclists, through upgraded load capacity and the upgrade and strengthening of the existing bridge structure.</p>	<p>Short-term Minor Negative</p> <p>Long-term Minor Negative</p> <p>Long-term Moderate Positive</p>
<p>b) Any transformation of a locality?</p> <p>The proposal would involve the dismantling of the existing McKanes Bridge and construction of the new bridge superstructure within the existing alignment. The bridge would be based broadly on the original design in appearance but with a subtle change to strengthening detail.</p> <p>There would be no change to the use of open spaces and waterways which would continue to operate in the same way. The proposed changes to the existing crossing would enhance the road network, increase the bridge capacity and create a safer crossing for all vehicles.</p>	<p>Long-term Minor Negative</p> <p>Long-term Minor Positive</p>
<p>c) Any environmental impact on the ecosystems of the locality?</p> <p>The terrestrial and aquatic habitat values are considered to be limited. The local ecosystems are degraded.</p> <p>The proposal will require the removal of several mature trees for the relocation of a powerline. The proposal has potential for temporary environmental impact on aquatic biodiversity during construction works as a result of potential increased erosion and sedimentation and chemical or fuel spills during construction. These risks would be minimised by implementing the safeguards listed in Section 7.2.</p>	<p>Short-term Minor Negative</p>
<p>d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>During construction works, the proposal would result in short-term reduction to the aesthetic quality of the locality as a result of visual impacts and traffic detours. These impacts would be minimised through the implementation of the safeguards listed in Section 7.2.</p>	<p>Short-term Minor Negative</p>

Factor	Impact
<p>e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The proposal involves the upgrade of McKanes Bridge, which is of State heritage significance. As discussed in Section 6.6, the SoHI identified that the bridge is one of only four remaining McDonald Truss bridges NSW. The upgrade will be based on the original design in appearance with subtle changes to strengthening details. Mitigation measures would be implemented including archival recording and modelling of the bridge prior to work commencing and retaining potentially original metal components of the bridge to be displayed in a Roads and Maritime moveable heritage collection.</p> <p>There are no known sites of Aboriginal significance recorded within the study area and the Stage 1 PACHCI assessment concluded that the proposal is unlikely to harm an Aboriginal object of place of cultural heritage significance.</p>	<p>Long-term Minor Negative</p>
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The terrestrial and aquatic habitat values in the proposal area are considered to be limited. The proposal will require the removal of several mature trees for the relocation of a powerline.</p> <p>The proposal has potential for temporary environmental impact on aquatic biodiversity during construction works as a result of potential increased erosion and sedimentation and chemical or fuel spills during construction. The proposal is unlikely to have a significant impact on threatened species, populations or ecological communities and their habitats. Potential impacts to the habitat of protected fauna would be minimised by implementing the safeguards list in Section 7.2.</p>	<p>Short-term Minor Negative</p>
<p>g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposal would not endanger a species of animal, plant or other form of life. The aquatic and terrestrial habitat values of the proposal area are limited. The construction work has the potential to temporarily impact on aquatic biodiversity as a result of increased erosion and sedimentation and chemical or fuel spills.</p> <p>The proposal is unlikely to have a significant impact on threatened species, populations or ecological communities and their habitats. Potential impacts to the habitat or protected fauna would be minimised by implementing the safeguards listed in Section 7.2.</p>	<p>Short-term Minor Negative</p>
<p>h) Any long-term effects on the environment?</p> <p>The proposal would impact on an item of State heritage significance and would therefore change the heritage significance and aesthetic value of the proposal area. The new bridge would have different structural elements to the existing structure, yet its overall built form would be similar to the existing design.</p> <p>The proposal would improve safety for motorists and cyclists, through upgraded load capacity and the upgrade and strengthening of the existing bridge structure.</p>	<p>Long-term Minor Negative</p> <p>Long-term Moderate Positive</p>

Factor	Impact
<p>i) Any degradation of the quality of the environment?</p> <p>Water quality may be temporarily impacted during the proposal as a result of erosion and sedimentation, increased turbidity, and potential fuel or chemical spills during construction. Safeguards and management measures listed in Section 7.2 would be implemented to minimise these impacts.</p>	<p>Short-term Minor Negative</p>
<p>j) Any risk to the safety of the environment?</p> <p>The proposal would improve safety for motorists and cyclists, through upgraded load capacity and the upgrade and strengthening of the existing bridge structure.</p>	<p>Long-term Moderate Positive</p>
<p>k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposal would result in short-term impacts to traffic as a result of the traffic detour as a result of the bridge closure. This would be mitigated through the implementation of safeguards listed in Section 7.2.</p> <p>In the long-term, there would be no change to the use of open spaces and waterways which would continue to operate in the same way.</p>	<p>Short-term Minor Negative</p> <p>Nil</p>
<p>l) Any pollution of the environment?</p> <p>Water quality may be impacted during the proposal as a result of erosion and sedimentation, increased turbidity and potential fuel or chemical spills. Safeguards and management measures listed in Section 7.2 would be implemented to minimise these impacts.</p>	<p>Short-term Minor Negative</p>
<p>m) Any environmental problems associated with the disposal of waste?</p> <p>The largest quantities of waste from the proposal would be generated during the dismantling of the existing bridge. This waste would consist primarily of metal and timber components and would be recycled where possible. Waste materials would be classified in accordance with the EPA's Waste Classification Guidelines.</p>	<p>Nil</p>
<p>n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>Truss timber is a scarce resource with a long procurement time, often taking years to be suitable. The impact of using this resource is mitigated through the long-term durability of truss timber and the time in service it will have as a bridge. The timber will also eventually be recycled once it is no longer suitable for the bridge.</p>	<p>Short-term Minor Negative</p>
<p>o) Any cumulative environmental effect with other existing or likely future activities?</p> <p>There are no other activities known to occur concurrently with the proposed work. Given the minor nature of the work and the isolated nature of the site, the proposal is unlikely to have a cumulative environmental impact.</p>	<p>Nil</p>
<p>p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The proposal is not located within a coastal area and would not impact on coastal processes and coastal hazards.</p>	<p>Nil</p>

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, 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 Government Department of the Environment and Energy.

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
<p>a) Any impact on a World Heritage property?</p> <p>No impact. There are no World Heritage properties in the study area.</p>	Nil
<p>b) Any impact on a National Heritage place?</p> <p>No impact. There are no National Heritage places in the study area.</p>	Nil
<p>c) Any impact on a wetland of international importance?</p> <p>No impact. There are no wetlands of international importance in the study area.</p>	Nil
<p>d) Any impact on a listed threatened species or communities?</p> <p>An EPBC Protected Matters search identified 32 listed threatened species and three listed threatened ecological communities with potential to occur within 5km of the proposal area. The biodiversity assessment concluded that the proposal is unlikely to have a significant impact to listed threatened species, populations or ecological communities.</p>	Nil
<p>e) Any impacts on listed migratory species?</p> <p>An EPBC Protected Matters search identified 13 listed migratory species with potential to occur within 5km of the study area. The biodiversity assessment concluded that the proposal is unlikely to have a significant impact to listed migratory species.</p>	Nil
<p>f) Any impact on a Commonwealth marine area?</p> <p>No impact. There are no Commonwealth marine areas in the study area.</p>	Nil
<p>g) Does the proposal involve a nuclear action (including uranium mining)?</p> <p>No impact. The proposal does not involve a nuclear action.</p>	Nil
<p>h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land?</p> <p>No impact. There are no Commonwealth lands in the study area.</p>	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Lithgow City Council and the occupiers of adjoining land	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	Lithgow City Council and the occupiers of adjoining land	ISEPP cl. 95A
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	Lithgow City Council and the occupiers of adjoining land	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes / No / NA	If 'yes' consult with	ISEPP clause
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	Lithgow City Council	ISEPP cl. 15A

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No	Lithgow City Council	ISEPP cl.13(1)(a)
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	Lithgow City Council	ISEPP cl.13(1)(b)
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	Lithgow City Council	ISEPP cl.13(1)(c)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water?	No	Lithgow City Council	ISEPP cl.13(1)(d)
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 – access to Coxs River will be altered during the construction period. This is not considered to be more than minor or inconsequential	Lithgow City Council	ISEPP cl.13(1)(e)
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	Lithgow City Council	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
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 <i>minor</i> or <i>inconsequential</i> ?	No – however consultation occurred to advise them of the proposed works on a State heritage item.	Lithgow City Council	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
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 – however consultation occurred to advise them of the proposed works in potentially flood liable land.	Lithgow City Council	ISEPP cl.15
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 – however consultation occurred to advise them of the proposed works in potentially flood	State Emergency Services Email: erm@ses.nsw	ISEPP cl.15AA

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
		liable land.	w.gov.au	

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

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
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	Office of Environment and Heritage	ISEPP cl.16(2)(a)
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	Office of Environment and Heritage	ISEPP cl. 16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the <i>Marine Estate Management Act 2014</i> ?	No	Department of Industry	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	No	Sydney Harbour Foreshore Authority	ISEPP cl.16(2)(d)
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?	No	Rural Fire Service	ISEPP cl.16(2)(f)
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? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
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	ISEPP cl. 16(2)(i)

Appendix C

Neutral or beneficial effect on water quality assessment

Neutral or Beneficial Effect Assessment

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 relates to the use of land within the Sydney drinking water catchment. In accordance with clause 12 of the SEPP, Roads and Maritime is required to consider whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity.

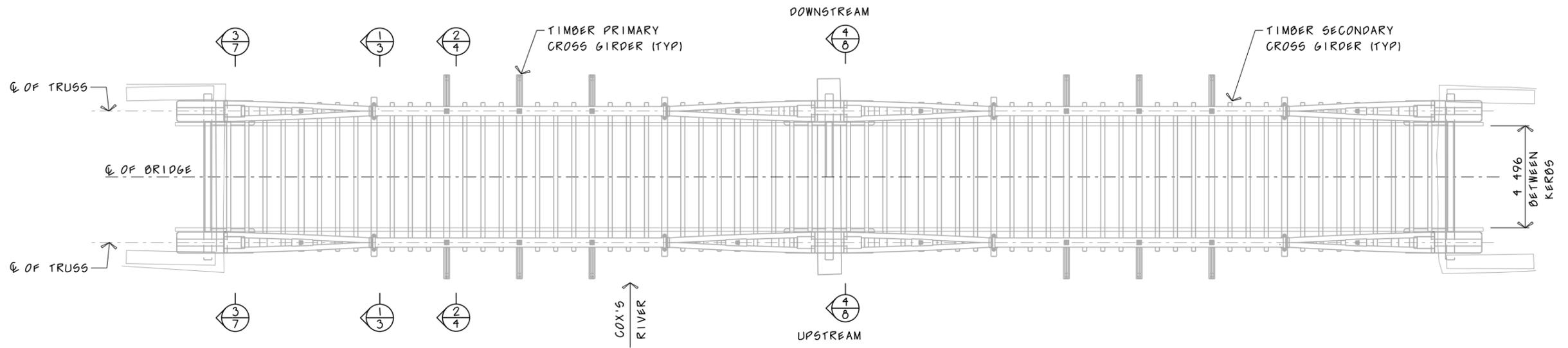
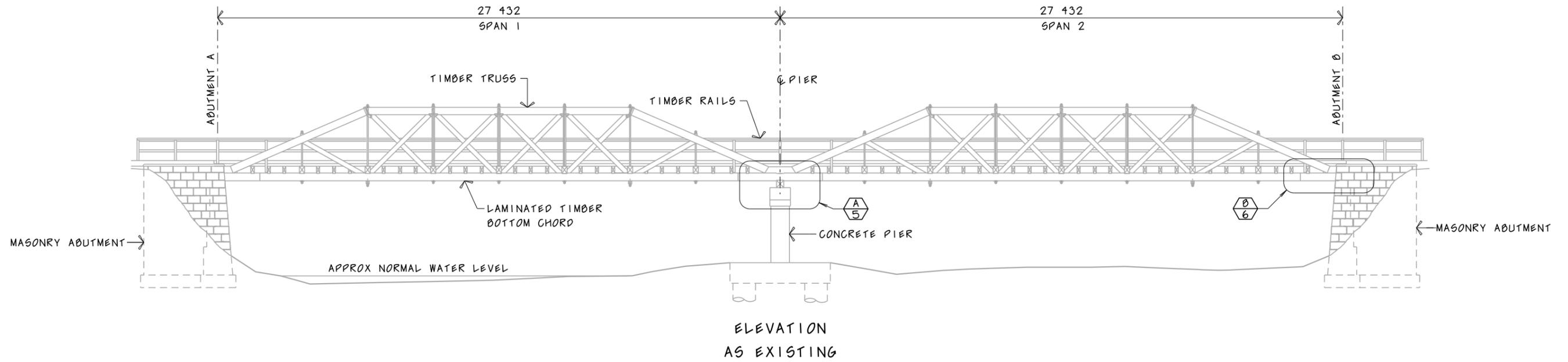
Factor	Impact
<p>1. Are there any identifiable potential impacts on water quality?</p> <p>What pollutants are likely?</p> <p>During construction and/or post construction?</p>	<p>Impacts on water quality are possible from the construction and operation of the proposal.</p> <p>Impacts on water quality and likely pollutants during construction and during operation are identified in Section 6.2.2.</p> <p>Major potential pollutants: sediments (fine and coarse), hazardous chemicals and contaminants (eg hydrocarbon fuel, lubricants, solvents and paints).</p> <p>Impacts on water quality are more likely during construction.</p>
<p>2. For each pollutant, list the safeguards needed to prevent or mitigate potential impacts on water quality (these may be Water NSW endorsed current recommended practices and/or equally effective other practices)</p>	<p>Mitigation measures for the construction impacts and operation impacts are identified in Section 6.2.3.</p> <p>The construction phase mitigation measures are based on the <i>Managing Urban Stormwater: Soils and Construction Vol 1 and 2A Installation of services</i> (the Blue Book) (Landcom 2004, DECC and Water NSW 2008) and which are endorsed by Water NSW as 'current recommended practice' (CRP).</p>
<p>3. Will the safeguards be adequate for the time required? How will they need to be maintained?</p>	<p>Construction phase controls would be designed for an anticipated duration of 12 months, using the Blue Book (Landcom 2004) and <i>Managing Urban Stormwater: Soils and Construction Vol 2A Installation of services</i> (DECC and Water NSW 2008) guidelines. Maintenance of construction phase controls detailed in ESCP.</p>
<p>4. Will all impacts on water quality be effectively contained on the site by the identified safeguards (above) and not reach any watercourse, waterbody or drainage depression?</p> <p>Or will impacts on water quality be transferred outside the site for treatment? How? Why?</p>	<p>All potential impacts as a result of both construction and operation of the proposal would be effectively contained on site by the identified safeguards. No discharge to the surrounding environment or receiving water bodies is anticipated.</p>
<p>5. Is it likely that a neutral or beneficial effect on water quality will occur? Why?</p>	<p>From the qualitative assessment undertaken, the proposal is likely to have a neutral effect on the water quality. Refer to Section 6.2.</p>

Appendix D

Concept Design

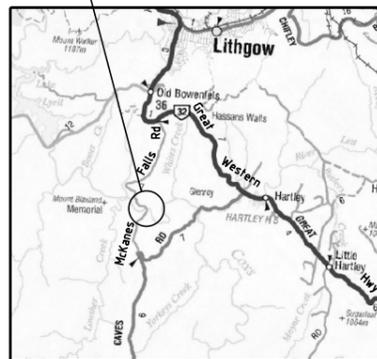
FROM SOUTH BOWENFELS

TO JENOLAN GAVES ROAD



DECK NOT SHOWN FOR CLARITY

BRIDGE SITE



LOCALITY PLAN

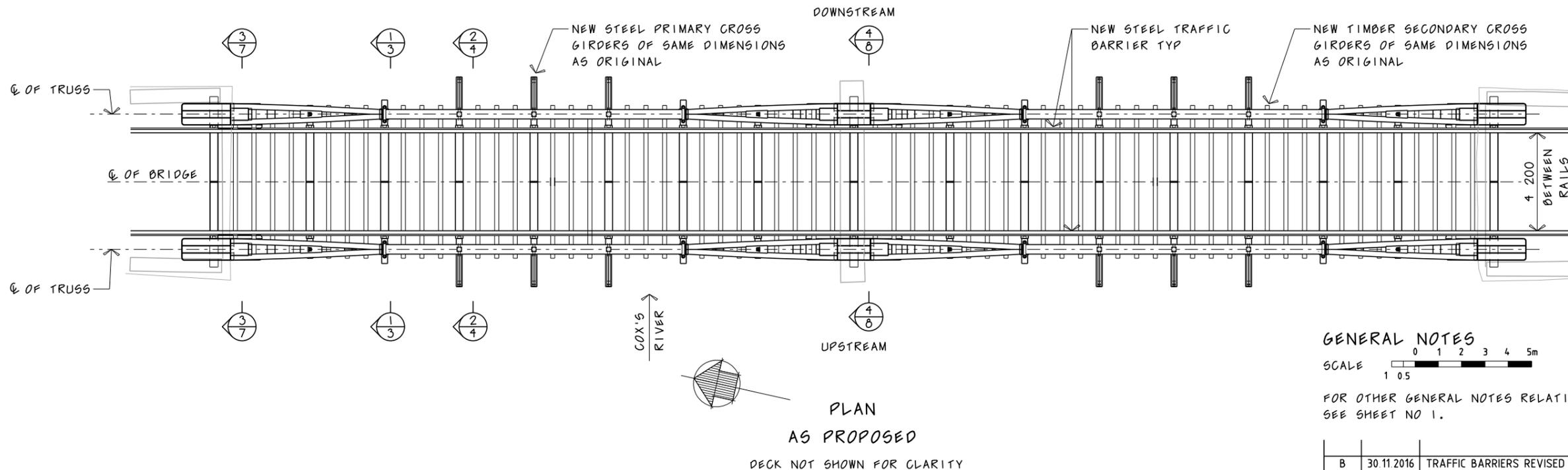
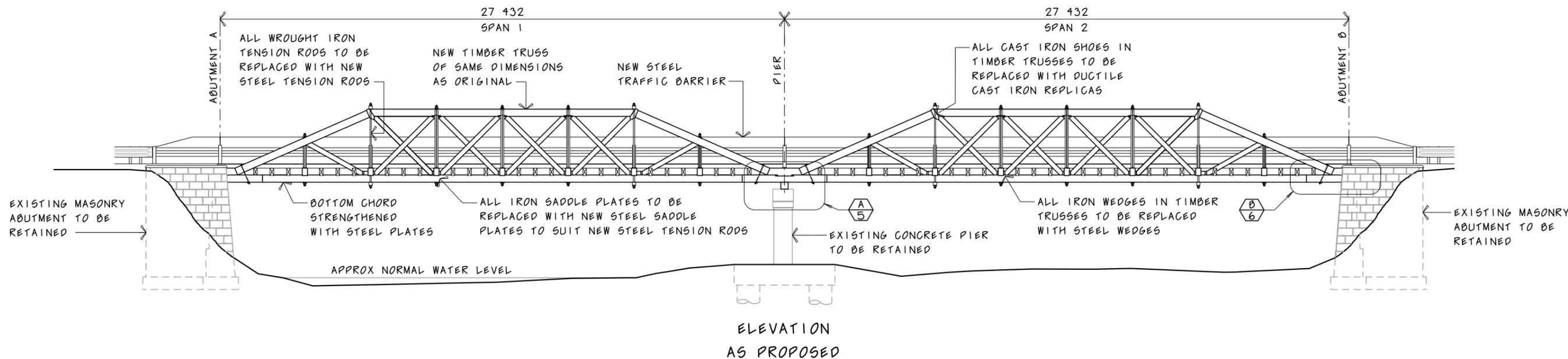
THE BRIDGE SITE IS APPROXIMATELY 131KM BY ROAD FROM SYDNEY

GENERAL NOTES



DIMENSIONS ARE IN MILLIMETRES.
 ALL EXISTING DIMENSIONS ARE BASED ON ORIGINAL DRAWINGS.
 NUMBER OF PLAN 000 258 BC 0127.
 TYP DENOTES ALL SUCH COMPONENTS IN ALL LOCATIONS.
 UC DENOTES UNIVERSAL COLUMN.
 SHS DENOTES SQUARE HOLLOW SECTION.
 SLT DENOTES STRESS LAMINATED TIMBER.

ISSUE	DATE	REVISION	PREP	CHECK	AUTH
LOCAL ROAD			CITY OF LITHGOW		
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT					
GENERAL ARRANGEMENT - SHEET A					
		Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023	
PREPARED DESIGN <u>A NICHOLAS</u>		CHECKED <u>S SUN</u>		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414	
DRAWING <u>JK</u>		<u>A NICHOLAS</u>		SKETCH No KA872HCS	
<u>S DESHPANDE</u> BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No 1 OF 8		ISSUE A	



GENERAL NOTES



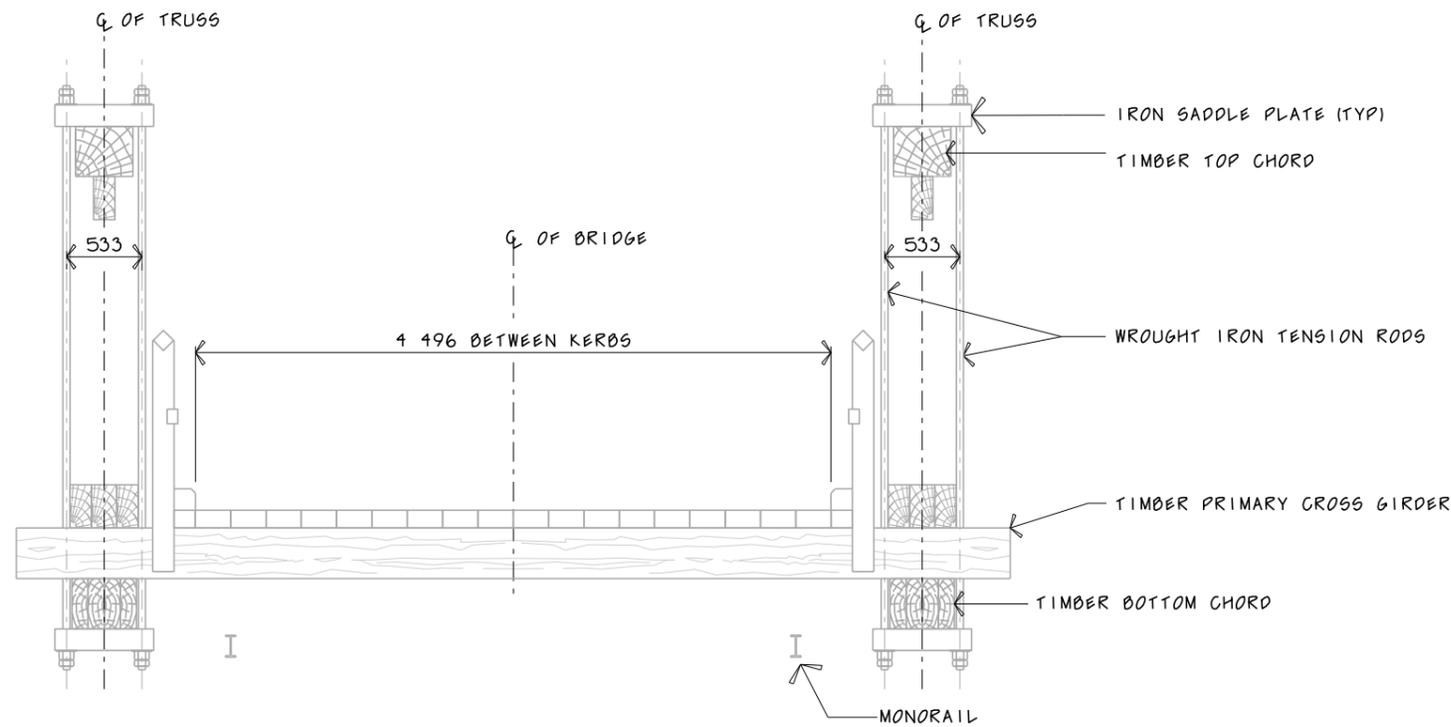
FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

B	30.11.2016	TRAFFIC BARRIERS REVISED	JP	
ISSUE	DATE	REVISION	PREP	CHECK AUTH
LOCAL ROAD			CITY OF LITHGOW	
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT GENERAL ARRANGEMENT - SHEET B				
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023 CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
		PREPARED DESIGN A NICHOLAS DRAWING JK	CHECKED S SUN A NICHOLAS	SKETCH No KA872HCS BRIDGE NUMBER B1302 ISSUE STATUS: HERITAGE REVIEW SHEET No 2 OF 8 ISSUE B
S DESHPANDE BRIDGE ENGINEER (REHABILITATION DESIGN)		CAD No KA872GAB_2_B.dgn		

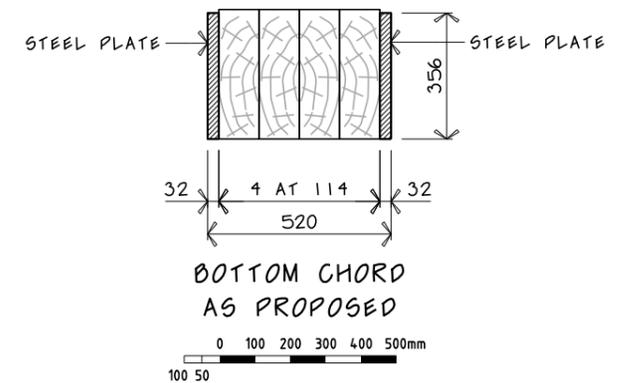
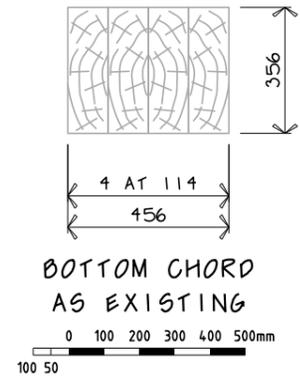
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UPSTREAM

DOWNSTREAM

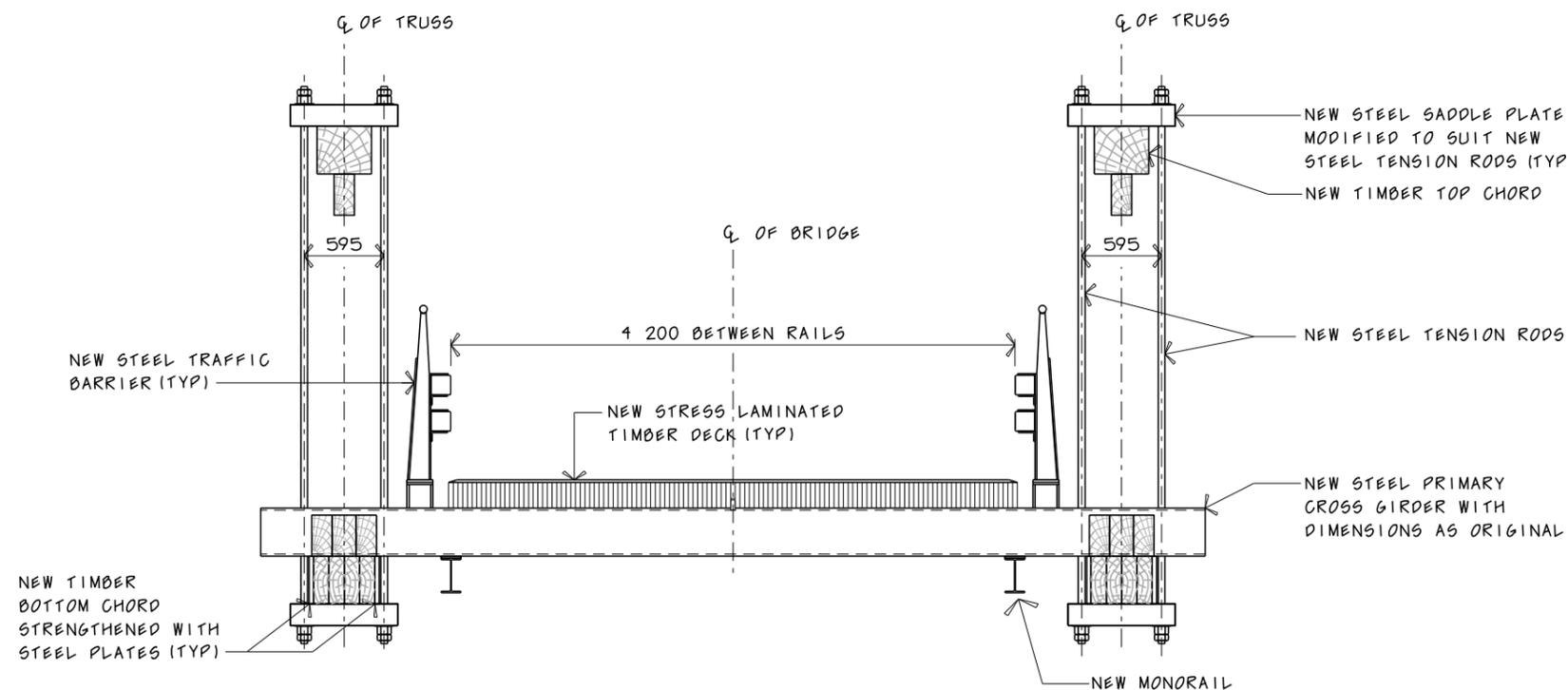


SECTION 1
AS EXISTING



UPSTREAM

DOWNSTREAM



SECTION 2
AS PROPOSED

GENERAL NOTES

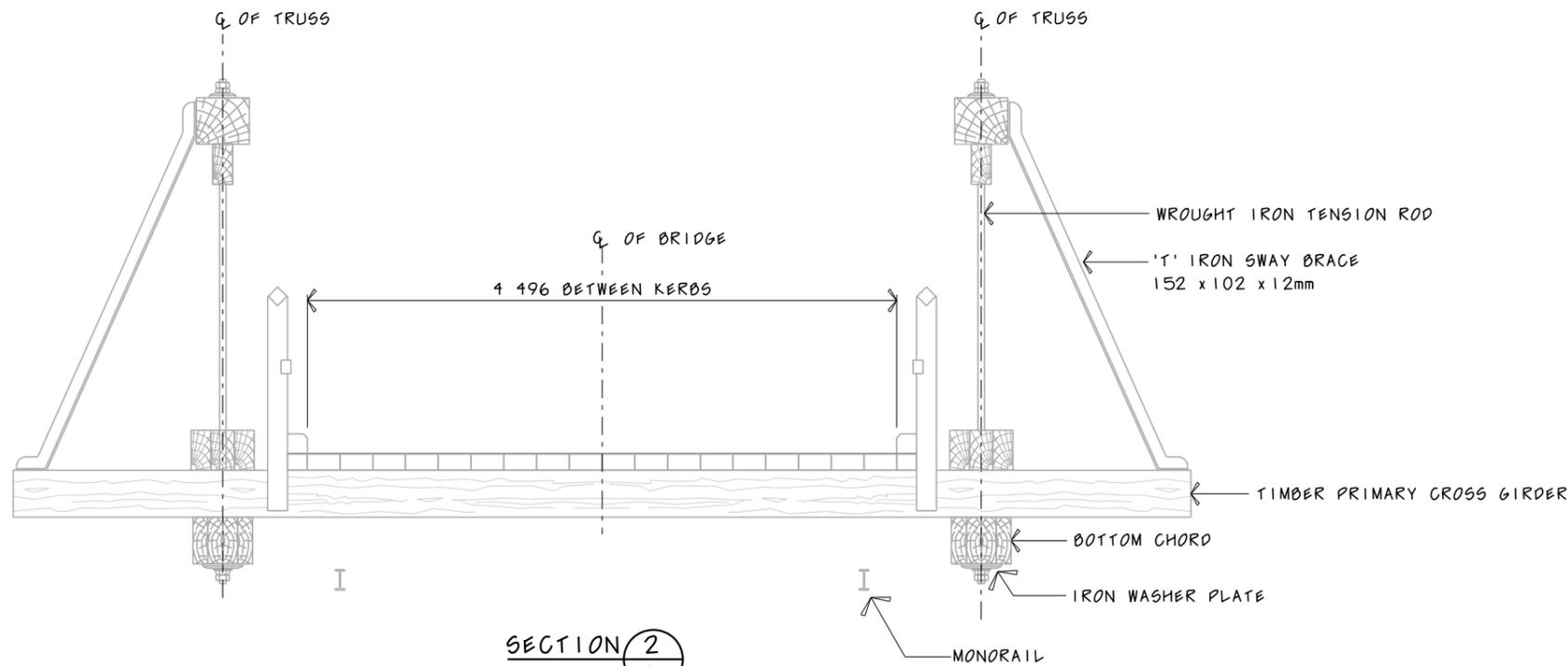
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B	30.11.2016	TRAFFIC BARRIERS REVISED	JP
ISSUE	DATE	REVISION	PREP [CHECK] AUTH
LOCAL ROAD		CITY OF LITHGOW	
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT			
TRUSS DETAIL - SHEET A			
	PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
	CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No	
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS	
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302
<u>S DESHPANDE</u>		ISSUE STATUS:	HERITAGE REVIEW
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No	3 OF 8 ISSUE
CAD No KA872TDA_3_B.dgn		B	

UPSTREAM

DOWNSTREAM

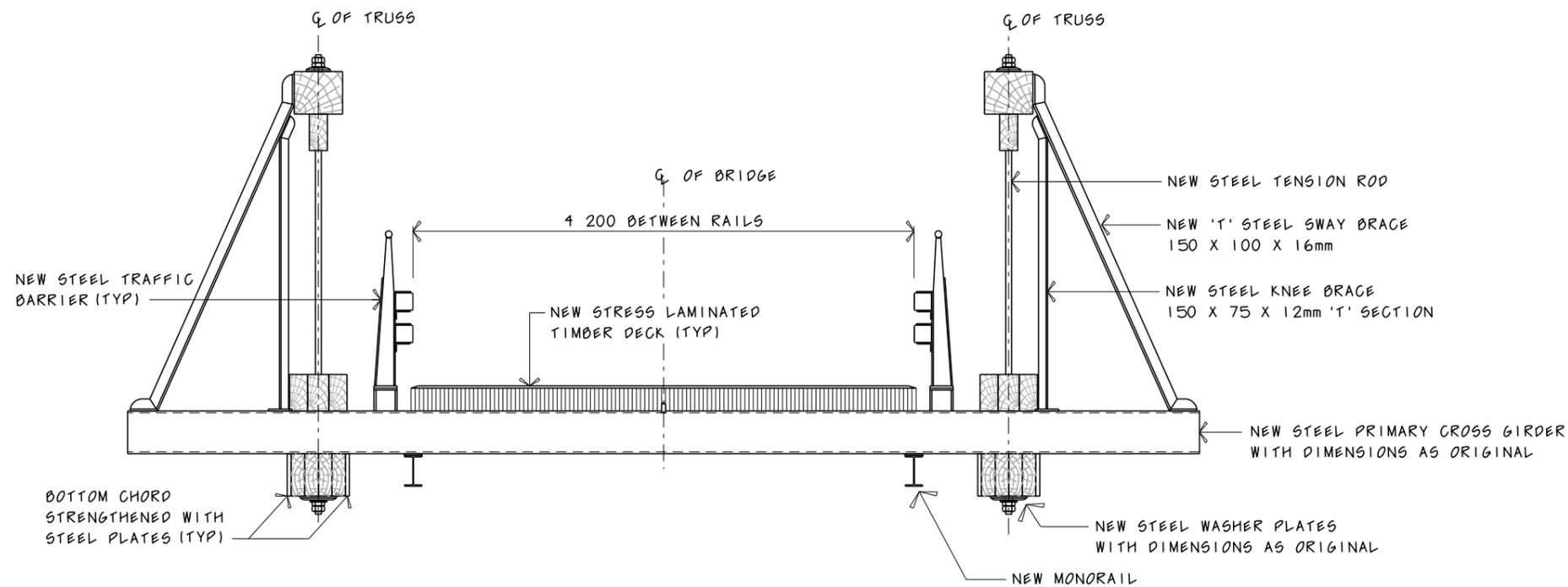


SECTION 2
1

AS EXISTING

UPSTREAM

DOWNSTREAM



SECTION 2
2

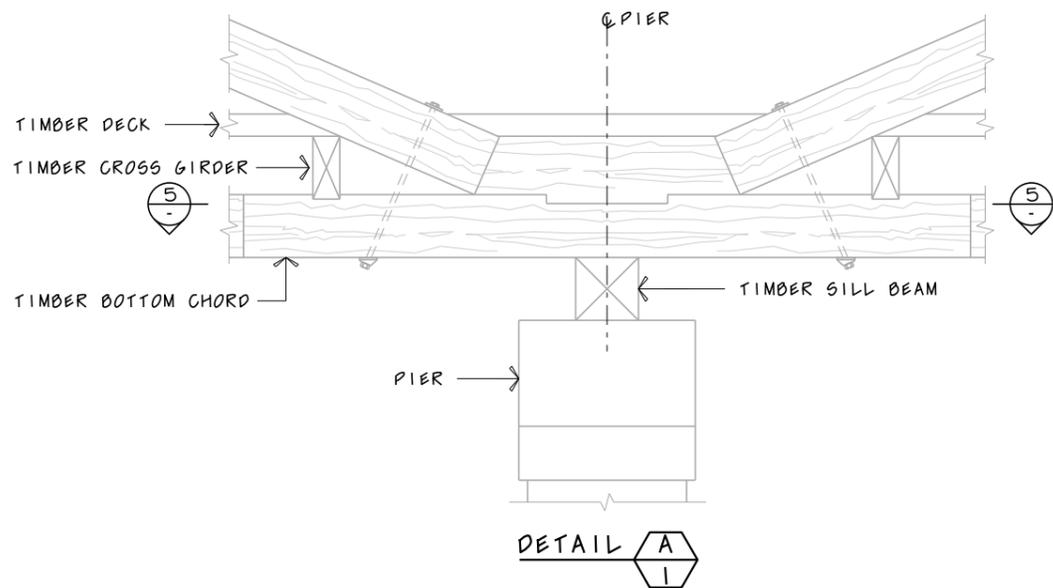
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GENERAL NOTES

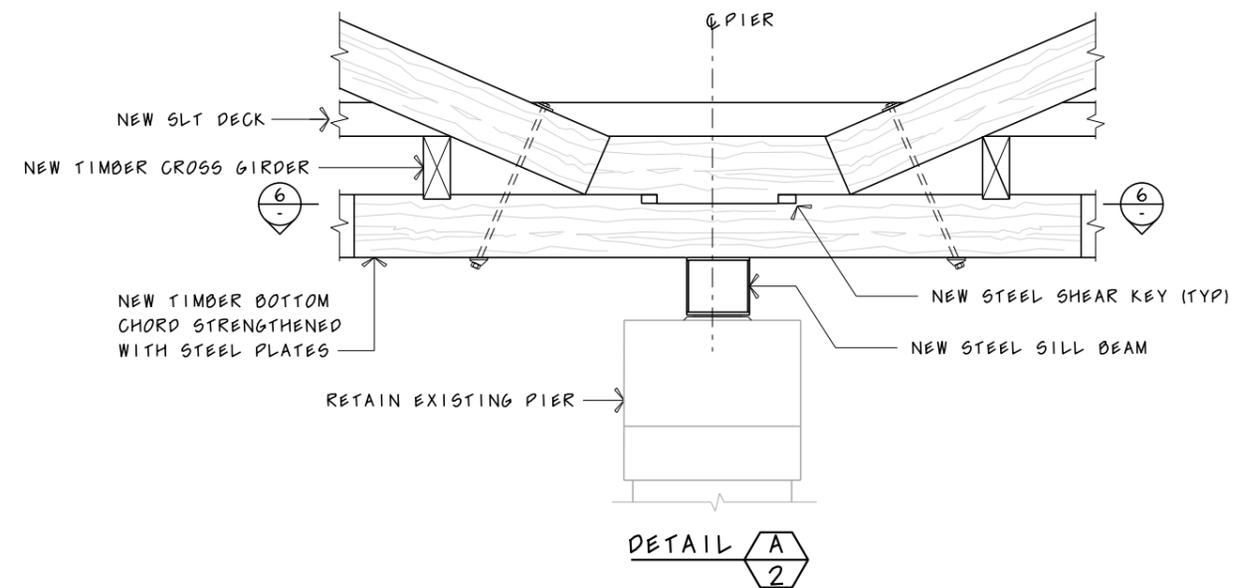
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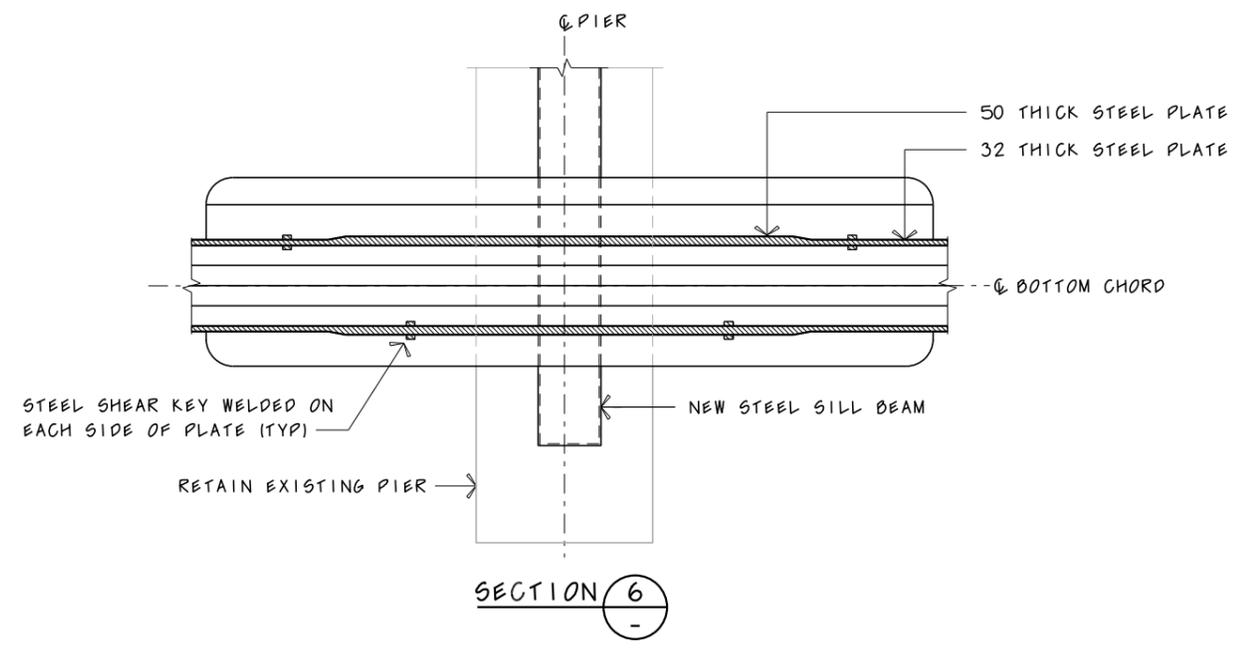
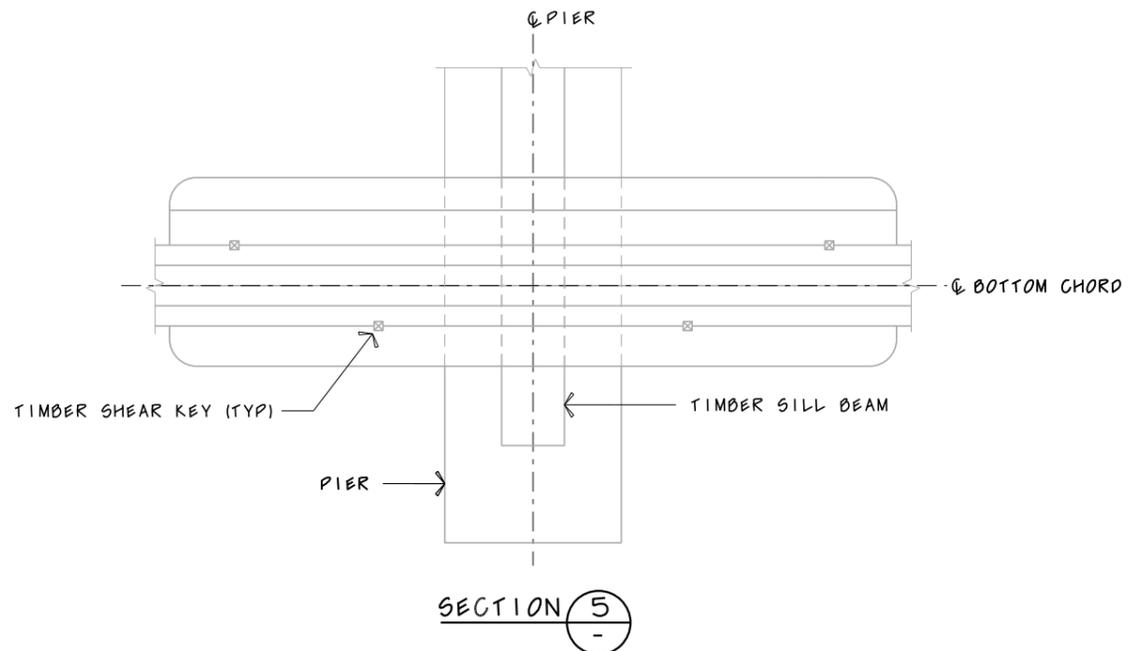
B	30.11.2016	TRAFFIC BARRIERS REVISED	JP		
ISSUE	DATE	REVISION	PREP	CHECK	AUTH
LOCAL ROAD			CITY OF LITHGOW		
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT					
TRUSS DETAILS - SHEET B					
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023 CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414			
		PREPARED DESIGN <u>A NICHOLAS</u>	CHECKED <u>S SUN</u>	SKETCH No KA872HCS	
DRAWING <u>JK</u>		A NICHOLAS	BRIDGE NUMBER B1302	ISSUE STATUS: HERITAGE REVIEW	
S DESHPANDE BRIDGE ENGINEER (REHABILITATION DESIGN)			SHEET No 4 OF 8	ISSUE	B



EXISTING CONNECTIONS AT PIER



PROPOSED CONNECTIONS AT PIER

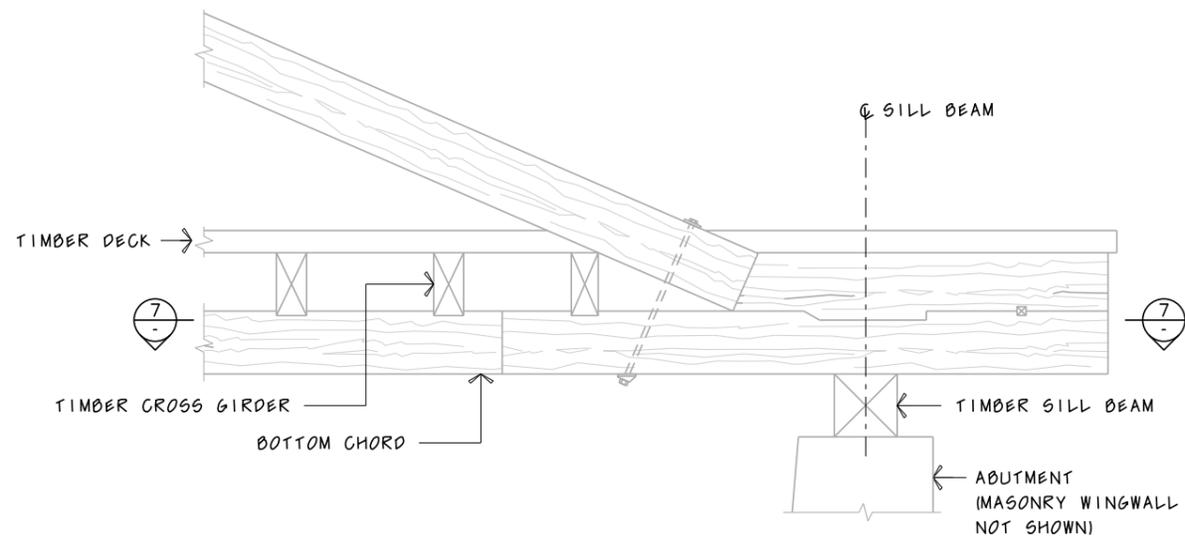


GENERAL NOTES

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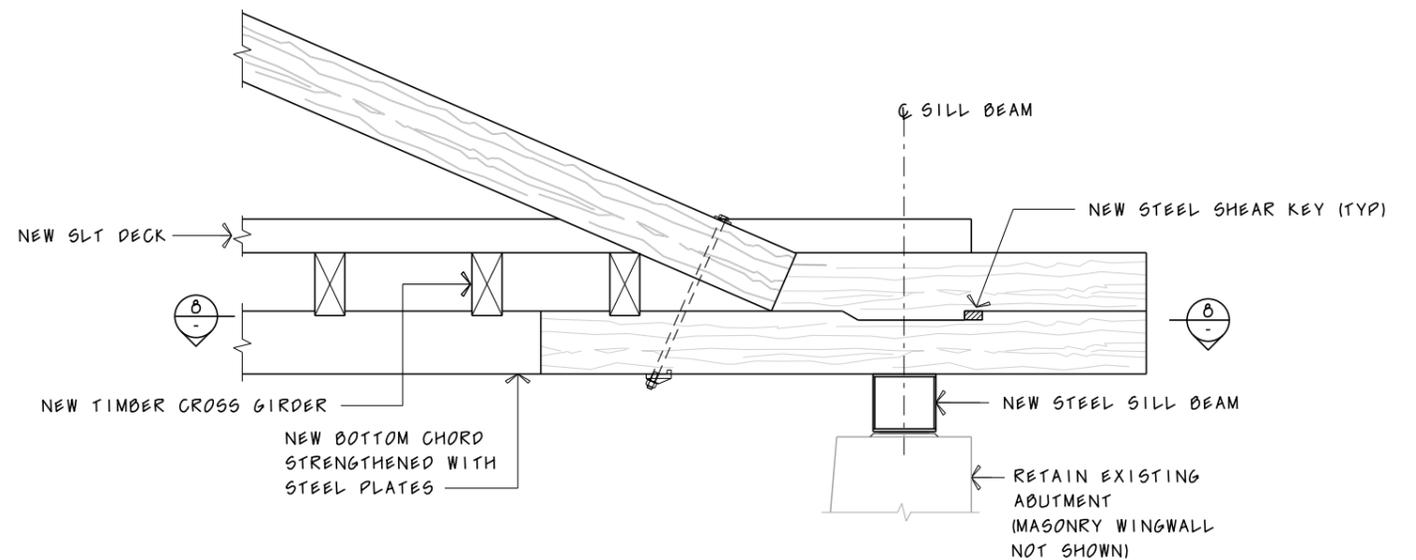
FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

ISSUE	DATE	REVISION	PREP	CHECK	AUTH
LOCAL ROAD CITY OF LITHGOW					
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT					
TRUSS DETAILS - SHEET C					
Transport Roads & Maritime Services			PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023 CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No			
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS			
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302		
<u>S DESHPANDE</u> BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW		
		SHEET No 5 OF 8	ISSUE	A	



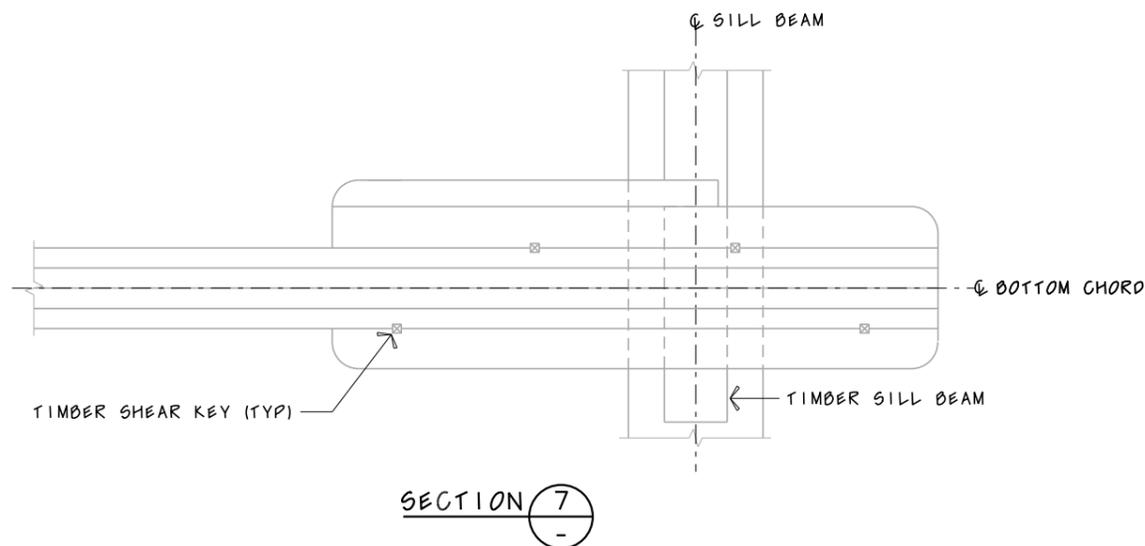
DETAIL **B**
1

EXISTING CONNECTION OF PRINCIPAL TO
BOTTOM CHORD AT ABUTMENTS

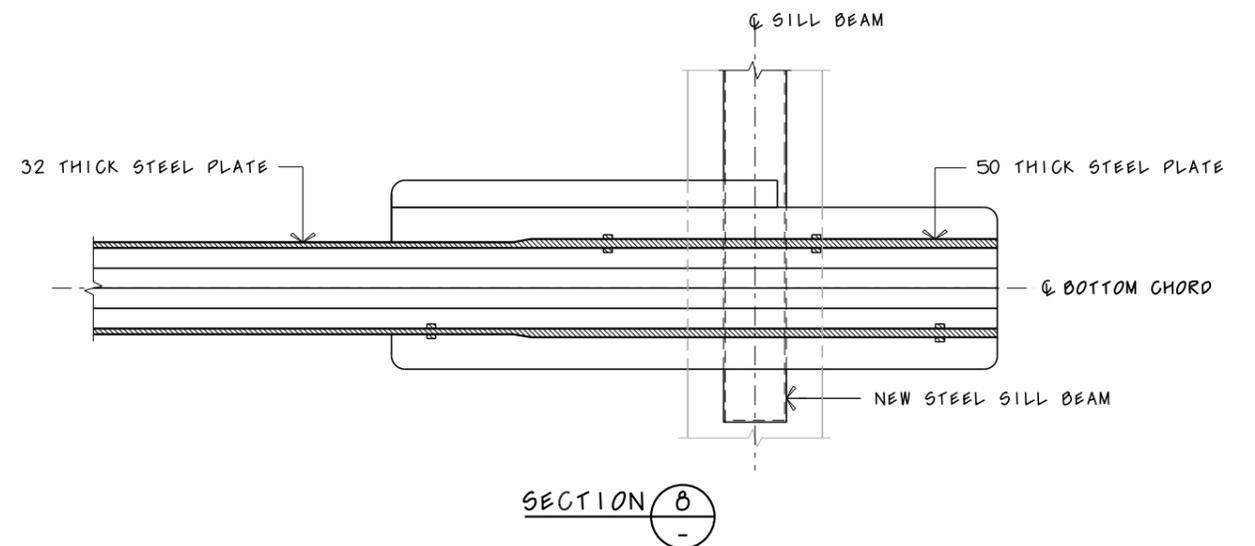


DETAIL **B**
2

PROPOSED CONNECTION OF PRINCIPAL TO
BOTTOM CHORD AT ABUTMENTS



SECTION **7**



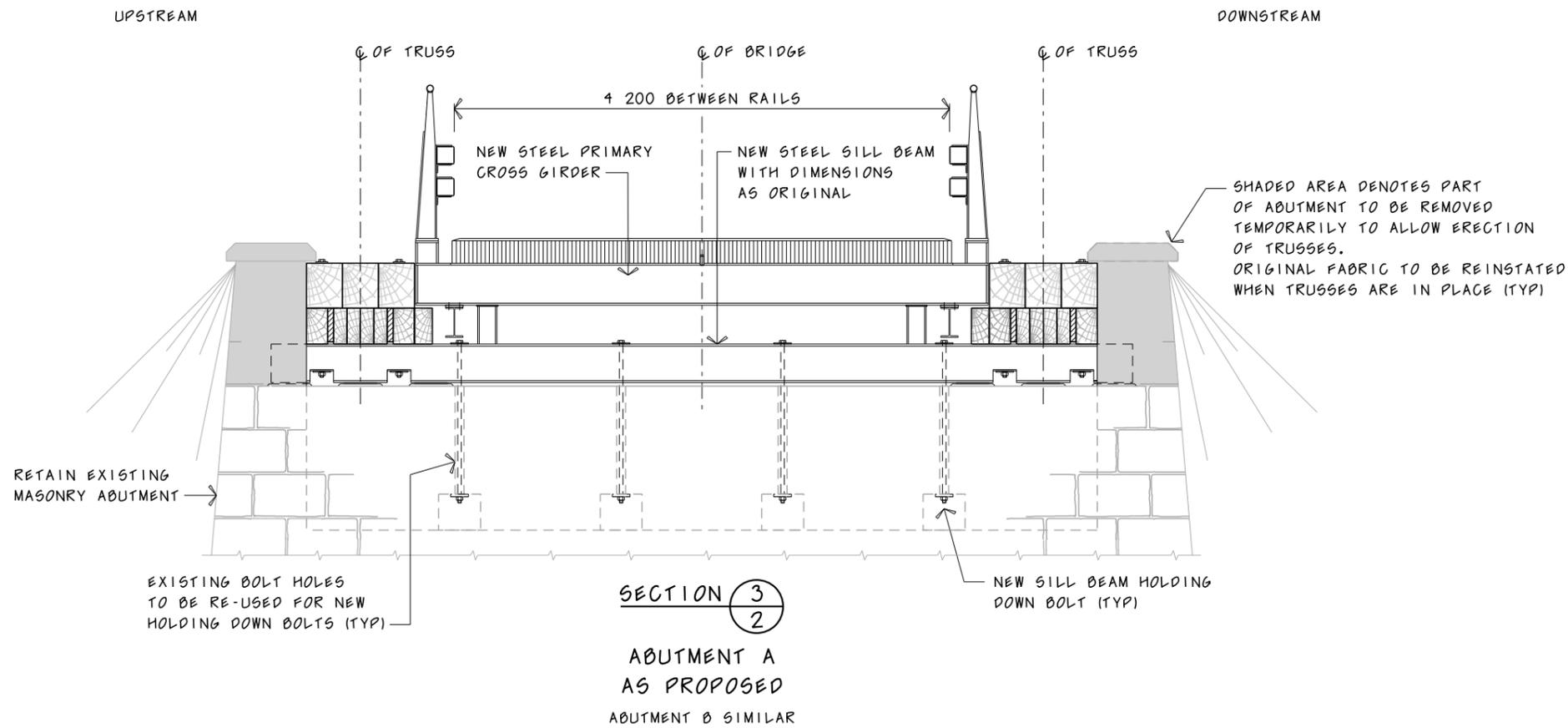
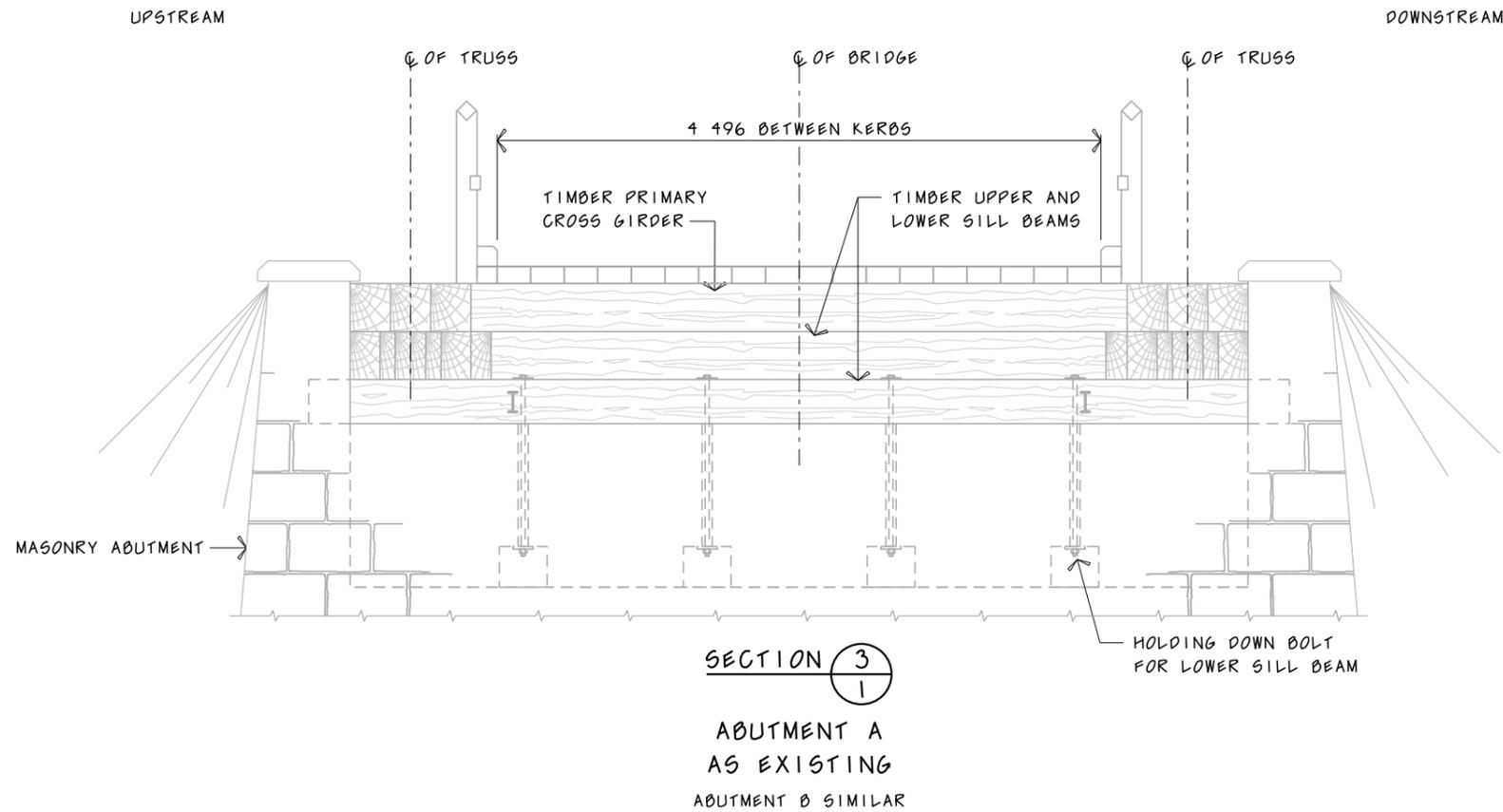
SECTION **8**

GENERAL NOTES

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SEE SHEET NO 1.

B	30.11.2016	BOLT ADDED AT DETAIL B (PROPOSED).	JP	
ISSUE	DATE	REVISION	PREP	CHECK AUTH
LOCAL ROAD		CITY OF LITHGOW		
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT				
TRUSS DETAILS - SHEET D				
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS		
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302	
<u>S DESHPANDE</u> BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW	
		SHEET No	6 OF 8	ISSUE
				B



GENERAL NOTES

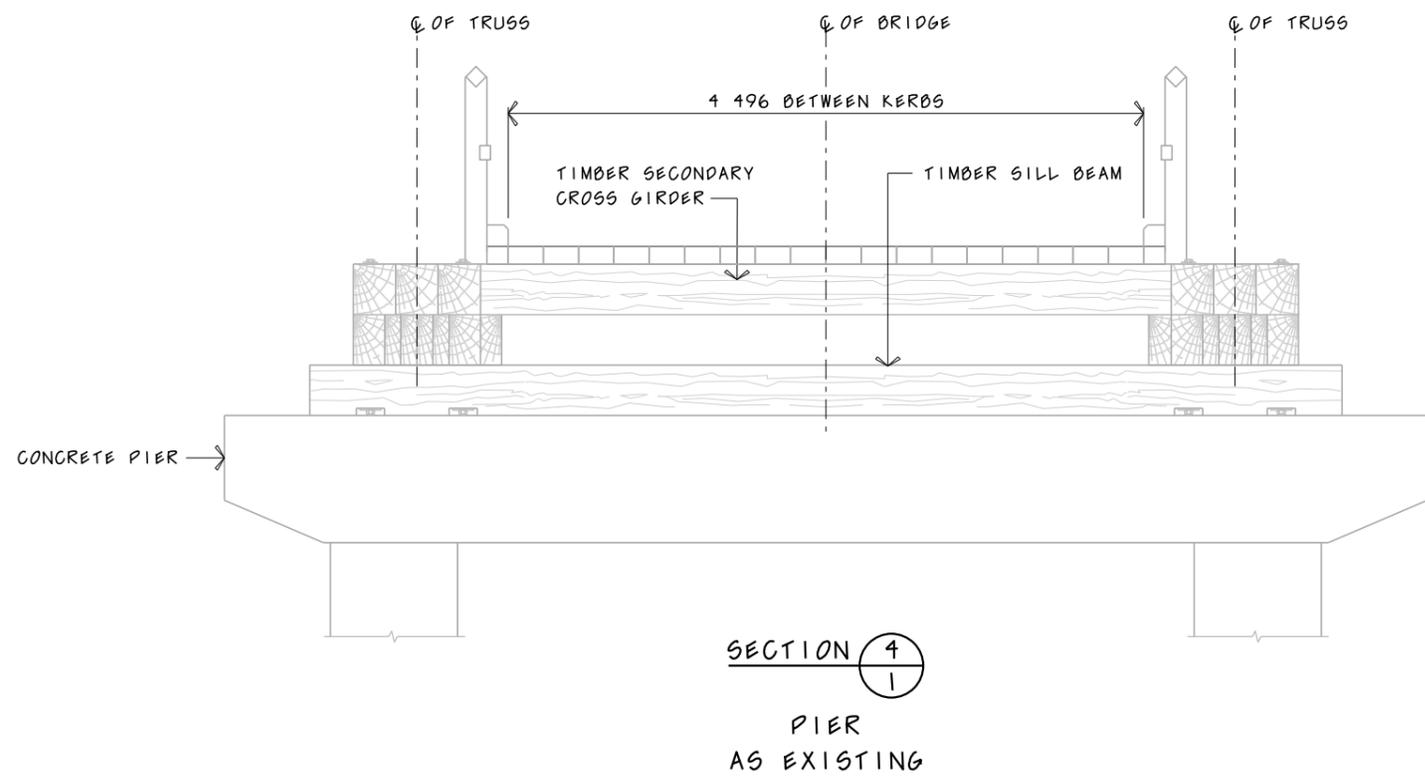


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B	30.11.2016	TRAFFIC BARRIERS REVISED	JP	
ISSUE	DATE	REVISION	PREP	CHECK AUTH
LOCAL ROAD		CITY OF LITHGOW		
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT				
ABUTMENTS				
 Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
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PREPARED	CHECKED	SKETCH No		
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS		
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302	
<u>S DESHPANDE</u>		ISSUE STATUS: HERITAGE REVIEW		
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No	7 OF 8	ISSUE
				B

UPSTREAM

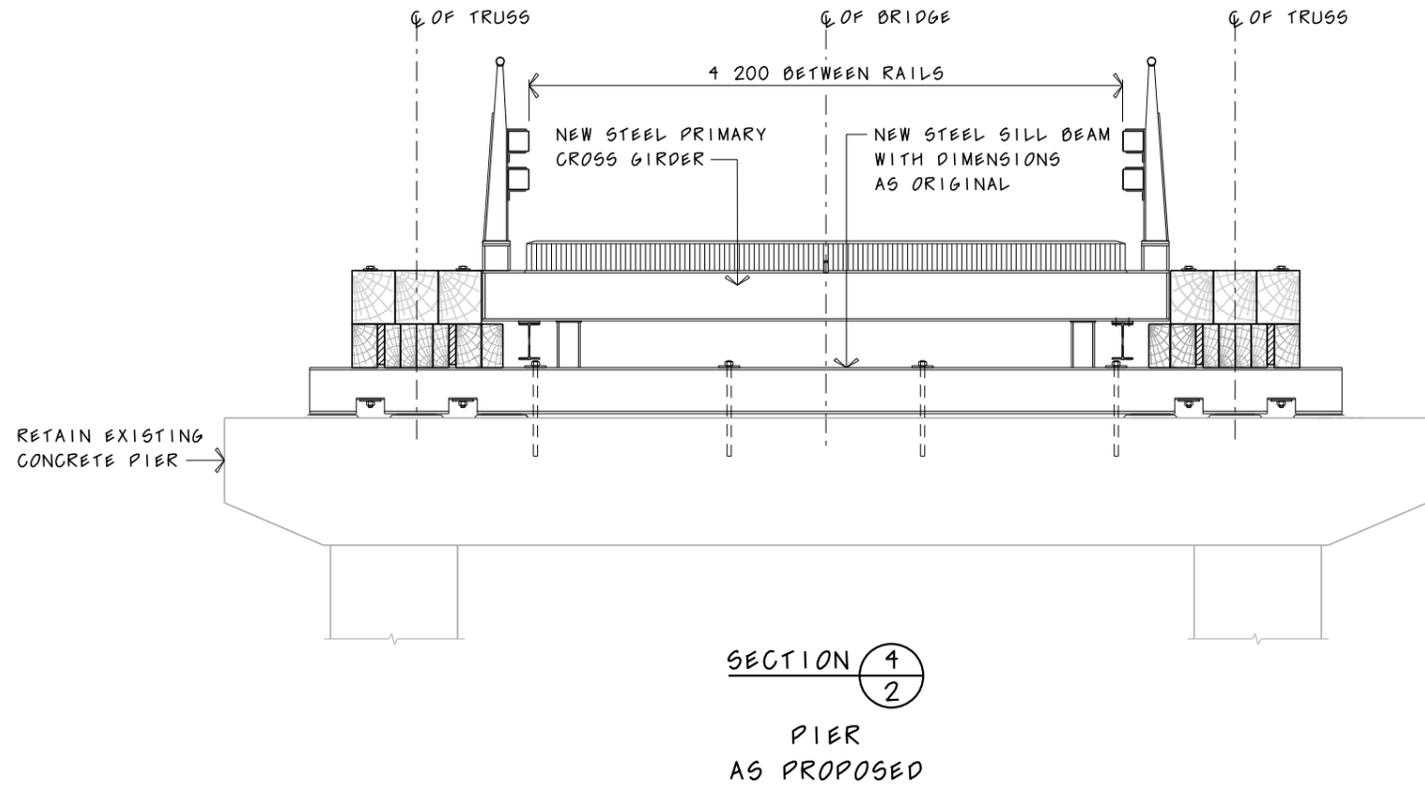
DOWNSTREAM



SECTION $\frac{4}{1}$
PIER
AS EXISTING

UPSTREAM

DOWNSTREAM



SECTION $\frac{4}{2}$
PIER
AS PROPOSED

GENERAL NOTES



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ISSUE	DATE	REVISION	PREP	CHECK AUTH
LOCAL ROAD			CITY OF LITHGOW	
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT				
PIER				
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS		
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302	
<u>S DESHPANDE</u>		ISSUE STATUS: HERITAGE REVIEW		
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No 8 OF 8	ISSUE	B

Appendix E

Biodiversity search results

BioNET search

Kingdom	Class	Family	Scientific Name	Common Name	NSW Status	Comm. Status
Fauna	Amphibia	Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet	P	
Fauna	Amphibia	Myobatrachidae	<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog	P	
Fauna	Amphibia	Myobatrachidae	<i>Limnodynastes dumerilii dumerilii</i>		P	
Fauna	Amphibia	Myobatrachidae	<i>Limnodynastes peronii</i>	Brown-striped Frog	P	
Fauna	Amphibia	Myobatrachidae	<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog	P	
Fauna	Amphibia	Myobatrachidae	<i>Uperoleia laevigata</i>	Smooth Toadlet	P	
Fauna	Amphibia	Hylidae	<i>Litoria dentata</i>	Bleating Tree Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria latopalmeta</i>	Broad-palmed Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria lesueuri</i>	Lesueur's Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria peronii</i>	Peron's Tree Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria phyllochroa</i>	Leaf-green Tree Frog	P	
Fauna	Amphibia	Hylidae	<i>Litoria verreauxii</i>	Verreaux's Frog	P	
Fauna	Reptilia	Chelidae	<i>Chelodina longicollis</i>	Eastern Snake-necked Turtle	P	
Fauna	Reptilia	Scincidae	<i>Acritoscincus platynota</i>	Red-throated Skink	P	
Fauna	Reptilia	Scincidae	<i>Ctenotus robustus</i>	Robust Ctenotus	P	
Fauna	Reptilia	Scincidae	<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	P	
Fauna	Reptilia	Scincidae	<i>Egernia cunninghami</i>	Cunningham's Skink	P	
Fauna	Reptilia	Scincidae	<i>Egernia striolata</i>	Tree Skink	P	
Fauna	Reptilia	Scincidae	<i>Eulamprus quoyii</i>	Eastern Water-skink	P	
Fauna	Reptilia	Scincidae	<i>Hemiergis decresiensis</i>	Three-toed Earless Skink	P	
Fauna	Reptilia	Scincidae	<i>Lampropholis delicata</i>	Dark-flecked Garden Sunskink	P	
Fauna	Reptilia	Scincidae	<i>Lampropholis guichenoti</i>	Pale-flecked Garden Sunskink	P	
Fauna	Reptilia	Scincidae	<i>Lampropholis sp.</i>	unidentified grass skink	P	
Fauna	Reptilia	Scincidae	<i>Lygisaurus foliorum</i>	Tree-base Litter-skink	P	
Fauna	Reptilia	Scincidae	<i>Saiphos equalis</i>	Three-toed Skink	P	
Fauna	Reptilia	Scincidae	<i>Saproscincus mustelinus</i>	Weasel Skink	P	
Fauna	Reptilia	Scincidae	<i>Tiliqua nigrolutea</i>	Blotched Blue-tongue	P	
Fauna	Reptilia	Scincidae	<i>Tiliqua scincoides</i>	Eastern Blue-tongue	P	
Fauna	Reptilia	Agamidae	<i>Amphibolurus muricatus</i>	Jacky Lizard	P	
Fauna	Reptilia	Agamidae	<i>Diporiphora nobbi</i>	Nobbi Dragon	P	
Fauna	Reptilia	Agamidae	<i>Intellagama lesueurii</i>	Eastern Water Dragon	P	
Fauna	Reptilia	Agamidae	<i>Pogona barbata</i>	Bearded Dragon	P	
Fauna	Reptilia	Varanidae	<i>Varanus varius</i>	Lace Monitor	P	
Fauna	Reptilia	Typhlopidae	<i>Anilius nigrescens</i>	Blackish Blind Snake	P	
Fauna	Reptilia	Elapidae	<i>Austrelaps ramsayi</i>	Highland Copperhead	P	
Fauna	Reptilia	Elapidae	<i>Notechis scutatus</i>	Tiger Snake	P	

BioNET search

Fauna	Reptilia	Elapidae	<i>Pseudechis guttatus</i>	Spotted Black Snake	P	
Fauna	Reptilia	Elapidae	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	P	
Fauna	Reptilia	Elapidae	<i>Pseudonaja textilis</i>	Eastern Brown Snake	P	
Fauna	Aves	Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail	P	
Fauna	Aves	Anatidae	<i>Anas castanea</i>	Chestnut Teal	P	
Fauna	Aves	Anatidae	<i>Anas gracilis</i>	Grey Teal	P	
Fauna	Aves	Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck	P	
Fauna	Aves	Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck	P	
Fauna	Aves	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	P	
Fauna	Aves	Columbidae	<i>Geopelia humeralis</i>	Bar-shouldered Dove	P	
Fauna	Aves	Columbidae	<i>Geopelia striata</i>	Peaceful Dove	P	
Fauna	Aves	Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	P	
Fauna	Aves	Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	P	
Fauna	Aves	Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	P	
Fauna	Aves	Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owllet-nightjar	P	
Fauna	Aves	Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	P	C,J,K
Fauna	Aves	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	P	
Fauna	Aves	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant	P	
Fauna	Aves	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	P	
Fauna	Aves	Ardeidae	<i>Ardea ibis</i>	Cattle Egret	P	C,J
Fauna	Aves	Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	P	
Fauna	Aves	Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron	P	
Fauna	Aves	Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	P	
Fauna	Aves	Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	P	
Fauna	Aves	Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite	P	
Fauna	Aves	Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P	C
Fauna	Aves	Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	P	
Fauna	Aves	Falconidae	<i>Falco berigora</i>	Brown Falcon	P	
Fauna	Aves	Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	P	
Fauna	Aves	Falconidae	<i>Falco longipennis</i>	Australian Hobby	P	
Fauna	Aves	Rallidae	<i>Gallinula tenebrosa</i>	Dusky Moorhen	P	
Fauna	Aves	Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen	P	
Fauna	Aves	Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	P	
Fauna	Aves	Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	P	C,J,K
Fauna	Aves	Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe	P	C,J,K
Fauna	Aves	Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	P	
Fauna	Aves	Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	P	
Fauna	Aves	Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V,P,3	
Fauna	Aves	Cacatuidae	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	P	

BioNET search

Fauna	Aves	Cacatuidae	<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V,P,2	
Fauna	Aves	Cacatuidae	<i>Eolophus roseicapillus</i>	Galah	P	
Fauna	Aves	Psittacidae	<i>Alisterus scapularis</i>	Australian King-Parrot	P	
Fauna	Aves	Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E1,P,3	CE
Fauna	Aves	Psittacidae	<i>Platycercus elegans</i>	Crimson Rosella	P	
Fauna	Aves	Psittacidae	<i>Platycercus eximius</i>	Eastern Rosella	P	
Fauna	Aves	Psittacidae	<i>Platycercus</i> sp.	Unidentified Rosella	P	
Fauna	Aves	Psittacidae	<i>Psephotus haematonotus</i>	Red-rumped Parrot	P	
Fauna	Aves	Centropodidae	<i>Centropus phasianinus</i>	Pheasant Coucal	P	
Fauna	Aves	Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	P	
Fauna	Aves	Cuculidae	<i>Cacomantis variolosus</i>	Brush Cuckoo	P	
Fauna	Aves	Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo	P	
Fauna	Aves	Cuculidae	<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo	P	
Fauna	Aves	Cuculidae	<i>Eudynamys orientalis</i>	Eastern Koel	P	
Fauna	Aves	Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	P	
Fauna	Aves	Strigidae	<i>Ninox connivens</i>	Barking Owl	V,P,3	
Fauna	Aves	Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook	P	
Fauna	Aves	Strigidae	<i>Ninox strenua</i>	Powerful Owl	V,P,3	
Fauna	Aves	Tytonidae	<i>Tyto javanica</i>	Eastern Barn Owl	P	
Fauna	Aves	Alcedinidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P	
Fauna	Aves	Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher	P	
Fauna	Aves	Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	P	J
Fauna	Aves	Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	P	
Fauna	Aves	Menuridae	<i>Menura novaehollandiae</i>	Superb Lyrebird	P	
Fauna	Aves	Climacteridae	<i>Cormobates leucophaea</i>	White-throated Treecreeper	P	
Fauna	Aves	Ptilonorhynchidae	<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	P	
Fauna	Aves	Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	P	
Fauna	Aves	Maluridae	<i>Malurus lamberti</i>	Variigated Fairy-wren	P	
Fauna	Aves	Dasyornithidae	<i>Pycnoptilus floccosus</i>	Pilotbird	P	
Fauna	Aves	Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	P	
Fauna	Aves	Acanthizidae	<i>Acanthiza lineata</i>	Striated Thornbill	P	
Fauna	Aves	Acanthizidae	<i>Acanthiza nana</i>	Yellow Thornbill	P	
Fauna	Aves	Acanthizidae	<i>Acanthiza pusilla</i>	Brown Thornbill	P	
Fauna	Aves	Acanthizidae	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	P	
Fauna	Aves	Acanthizidae	<i>Gerygone olivacea</i>	White-throated Gerygone	P	
Fauna	Aves	Acanthizidae	<i>Origma solitaria</i>	Rockwarbler	P	
Fauna	Aves	Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren	P	
Fauna	Aves	Acanthizidae	<i>Smicronis brevirostris</i>	Weebill	P	
Fauna	Aves	Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote	P	

BioNET search

Fauna	Aves	Pardalotidae	Pardalotus striatus	Striated Pardalote	P
Fauna	Aves	Meliphagidae	Acanthorhynchus tenuirostris	Eastern Spinebill	P
Fauna	Aves	Meliphagidae	Anthochaera carunculata	Red Wattlebird	P
Fauna	Aves	Meliphagidae	Caligavis chrysops	Yellow-faced Honeyeater	P
Fauna	Aves	Meliphagidae	Manorina melanocephala	Noisy Miner	P
Fauna	Aves	Meliphagidae	Meliphaga lewinii	Lewin's Honeyeater	P
Fauna	Aves	Meliphagidae	Melithreptus brevirostris	Brown-headed Honeyeater	P
Fauna	Aves	Meliphagidae	Melithreptus lunatus	White-naped Honeyeater	P
Fauna	Aves	Meliphagidae	Nesoptilotis leucotis	White-eared Honeyeater	P
Fauna	Aves	Meliphagidae	Philemon citreogularis	Little Friarbird	P
Fauna	Aves	Meliphagidae	Philemon corniculatus	Noisy Friarbird	P
Fauna	Aves	Meliphagidae	Phylidonyris novaehollandiae	New Holland Honeyeater	P
Fauna	Aves	Meliphagidae	Ptilotula fuscus	Fuscous Honeyeater	P
Fauna	Aves	Meliphagidae	Ptilotula penicillatus	White-plumed Honeyeater	P
Fauna	Aves	Psophodidae	Psophodes olivaceus	Eastern Whipbird	P
Fauna	Aves	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	V,P
Fauna	Aves	Campephagidae	Coracina novaehollandiae	Black-faced Cuckoo-shrike	P
Fauna	Aves	Campephagidae	Coracina tenuirostris	Cicadabird	P
Fauna	Aves	Pachycephalidae	Colluricincla harmonica	Grey Shrike-thrush	P
Fauna	Aves	Pachycephalidae	Falcunculus frontatus		P
Fauna	Aves	Pachycephalidae	Pachycephala pectoralis	Golden Whistler	P
Fauna	Aves	Pachycephalidae	Pachycephala rufiventris	Rufous Whistler	P
Fauna	Aves	Oriolidae	Oriolus sagittatus	Olive-backed Oriole	P
Fauna	Aves	Artamidae	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P
Fauna	Aves	Artamidae	Cracticus tibicen	Australian Magpie	P
Fauna	Aves	Artamidae	Cracticus torquatus	Grey Butcherbird	P
Fauna	Aves	Artamidae	Strepera graculina	Pied Currawong	P
Fauna	Aves	Rhipiduridae	Rhipidura albiscapa	Grey Fantail	P
Fauna	Aves	Rhipiduridae	Rhipidura leucophrys	Willie Wagtail	P
Fauna	Aves	Rhipiduridae	Rhipidura rufifrons	Rufous Fantail	P
Fauna	Aves	Corvidae	Corvus coronoides	Australian Raven	P
Fauna	Aves	Corvidae	Corvus mellori	Little Raven	P
Fauna	Aves	Monarchidae	Grallina cyanoleuca	Magpie-lark	P
Fauna	Aves	Monarchidae	Myiagra cyanoleuca	Satin Flycatcher	P
Fauna	Aves	Monarchidae	Myiagra rubecula	Leaden Flycatcher	P
Fauna	Aves	Corcoracidae	Corcorax melanorhamphos	White-winged Chough	P
Fauna	Aves	Petroicidae	Eopsaltria australis	Eastern Yellow Robin	P
Fauna	Aves	Petroicidae	Microeca fascinans	Jacky Winter	P
Fauna	Aves	Petroicidae	Petroica boodang	Scarlet Robin	V,P

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Fauna	Aves	Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin	P	
Fauna	Aves	Petroicidae	<i>Petroica rosea</i>	Rose Robin	P	
Fauna	Aves	Acrocephalidae	<i>Acrocephalus australis</i>	Australian Reed-Warbler	P	
Fauna	Aves	Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	P	
Fauna	Aves	Timaliidae	<i>Zosterops lateralis</i>	Silvereye	P	
Fauna	Aves	Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	P	
Fauna	Aves	Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin	P	
Fauna	Aves	Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin	P	
Fauna	Aves	Turdidae	<i>Turdus merula</i>	Eurasian Blackbird		
Fauna	Aves	Sturnidae	<i>Sturnus tristis</i>	Common Myna		
Fauna	Aves	Sturnidae	<i>Sturnus vulgaris</i>	Common Starling		
Fauna	Aves	Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	P	
Fauna	Aves	Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch	P	
Fauna	Aves	Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred Finch	P	
Fauna	Aves	Passeridae	<i>Passer domesticus</i>	House Sparrow		
Fauna	Aves	Motacillidae	<i>Anthus novaeseelandiae</i>	Australian Pipit	P	
Fauna	Aves	Fringillidae	<i>Carduelis carduelis</i>	European Goldfinch		
Fauna	Mammalia	Ornithorhynchidae	<i>Ornithorhynchus anatinus</i>	Platypus	P	
Fauna	Mammalia	Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	P	
Fauna	Mammalia	Dasyuridae	<i>Antechinus stuartii</i>	Brown Antechinus	P	
Fauna	Mammalia	Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E
Fauna	Mammalia	Peramelidae	<i>Perameles nasuta</i>	Long-nosed Bandicoot	P	
Fauna	Mammalia	Vombatidae	<i>Vombatus ursinus</i>	Common Wombat	P	
Fauna	Mammalia	Petauridae	<i>Petaurus breviceps</i>	Sugar Glider	P	
Fauna	Mammalia	Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider	P	V
Fauna	Mammalia	Pseudocheiridae	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	P	
Fauna	Mammalia	Acrobatidae	<i>Acrobates pygmaeus</i>	Feathertail Glider	P	
Fauna	Mammalia	Phalangeridae	<i>Trichosurus sp.</i>	brushtail possum	P	
Fauna	Mammalia	Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P	
Fauna	Mammalia	Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	P	
Fauna	Mammalia	Macropodidae	<i>Macropus robustus</i>	Common Wallaroo	P	
Fauna	Mammalia	Macropodidae	<i>Macropus rufogriseus</i>	Red-necked Wallaby	P	
Fauna	Mammalia	Macropodidae	<i>Macropus sp.</i>	kangaroo / wallaby	P	
Fauna	Mammalia	Macropodidae	<i>Wallabia bicolor</i>	Swamp Wallaby	P	
Fauna	Mammalia	Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V
Fauna	Mammalia	Rhinolophidae	<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe-bat	P	
Fauna	Mammalia	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P	
Fauna	Mammalia	Molossidae	<i>Austronomus australis</i>	White-striped Freetail-bat	P	
Fauna	Mammalia	Molossidae	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V,P	

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Fauna	Mammalia	Molossidae	Mormopterus ridei	Eastern Free-tailed Bat	P
Fauna	Mammalia	Vespertilionidae	Chalinolobus gouldii	Gould's Wattled Bat	P
Fauna	Mammalia	Vespertilionidae	Chalinolobus morio	Chocolate Wattled Bat	P
Fauna	Mammalia	Vespertilionidae	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P
Fauna	Mammalia	Vespertilionidae	Miniopterus australis	Little Bentwing-bat	V,P
Fauna	Mammalia	Vespertilionidae	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P
Fauna	Mammalia	Vespertilionidae	Myotis macropus	Southern Myotis	V,P
Fauna	Mammalia	Vespertilionidae	Nyctophilus geoffroyi	Lesser Long-eared Bat	P
Fauna	Mammalia	Vespertilionidae	Nyctophilus gouldi	Gould's Long-eared Bat	P
Fauna	Mammalia	Vespertilionidae	Nyctophilus sp.	long-eared bat	P
Fauna	Mammalia	Vespertilionidae	Scoteanax rueppellii	Greater Broad-nosed Bat	V,P
Fauna	Mammalia	Vespertilionidae	Scotorepens orion	Eastern Broad-nosed Bat	P
Fauna	Mammalia	Vespertilionidae	Scotorepens sp.	Unidentified broad-nosed bat	P
Fauna	Mammalia	Vespertilionidae	Vespadelus darlingtoni	Large Forest Bat	P
Fauna	Mammalia	Vespertilionidae	Vespadelus regulus	Southern Forest Bat	P
Fauna	Mammalia	Vespertilionidae	Vespadelus vulturnus	Little Forest Bat	P
Fauna	Mammalia	Muridae	Mus musculus	House Mouse	
Fauna	Mammalia	Muridae	Rattus fuscipes	Bush Rat	P
Fauna	Mammalia	Muridae	Rattus rattus	Black Rat	
Fauna	Mammalia	Canidae	Canis lupus	Dingo, domestic dog	
Fauna	Mammalia	Canidae	Canis lupus dingo	Dingo	
Fauna	Mammalia	Canidae	Canis lupus familiaris	Dog	
Fauna	Mammalia	Canidae	Vulpes vulpes	Fox	
Fauna	Mammalia	Felidae	Felis catus	Cat	
Fauna	Mammalia	Leporidae	Lepus capensis	Brown Hare	
Fauna	Mammalia	Leporidae	Oryctolagus cuniculus	Rabbit	
Fauna	Mammalia	Bovidae	Capra hircus	Goat	
Fauna	Arachnida	Hexathelidae	Atrax robustus	Sydney funnelweb spider	
Fauna	Insecta	Lycaenidae	Paralucia spinifera	Purple Copper Butterfly, Bathurst Co E1	V
Fauna	Unknown	Unknown Fauna	Fauna sp.	Unidentified Fauna	
Flora	Flora	Acanthaceae	Acanthus mollis	Bear's Breeches	
Flora	Flora	Acanthaceae	Brunoniella australis	Blue Trumpet	
Flora	Flora	Adiantaceae	Adiantum aethiopicum	Common Maidenhair	P
Flora	Flora	Agavaceae	Yucca spp.		
Flora	Flora	Alliaceae	Agapanthus spp.		
Flora	Flora	Alliaceae	Nothoscordum borbonicum	Onion Weed	
Flora	Flora	Amygdalaceae	Prunus cerasifera	Cherry Plum	
Flora	Flora	Amygdalaceae	Prunus persica		
Flora	Flora	Anthericaceae	Arthropodium milleflorum	Pale Vanilla-lily	

BioNET search

Flora	Flora	Anthericaceae	Caesia parviflora var. parviflora		
Flora	Flora	Anthericaceae	Dichopogon spp.	Chocolate Lily	
Flora	Flora	Anthericaceae	Laxmannia gracilis	Slender Wire Lily	
Flora	Flora	Anthericaceae	Sowerbaea juncea	Vanilla Plant	
Flora	Flora	Anthericaceae	Tricoryne elatior	Yellow Autumn-lily	
Flora	Flora	Apiaceae	Actinotus helianthi	Flannel Flower	P
Flora	Flora	Apiaceae	Conium maculatum	Hemlock	
Flora	Flora	Apiaceae	Daucus glochidiatus	Native Carrot	
Flora	Flora	Apiaceae	Eryngium ovinum	Blue Devil	
Flora	Flora	Apiaceae	Foeniculum vulgare	Fennel	
Flora	Flora	Apiaceae	Hydrocotyle laxiflora	Stinking Pennywort	
Flora	Flora	Apiaceae	Hydrocotyle sibthorpioides		
Flora	Flora	Apiaceae	Platysace ericoides		
Flora	Flora	Apiaceae	Platysace lanceolata	Shrubby Platysace	
Flora	Flora	Apiaceae	Platysace linearifolia		
Flora	Flora	Apiaceae	Xanthosia pilosa	Woolly Xanthosia	
Flora	Flora	Apocynaceae	Vinca major	Periwinkle	
Flora	Flora	Aquifoliaceae	Ilex aquifolium	English Holly	
Flora	Flora	Araliaceae	Hedera helix	English Ivy	
Flora	Flora	Araliaceae	Polyscias sambucifolia subsp. leptophylla		
Flora	Flora	Asphodelaceae	Bulbine bulbosa	Bulbine Lily	
Flora	Flora	Asphodelaceae	Kniphofia spp.		
Flora	Flora	Aspleniaceae	Asplenium flabellifolium	Necklace Fern	
Flora	Flora	Asteraceae	Achillea millefolium	Yarrow	
Flora	Flora	Asteraceae	Arctotheca calendula	Capeweed	
Flora	Flora	Asteraceae	Arrhenechthites mixta	Purple Fireweed	
Flora	Flora	Asteraceae	Bidens subalternans	Greater Beggar's Ticks	
Flora	Flora	Asteraceae	Brachyscome spathulata		
Flora	Flora	Asteraceae	Calotis cuneifolia	Purple Burr-Daisy	
Flora	Flora	Asteraceae	Calotis lappulacea	Yellow Burr-daisy	
Flora	Flora	Asteraceae	Carduus spp.		
Flora	Flora	Asteraceae	Cassinia aculeata	Dolly Bush	
Flora	Flora	Asteraceae	Cassinia arcuata	Sifton Bush	
Flora	Flora	Asteraceae	Cassinia quinquefaria		
Flora	Flora	Asteraceae	Cassinia spp.		
Flora	Flora	Asteraceae	Cassinia uncata	Sticky Cassinia	
Flora	Flora	Asteraceae	Chondrilla juncea	Skeleton Weed	
Flora	Flora	Asteraceae	Chrysocephalum apiculatum	Common Everlasting	
Flora	Flora	Asteraceae	Chrysocephalum semipapposum	Clustered Everlasting	

BioNET search

Flora	Flora	Asteraceae	Cirsium vulgare	Spear Thistle
Flora	Flora	Asteraceae	Conyza bonariensis	Flaxleaf Fleabane
Flora	Flora	Asteraceae	Conyza spp.	A Fleabane
Flora	Flora	Asteraceae	Conyza sumatrensis	Tall fleabane
Flora	Flora	Asteraceae	Coreopsis lanceolata	Coreopsis
Flora	Flora	Asteraceae	Coronidium scorpioides	Button Everlasting
Flora	Flora	Asteraceae	Cymbonotus lawsonianus	Bear's Ear
Flora	Flora	Asteraceae	Cymbonotus preissianus	Austral Bear's Ear
Flora	Flora	Asteraceae	Euchiton involucratu	Star Cudweed
Flora	Flora	Asteraceae	Euchiton japonicus	
Flora	Flora	Asteraceae	Euchiton sphaericus	Star Cudweed
Flora	Flora	Asteraceae	Euchiton spp.	A Cudweed
Flora	Flora	Asteraceae	Gamochaeta purpurea	Purple Cudweed
Flora	Flora	Asteraceae	Glossocardia bidens	Cobbler's Tack
Flora	Flora	Asteraceae	Helichrysum leucopsidum	Satin Everlasting
Flora	Flora	Asteraceae	Hypochaeris glabra	Smooth Catsear
Flora	Flora	Asteraceae	Hypochaeris radicata	Catsear
Flora	Flora	Asteraceae	Lactuca serriola	Prickly Lettuce
Flora	Flora	Asteraceae	Lagenifera stipitata	Blue Bottle-daisy
Flora	Flora	Asteraceae	Lagenophora gracilis	Slender Lagenophora
Flora	Flora	Asteraceae	Lagenophora stipitata	Common Lagenophora
Flora	Flora	Asteraceae	Leucochrysum albicans	
Flora	Flora	Asteraceae	Olearia ramulosa	Twiggy Daisy-bush
Flora	Flora	Asteraceae	Ozothamnus diosmifolius	White Dogwood
Flora	Flora	Asteraceae	Podolepis jaceoides	Showy Copper-wire Daisy
Flora	Flora	Asteraceae	Senecio diaschides	
Flora	Flora	Asteraceae	Senecio hispidulus	Hill Fireweed
Flora	Flora	Asteraceae	Senecio jacobaea	Ragwort
Flora	Flora	Asteraceae	Senecio pinnatifolius var. pinnatifolius	
Flora	Flora	Asteraceae	Senecio prenanthoides	
Flora	Flora	Asteraceae	Senecio quadridentatus	Cotton Fireweed
Flora	Flora	Asteraceae	Senecio spp.	Groundsel, Fireweed
Flora	Flora	Asteraceae	Senecio tenuiflorus	A fireweed
Flora	Flora	Asteraceae	Solenogyne bellioides	Solengyne
Flora	Flora	Asteraceae	Solenogyne gunnii	Solengyne
Flora	Flora	Asteraceae	Sonchus asper	Prickly Sowthistle
Flora	Flora	Asteraceae	Sonchus oleraceus	Common Sowthistle
Flora	Flora	Asteraceae	Taraxacum officinale	Dandelion
Flora	Flora	Asteraceae	Tragopogon porrifolius subsp. porrifolius	Salsify

BioNET search

Flora	Flora	Asteraceae	Vernonia cinerea	
Flora	Flora	Asteraceae	Vernonia cinerea var. cinerea	
Flora	Flora	Asteraceae	Vittadinia cuneata	A Fuzzweed
Flora	Flora	Asteraceae	Vittadinia cuneata var. cuneata	A Fuzzweed
Flora	Flora	Asteraceae	Vittadinia muelleri	A Fuzzweed
Flora	Flora	Asteraceae	Vittadinia spp.	Fuzzweed
Flora	Flora	Asteraceae	Xerochrysum bracteatum	Golden Everlasting
Flora	Flora	Asteraceae	Xerochrysum spp.	
Flora	Flora	Asteraceae	Xerochrysum viscosum	Sticky Everlasting
Flora	Flora	Blechnaceae	Blechnum ambiguum	
Flora	Flora	Blechnaceae	Blechnum cartilagineum	Gristle Fern
Flora	Flora	Blechnaceae	Blechnum nudum	Fishbone Water Fern
Flora	Flora	Blechnaceae	Blechnum spp.	
Flora	Flora	Boraginaceae	Cynoglossum australe	
Flora	Flora	Boraginaceae	Echium plantagineum	Patterson's Curse
Flora	Flora	Boraginaceae	Echium vulgare	Viper's Bugloss
Flora	Flora	Boraginaceae	Hackelia latifolia	
Flora	Flora	Boraginaceae	Hackelia suaveolens	
Flora	Flora	Brassicaceae	Lepidium africanum	Common Peppercross
Flora	Flora	Brassicaceae	Lepidium pseudohyssopifolium	Peppercross
Flora	Flora	Campanulaceae	Lobelia purpurascens	whiteroot
Flora	Flora	Campanulaceae	Wahlenbergia communis	Tufted Bluebell
Flora	Flora	Campanulaceae	Wahlenbergia gracilis	Sprawling Bluebell
Flora	Flora	Campanulaceae	Wahlenbergia luteola	Bluebell
Flora	Flora	Campanulaceae	Wahlenbergia spp.	Bluebell
Flora	Flora	Campanulaceae	Wahlenbergia stricta	Tall Bluebell
Flora	Flora	Campanulaceae	Wahlenbergia stricta subsp. stricta	Tall Bluebell
Flora	Flora	Caprifoliaceae	Lonicera japonica	Japanese Honeysuckle
Flora	Flora	Caryophyllaceae	Cerastium glomeratum	Mouse-ear Chickweed
Flora	Flora	Caryophyllaceae	Petrorhagia nanteuillii	Proliferous Pink
Flora	Flora	Caryophyllaceae	Saponaria officinalis	Soapwort
Flora	Flora	Caryophyllaceae	Scleranthus biflorus	Two-flowered Knawel
Flora	Flora	Caryophyllaceae	Stellaria media	Common Chickweed
Flora	Flora	Caryophyllaceae	Stellaria pungens	Prickly Starwort
Flora	Flora	Casuarinaceae	Allocasuarina littoralis	Black She-Oak
Flora	Flora	Casuarinaceae	Allocasuarina nana	Dwarf She-oak
Flora	Flora	Casuarinaceae	Casuarina cunninghamiana subsp. c	River Oak
Flora	Flora	Chenopodiaceae	Dysphania pumilio	Small Crumbweed
Flora	Flora	Chenopodiaceae	Einadia hastata	Berry Saltbush

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Flora	Flora	Chenopodiaceae	Einadia trigonos subsp. trigonos		
Flora	Flora	Clusiaceae	Hypericum gramineum	Small St John's Wort	
Flora	Flora	Clusiaceae	Hypericum japonicum		
Flora	Flora	Clusiaceae	Hypericum perforatum	St. Johns Wort	
Flora	Flora	Convolvulaceae	Convolvulus erubescens	Pink Bindweed	
Flora	Flora	Convolvulaceae	Dichondra repens	Kidney Weed	
Flora	Flora	Convolvulaceae	Polymeria calycina		
Flora	Flora	Crassulaceae	Crassula sieberiana	Australian Stonecrop	
Flora	Flora	Crassulaceae	Crassula spp.	Stonecrop	
Flora	Flora	Cunoniaceae	Callicoma serratifolia	Black Wattle	
Flora	Flora	Cyatheaceae	Cyathea australis	Rough Treefern	P
Flora	Flora	Cyperaceae	Baumea rubiginosa		
Flora	Flora	Cyperaceae	Carex appressa	Tall Sedge	
Flora	Flora	Cyperaceae	Carex inversa	Knob Sedge	
Flora	Flora	Cyperaceae	Carex polyantha		
Flora	Flora	Cyperaceae	Carex spp.		
Flora	Flora	Cyperaceae	Caustis flexuosa	Curly Wig	P
Flora	Flora	Cyperaceae	Caustis spp.		P
Flora	Flora	Cyperaceae	Cyperus congestus		
Flora	Flora	Cyperaceae	Cyperus eragrostis	Umbrella Sedge	
Flora	Flora	Cyperaceae	Cyperus sphaeroideus		
Flora	Flora	Cyperaceae	Cyperus spp.		
Flora	Flora	Cyperaceae	Eleocharis acuta		
Flora	Flora	Cyperaceae	Gahnia aspera	Rough Saw-sedge	
Flora	Flora	Cyperaceae	Gahnia filifolia		
Flora	Flora	Cyperaceae	Gahnia melanocarpa	Black Fruit Saw-sedge	
Flora	Flora	Cyperaceae	Gahnia sieberiana	Red-fruit Saw-sedge	P
Flora	Flora	Cyperaceae	Gymnoschoenus sphaerocephalus	Button Grass	
Flora	Flora	Cyperaceae	Isolepis cernua	Nodding Club-rush	
Flora	Flora	Cyperaceae	Lepidosperma concavum		
Flora	Flora	Cyperaceae	Lepidosperma curtisiae		
Flora	Flora	Cyperaceae	Lepidosperma filiforme		
Flora	Flora	Cyperaceae	Lepidosperma gunnii		
Flora	Flora	Cyperaceae	Lepidosperma laterale	Variable Sword-sedge	
Flora	Flora	Cyperaceae	Lepidosperma limicola		
Flora	Flora	Cyperaceae	Lepidosperma spp.		
Flora	Flora	Cyperaceae	Lepidosperma urophorum		
Flora	Flora	Cyperaceae	Lepidosperma viscidum		
Flora	Flora	Cyperaceae	Schoenus apogon	Fluke Bogrush	

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Flora	Flora	Cyperaceae	Schoenus ericetorum	
Flora	Flora	Cyperaceae	Schoenus maschalinus	
Flora	Flora	Cyperaceae	Tricostularia pauciflora	
Flora	Flora	Dennstaedtiaceae	Pteridium esculentum	Bracken
Flora	Flora	Dicksoniaceae	Calochlaena dubia	Rainbow Fern
Flora	Flora	Dilleniaceae	Hibbertia aspera	Rough Guinea Flower
Flora	Flora	Dilleniaceae	Hibbertia obtusifolia	Hoary Guinea Flower
Flora	Flora	Dilleniaceae	Hibbertia pedunculata	
Flora	Flora	Dilleniaceae	Hibbertia riparia	
Flora	Flora	Dilleniaceae	Hibbertia serpyllifolia	Hairy Guinea Flower
Flora	Flora	Dilleniaceae	Hibbertia spp.	
Flora	Flora	Droseraceae	Drosera binata	Forked Sundew
Flora	Flora	Droseraceae	Drosera peltata	A Sundew
Flora	Flora	Droseraceae	Drosera spatulata	
Flora	Flora	Ericaceae	Astroloma humifusum	Native Cranberry
Flora	Flora	Ericaceae	Brachyloma daphnoides	Daphne Heath
Flora	Flora	Ericaceae	Dracophyllum secundum	
Flora	Flora	Ericaceae	Epacris longiflora	Fuchsia Heath
Flora	Flora	Ericaceae	Epacris microphylla	Coral Heath
Flora	Flora	Ericaceae	Epacris obtusifolia	Blunt-leaf Heath
Flora	Flora	Ericaceae	Epacris paludosa	Swamp Heath
Flora	Flora	Ericaceae	Epacris pulchella	Wallum Heath
Flora	Flora	Ericaceae	Epacris purpurascens	
Flora	Flora	Ericaceae	Epacris purpurascens var. onosmiflora	
Flora	Flora	Ericaceae	Epacris reclinata	Fuchsia Heath
Flora	Flora	Ericaceae	Leucopogon esquamatus	
Flora	Flora	Ericaceae	Leucopogon lanceolatus	
Flora	Flora	Ericaceae	Leucopogon lanceolatus var. lanceolatus	
Flora	Flora	Ericaceae	Leucopogon microphyllus	
Flora	Flora	Ericaceae	Leucopogon muticus	Blunt Beard-heath
Flora	Flora	Ericaceae	Leucopogon setiger	
Flora	Flora	Ericaceae	Lissanthe strigosa	Peach Heath
Flora	Flora	Ericaceae	Monotoca scoparia	
Flora	Flora	Ericaceae	Sprengelia incarnata	Pink Swamp Heath
Flora	Flora	Ericaceae	Styphelia tubiflora	Red Five-Corner
Flora	Flora	Ericaceae	Woolisia pungens	
Flora	Flora	Euphorbiaceae	Amperea xiphoclada	
Flora	Flora	Euphorbiaceae	Euphorbia peplus	Petty Spurge
Flora	Flora	Euphorbiaceae	Pseudanthus divaricatissimus	

BioNET search

Flora	Flora	Fabaceae (Caesalpinioideae)	<i>Gleditsia triacanthos</i>	Honey Locust
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea buxifolia</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea foliosa</i>	Leafy Bossiaea
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>	Variable Bossiaea
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea obcordata</i>	Spiny Bossiaea
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea prostrata</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Bossiaea</i> spp.	
Flora	Flora	Fabaceae (Faboideae)	<i>Chamaecytisus palmensis</i>	Tree Lucerne
Flora	Flora	Fabaceae (Faboideae)	<i>Cytisus scoparius</i> subsp. <i>scoparius</i>	English Broom
Flora	Flora	Fabaceae (Faboideae)	<i>Daviesia latifolia</i>	Bitter-pea
Flora	Flora	Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
Flora	Flora	Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i> subsp. <i>ulicifolia</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Desmodium gunnii</i>	Slender Tick-trefoil
Flora	Flora	Fabaceae (Faboideae)	<i>Desmodium varians</i>	Slender Tick-trefoil
Flora	Flora	Fabaceae (Faboideae)	<i>Dillwynia phyllicoides</i>	Parrot-pea
Flora	Flora	Fabaceae (Faboideae)	<i>Dillwynia retorta</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Dillwynia sericea</i>	Egg and Bacon Peas, Parrot Peas
Flora	Flora	Fabaceae (Faboideae)	<i>Dillwynia</i> spp.	
Flora	Flora	Fabaceae (Faboideae)	<i>Genista monspessulana</i>	Montpellier Broom
Flora	Flora	Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining glycine
Flora	Flora	Fabaceae (Faboideae)	<i>Glycine microphylla</i>	Small-leaf Glycine
Flora	Flora	Fabaceae (Faboideae)	<i>Glycine</i> spp.	
Flora	Flora	Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine
Flora	Flora	Fabaceae (Faboideae)	<i>Glycine tomentella</i>	Woolly Glycine
Flora	Flora	Fabaceae (Faboideae)	<i>Gompholobium huegelii</i>	Pale Wedge Pea
Flora	Flora	Fabaceae (Faboideae)	<i>Gompholobium uncinatum</i>	Red Wedge Pea
Flora	Flora	Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla
Flora	Flora	Fabaceae (Faboideae)	<i>Hovea heterophylla</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Hovea linearis</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian Indigo
Flora	Flora	Fabaceae (Faboideae)	<i>Medicago sativa</i>	Lucerne
Flora	Flora	Fabaceae (Faboideae)	<i>Melilotus albus</i>	Bokhara
Flora	Flora	Fabaceae (Faboideae)	<i>Mirbelia platylobioides</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Mirbelia rubiifolia</i>	Heathy Mirbelia
Flora	Flora	Fabaceae (Faboideae)	<i>Phyllota phyllicoides</i>	Heath Phyllota
Flora	Flora	Fabaceae (Faboideae)	<i>Phyllota squarrosa</i>	Dense Phyllota
Flora	Flora	Fabaceae (Faboideae)	<i>Podolobium ilicifolium</i>	Prickly Shaggy Pea
Flora	Flora	Fabaceae (Faboideae)	<i>Pultenaea flexilis</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Pultenaea subspicata</i>	Low Bush-pea

BioNET search

Flora	Flora	Fabaceae (Faboideae)	<i>Pultenaea tuberculata</i>	
Flora	Flora	Fabaceae (Faboideae)	<i>Trifolium arvense</i>	Haresfoot Clover
Flora	Flora	Fabaceae (Faboideae)	<i>Trifolium campestre</i>	Hop Clover
Flora	Flora	Fabaceae (Faboideae)	<i>Trifolium dubium</i>	Yellow Suckling Clover
Flora	Flora	Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover
Flora	Flora	Fabaceae (Faboideae)	<i>Trifolium spp.</i>	A Clover
Flora	Flora	Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common vetch
Flora	Flora	Fabaceae (Faboideae)	<i>Vicia sativa subsp. sativa</i>	Common Vetch
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia asparagoides</i>	
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia baileyana</i>	Cootamundra Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia brownii</i>	Heath Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia buxifolia</i>	Box-leaved Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia buxifolia subsp. buxifolia</i>	Box-leaved Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia dealbata</i>	Silver Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia dealbata subsp. dealbata</i>	Silver Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia decurrens</i>	Black Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia echinula</i>	Hedgehog Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia falcata</i>	
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia falciformis</i>	Broad-leaved Hickory
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia floribunda</i>	White Sally
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia gunnii</i>	Ploughshare Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia hamiltoniana</i>	Hamilton's Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia irrorata subsp. irrorata</i>	Green Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia longifolia subsp. longifolia</i>	Sydney Golden Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia melanoxylon</i>	Blackwood
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia myrtifolia</i>	Red-stemmed Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia obliquinervia</i>	Mountain Hickory
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia obtusifolia</i>	
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia siculiformis</i>	Dagger Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>	Sunshine Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia terminalis subsp. aurea</i>	
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	Prickly Moses
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia uncinata</i>	Gold-dust Wattle
Flora	Flora	Fabaceae (Mimosoideae)	<i>Acacia undulifolia</i>	
Flora	Flora	Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury
Flora	Flora	Gentianaceae	<i>Centaurium spp.</i>	
Flora	Flora	Geraniaceae	<i>Geranium homeanum</i>	
Flora	Flora	Geraniaceae	<i>Geranium molle subsp. molle</i>	Cranesbill Geranium

BioNET search

Flora	Flora	Geraniaceae	Geranium solanderi	Native Geranium
Flora	Flora	Geraniaceae	Geranium solanderi var. solanderi	
Flora	Flora	Geraniaceae	Geranium spp.	
Flora	Flora	Geraniaceae	Pelargonium spp.	
Flora	Flora	Gleicheniaceae	Gleichenia dicarpa	Pouched Coral Fern
Flora	Flora	Goodeniaceae	Dampiera stricta	
Flora	Flora	Goodeniaceae	Goodenia bellidifolia	
Flora	Flora	Goodeniaceae	Goodenia bellidifolia subsp. bellidifolia	
Flora	Flora	Goodeniaceae	Goodenia hederacea	Ivy Goodenia
Flora	Flora	Goodeniaceae	Goodenia hederacea subsp. hederacea	
Flora	Flora	Goodeniaceae	Goodenia heterophylla	
Flora	Flora	Goodeniaceae	Goodenia heterophylla subsp. montana	
Flora	Flora	Goodeniaceae	Goodenia ovata	Hop Goodenia
Flora	Flora	Goodeniaceae	Goodenia paniculata	
Flora	Flora	Goodeniaceae	Goodenia spp.	
Flora	Flora	Haloragaceae	Gonocarpus elatus	A Raspwort
Flora	Flora	Haloragaceae	Gonocarpus micranthus subsp. micranthus	
Flora	Flora	Haloragaceae	Gonocarpus tetragynus	Poverty Raspwort
Flora	Flora	Haloragaceae	Gonocarpus teucroides	Germander Raspwort
Flora	Flora	Haloragaceae	Haloragis heterophylla	Variable Raspwort
Flora	Flora	Hypoxidaceae	Hypoxis hygrometrica	Golden Weather-grass
Flora	Flora	Iridaceae	Crocasmia x crocosmiiflora	Montbretia
Flora	Flora	Iridaceae	Patersonia fragilis	Swamp Iris
Flora	Flora	Iridaceae	Patersonia glabrata	Leafy Purple-flag
Flora	Flora	Iridaceae	Patersonia longifolia	
Flora	Flora	Iridaceae	Patersonia sericea	Silky Purple-Flag
Flora	Flora	Iridaceae	Watsonia meriana	
Flora	Flora	Juncaceae	Juncus bufonius	Toad Rush
Flora	Flora	Juncaceae	Juncus continuus	
Flora	Flora	Juncaceae	Juncus planifolius	
Flora	Flora	Juncaceae	Juncus spp.	A Rush
Flora	Flora	Juncaceae	Juncus subsecundus	Finger Rush
Flora	Flora	Juncaceae	Juncus usitatus	
Flora	Flora	Juncaceae	Juncus vaginatus	
Flora	Flora	Juncaceae	Luzula spp.	
Flora	Flora	Lamiaceae	Ajuga australis	Austral Bugle
Flora	Flora	Lamiaceae	Mentha satureioides	Native Pennyroyal
Flora	Flora	Lamiaceae	Plectranthus parviflorus	
Flora	Flora	Lamiaceae	Salvia verbenaca	Vervain

BioNET search

Flora	Flora	Lauraceae	Cassytha glabella		
Flora	Flora	Lauraceae	Cassytha pubescens	Downy Dodder-laurel	
Flora	Flora	Linaceae	Linum marginale	Native Flax	
Flora	Flora	Lindsaeaceae	Lindsaea linearis	Screw Fern	
Flora	Flora	Loganiaceae	Mitrasacme polymorpha		
Flora	Flora	Lomandraceae	Lomandra confertifolia	Matrush	
Flora	Flora	Lomandraceae	Lomandra confertifolia subsp. pallida	Matrush	
Flora	Flora	Lomandraceae	Lomandra confertifolia subsp. rubiginosa		
Flora	Flora	Lomandraceae	Lomandra filiformis	Wattle Matt-rush	
Flora	Flora	Lomandraceae	Lomandra filiformis subsp. coriacea	Wattle Matt-rush	
Flora	Flora	Lomandraceae	Lomandra filiformis subsp. filiformis		
Flora	Flora	Lomandraceae	Lomandra glauca	Pale Mat-rush	
Flora	Flora	Lomandraceae	Lomandra longifolia	Spiny-headed Mat-rush	
Flora	Flora	Lomandraceae	Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush	
Flora	Flora	Lomandraceae	Lomandra obliqua		
Flora	Flora	Lomandraceae	Lomandra spp.	Mat-rush	
Flora	Flora	Loranthaceae	Amyema pendula subsp. pendula		
Flora	Flora	Loranthaceae	Muellerina eucalyptoides		
Flora	Flora	Lythraceae	Lythrum hyssopifolia	Hyssop Loosestrife	
Flora	Flora	Malaceae	Cotoneaster glaucophyllus		
Flora	Flora	Malaceae	Cotoneaster pannosus		
Flora	Flora	Malaceae	Cotoneaster spp.		
Flora	Flora	Malaceae	Crataegus monogyna	Hawthorn	
Flora	Flora	Malaceae	Malus domestica	Apple	
Flora	Flora	Malaceae	Pyracantha angustifolia	Orange Firethorn	
Flora	Flora	Malaceae	Pyracantha spp.		
Flora	Flora	Malvaceae	Brachychiton acerifolius	Illawarra Flame Tree	
Flora	Flora	Malvaceae	Modiola caroliniana	Red-flowered Mallow	
Flora	Flora	Moraceae	Ficus rubiginosa f. rubiginosa		
Flora	Flora	Myrtaceae	Baeckea linifolia	Weeping Baeckea	P
Flora	Flora	Myrtaceae	Calytrix tetragona	Common Fringe-myrtle	
Flora	Flora	Myrtaceae	Eucalyptus blaxlandii	Blaxland's Stringybark	
Flora	Flora	Myrtaceae	Eucalyptus bridgesiana	Apple Box	
Flora	Flora	Myrtaceae	Eucalyptus cinerea	Argyle Apple	
Flora	Flora	Myrtaceae	Eucalyptus cypellocarpa	Monkey Gum	
Flora	Flora	Myrtaceae	Eucalyptus dalrympleana	Mountain Gum	
Flora	Flora	Myrtaceae	Eucalyptus dives	Broad-leaved Peppermint	
Flora	Flora	Myrtaceae	Eucalyptus eugenioides	Thin-leaved Stringybark	
Flora	Flora	Myrtaceae	Eucalyptus fastigata	Brown Barrel	

BioNET search

Flora	Flora	Myrtaceae	<i>Eucalyptus globoidea</i>	White Stringybark		
Flora	Flora	Myrtaceae	<i>Eucalyptus goniocalyx</i>	Bundy		
Flora	Flora	Myrtaceae	<i>Eucalyptus laevopinea</i>	Silver-top Stringybark		
Flora	Flora	Myrtaceae	<i>Eucalyptus macrorhyncha</i>	Red Stringybark		
Flora	Flora	Myrtaceae	<i>Eucalyptus mannifera</i>	Brittle Gum		
Flora	Flora	Myrtaceae	<i>Eucalyptus mannifera</i> subsp. <i>gullickii</i>			
Flora	Flora	Myrtaceae	<i>Eucalyptus mannifera</i> subsp. <i>mannifera</i>	Brittle Gum		
Flora	Flora	Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box		
Flora	Flora	Myrtaceae	<i>Eucalyptus oreades</i>	Blue Mountains Ash		
Flora	Flora	Myrtaceae	<i>Eucalyptus ovata</i>	Swamp Gum		
Flora	Flora	Myrtaceae	<i>Eucalyptus pauciflora</i>	White Sally		
Flora	Flora	Myrtaceae	<i>Eucalyptus piperita</i>	Sydney Peppermint		
Flora	Flora	Myrtaceae	<i>Eucalyptus praecox</i>	Brittle Gum		
Flora	Flora	Myrtaceae	<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	V	V
Flora	Flora	Myrtaceae	<i>Eucalyptus radiata</i>	Narrow-leaved Peppermint		
Flora	Flora	Myrtaceae	<i>Eucalyptus radiata</i> subsp. <i>radiata</i>			
Flora	Flora	Myrtaceae	<i>Eucalyptus rubida</i> subsp. <i>rubida</i>			
Flora	Flora	Myrtaceae	<i>Eucalyptus sclerophylla</i>	Hard-leaved Scribbly Gum		
Flora	Flora	Myrtaceae	<i>Eucalyptus sieberi</i>	Silvertop Ash		
Flora	Flora	Myrtaceae	<i>Eucalyptus smithii</i>	Ironbark Peppermint		
Flora	Flora	Myrtaceae	<i>Eucalyptus viminalis</i>	Ribbon Gum		
Flora	Flora	Myrtaceae	<i>Harmogia densifolia</i>			
Flora	Flora	Myrtaceae	<i>Kunzea capitata</i>		P	
Flora	Flora	Myrtaceae	<i>Leptospermum arachnoides</i>			
Flora	Flora	Myrtaceae	<i>Leptospermum blakelyi</i>			
Flora	Flora	Myrtaceae	<i>Leptospermum grandifolium</i>	Woolly Teatree		
Flora	Flora	Myrtaceae	<i>Leptospermum juniperinum</i>	Prickly Tea-tree		
Flora	Flora	Myrtaceae	<i>Leptospermum lanigerum</i>	Woolly Teatree	P	
Flora	Flora	Myrtaceae	<i>Leptospermum morrisonii</i>			
Flora	Flora	Myrtaceae	<i>Leptospermum polyanthum</i>			
Flora	Flora	Myrtaceae	<i>Leptospermum polygalifolium</i>	Tantoon		
Flora	Flora	Myrtaceae	<i>Leptospermum rotundifolium</i>		P	
Flora	Flora	Myrtaceae	<i>Leptospermum trinervium</i>	Slender Tea-tree		
Flora	Flora	Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet		
Flora	Flora	Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet		
Flora	Flora	Oleaceae	<i>Ligustrum</i> spp.			
Flora	Flora	Onagraceae	<i>Epilobium billardierianum</i>			
Flora	Flora	Onagraceae	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>			
Flora	Flora	Onagraceae	<i>Oenothera stricta</i> subsp. <i>stricta</i>			

BioNET search

Flora	Flora	Orchidaceae	Acianthus exsertus	Mosquito Orchid	P
Flora	Flora	Orchidaceae	Acianthus fornicatus	Pixie Caps	P
Flora	Flora	Orchidaceae	Acianthus spp.	Mosquito Orchid	P
Flora	Flora	Orchidaceae	Caladenia carnea	Pink Fingers	P
Flora	Flora	Orchidaceae	Caladenia congesta	Black Tongue Caladenia	P
Flora	Flora	Orchidaceae	Caladenia cucullata	Hooded Caladenia	P
Flora	Flora	Orchidaceae	Caladenia fuscata	Dusky Fingers	P
Flora	Flora	Orchidaceae	Caladenia gracilis	Musky Caladenia	P
Flora	Flora	Orchidaceae	Caladenia spp.		P
Flora	Flora	Orchidaceae	Caladenia transitoria	Bronzed Caladenia	P
Flora	Flora	Orchidaceae	Caleana major	Large Duck Orchid	P
Flora	Flora	Orchidaceae	Chiloglottis spp.		P
Flora	Flora	Orchidaceae	Corybas hispidus	Bristly Helmet Orchid	P
Flora	Flora	Orchidaceae	Corybas spp.		P
Flora	Flora	Orchidaceae	Cryptostylis spp.		P
Flora	Flora	Orchidaceae	Dipodium punctatum		P
Flora	Flora	Orchidaceae	Diuris pardina	Leopard Orchid	P
Flora	Flora	Orchidaceae	Diuris sulphurea	Tiger Orchid	P
Flora	Flora	Orchidaceae	Eriochilus cucullatus	Parson's Bands	P
Flora	Flora	Orchidaceae	Genoplesium nudiscapum	Dense Midge Orchid	P
Flora	Flora	Orchidaceae	Microtis parviflora	Slender Onion Orchid	P
Flora	Flora	Orchidaceae	Microtis spp.		P
Flora	Flora	Orchidaceae	Microtis unifolia	Common Onion Orchid	P
Flora	Flora	Orchidaceae	Orchidaceae indeterminate	Orchids	
Flora	Flora	Orchidaceae	Prasophyllum odoratum	Rogers Scented Leek Orchid	P
Flora	Flora	Orchidaceae	Pterostylis coccina		P
Flora	Flora	Orchidaceae	Pterostylis longifolia	Tall Greenhood	P
Flora	Flora	Orchidaceae	Pterostylis parca		P
Flora	Flora	Orchidaceae	Pterostylis parviflora	Tiny Greenhood	P
Flora	Flora	Orchidaceae	Pterostylis pedunculata	Maroonhood	P
Flora	Flora	Orchidaceae	Pterostylis reflexa	Small Autumn Greenhood	P
Flora	Flora	Orchidaceae	Pterostylis spp.	Greenhood	P
Flora	Flora	Orchidaceae	Pterostylis truncata	Little Dumplings	P
Flora	Flora	Orchidaceae	Thelymitra pauciflora	Slender Sun Orchid	P
Flora	Flora	Orchidaceae	Thelymitra spp.		P
Flora	Flora	Osmundaceae	Todea barbara	King Fern	P
Flora	Flora	Oxalidaceae	Oxalis articulata		
Flora	Flora	Oxalidaceae	Oxalis exilis		
Flora	Flora	Oxalidaceae	Oxalis perennans		

BioNET search

Flora	Flora	Oxalidaceae	Oxalis radicata	
Flora	Flora	Oxalidaceae	Oxalis spp.	
Flora	Flora	Papaveraceae	Papaver spp.	
Flora	Flora	Phormiaceae	Dianella caerulea	Blue Flax-lily
Flora	Flora	Phormiaceae	Dianella caerulea var. caerulea	
Flora	Flora	Phormiaceae	Dianella caerulea var. producta	
Flora	Flora	Phormiaceae	Dianella longifolia	Blueberry Lily
Flora	Flora	Phormiaceae	Dianella longifolia var. longifolia	A Blue Flax Lily
Flora	Flora	Phormiaceae	Dianella revoluta	Blueberry Lily
Flora	Flora	Phormiaceae	Dianella revoluta var. revoluta	A Blue Flax Lily
Flora	Flora	Phormiaceae	Dianella tasmanica	
Flora	Flora	Phormiaceae	Stypandra glauca	Nodding Blue Lily
Flora	Flora	Phormiaceae	Thelionema caespitosum	Tufted Blue-lily
Flora	Flora	Phyllanthaceae	Phyllanthus hirtellus	Thyme Spurge
Flora	Flora	Phyllanthaceae	Poranthera corymbosa	
Flora	Flora	Phyllanthaceae	Poranthera microphylla	Small Poranthera
Flora	Flora	Phytolaccaceae	Phytolacca octandra	Inkweed
Flora	Flora	Pinaceae	Pinus radiata	Radiata Pine
Flora	Flora	Pittosporaceae	Billardiera scandens	Hairy Apple Berry
Flora	Flora	Pittosporaceae	Billardiera spp.	
Flora	Flora	Pittosporaceae	Bursaria calcicola	
Flora	Flora	Pittosporaceae	Bursaria spinosa	Native Blackthorn
Flora	Flora	Pittosporaceae	Bursaria spinosa subsp. lasiophylla	Native Blackthorn
Flora	Flora	Pittosporaceae	Bursaria spinosa subsp. spinosa	Native Blackthorn
Flora	Flora	Pittosporaceae	Rhytidosporum procumbens	
Flora	Flora	Plantaginaceae	Plantago debilis	Shade Plantain
Flora	Flora	Plantaginaceae	Plantago hispida	
Flora	Flora	Plantaginaceae	Plantago lanceolata	Lamb's Tongues
Flora	Flora	Plantaginaceae	Plantago varia	
Flora	Flora	Plantaginaceae	Veronica calycina	Hairy Speedwell
Flora	Flora	Plantaginaceae	Veronica derwentiana	
Flora	Flora	Plantaginaceae	Veronica derwentiana subsp. subglauca	
Flora	Flora	Plantaginaceae	Veronica plebeia	Trailing Speedwell
Flora	Flora	Poaceae	Anthosachne scabra	Wheatgrass, Common Wheatgrass
Flora	Flora	Poaceae	Anthoxanthum odoratum	Sweet Vernal Grass
Flora	Flora	Poaceae	Aristida echinata	
Flora	Flora	Poaceae	Aristida jerichoensis var. jerichoensis	Jericho Wiregrass
Flora	Flora	Poaceae	Aristida ramosa	Purple Wiregrass
Flora	Flora	Poaceae	Aristida spp.	A Wiregrass

BioNET search

Flora	Flora	Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass
Flora	Flora	Poaceae	<i>Austrostipa aristiglumis</i>	Plains Grass
Flora	Flora	Poaceae	<i>Austrostipa bigeniculata</i>	Yanganbil
Flora	Flora	Poaceae	<i>Austrostipa pubescens</i>	
Flora	Flora	Poaceae	<i>Austrostipa rudis</i>	
Flora	Flora	Poaceae	<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	A Speargrass
Flora	Flora	Poaceae	<i>Austrostipa scabra</i>	Speargrass
Flora	Flora	Poaceae	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Speargrass
Flora	Flora	Poaceae	<i>Austrostipa</i> spp.	A Speargrass
Flora	Flora	Poaceae	<i>Avena fatua</i>	Wild Oats
Flora	Flora	Poaceae	<i>Bothriochloa macra</i>	Red Grass
Flora	Flora	Poaceae	<i>Briza maxima</i>	Quaking Grass
Flora	Flora	Poaceae	<i>Briza minor</i>	Shivery Grass
Flora	Flora	Poaceae	<i>Bromus catharticus</i>	Praire Grass
Flora	Flora	Poaceae	<i>Bromus diandrus</i>	Great Brome
Flora	Flora	Poaceae	<i>Bromus hordeaceus</i>	Soft Brome
Flora	Flora	Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass
Flora	Flora	Poaceae	<i>Chloris truncata</i>	Windmill Grass
Flora	Flora	Poaceae	<i>Chloris virgata</i>	Feathertop Rhodes Grass
Flora	Flora	Poaceae	<i>Cortaderia</i> spp.	
Flora	Flora	Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass
Flora	Flora	Poaceae	<i>Cynodon dactylon</i>	Common Couch
Flora	Flora	Poaceae	<i>Dactylis glomerata</i>	Cocksfoot
Flora	Flora	Poaceae	<i>Deyeuxia decipiens</i>	Devious Bent-grass
Flora	Flora	Poaceae	<i>Dichelachne hirtella</i>	Plumegrass
Flora	Flora	Poaceae	<i>Dichelachne inaequiglumis</i>	
Flora	Flora	Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass
Flora	Flora	Poaceae	<i>Dichelachne parva</i>	
Flora	Flora	Poaceae	<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass
Flora	Flora	Poaceae	<i>Echinopogon caespitosus</i> var. <i>caesp</i>	Tufted Hedgehog Grass
Flora	Flora	Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
Flora	Flora	Poaceae	<i>Eleusine tristachya</i>	Goose Grass
Flora	Flora	Poaceae	<i>Entolasia marginata</i>	Bordered Panic
Flora	Flora	Poaceae	<i>Entolasia stricta</i>	Wiry Panic
Flora	Flora	Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass
Flora	Flora	Poaceae	<i>Eragrostis cilianensis</i>	Stinkgrass
Flora	Flora	Poaceae	<i>Eragrostis curvula</i>	African Lovegrass
Flora	Flora	Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
Flora	Flora	Poaceae	<i>Eragrostis parviflora</i>	Weeping Lovegrass

BioNET search

Flora	Flora	Poaceae	Hemarthria uncinata	Matgrass
Flora	Flora	Poaceae	Holcus lanatus	Yorkshire Fog
Flora	Flora	Poaceae	Microlaena stipoides	Weeping Grass
Flora	Flora	Poaceae	Microlaena stipoides var. stipoides	Weeping Grass
Flora	Flora	Poaceae	Nassella trichotoma	Serrated Tussock
Flora	Flora	Poaceae	Panicum decompositum	Native Millet
Flora	Flora	Poaceae	Panicum effusum	Hairy Panic
Flora	Flora	Poaceae	Panicum spp.	Panicum
Flora	Flora	Poaceae	Paspalum dilatatum	Paspalum
Flora	Flora	Poaceae	Paspalum urvillei	Vasey Grass
Flora	Flora	Poaceae	Phalaris aquatica	Phalaris
Flora	Flora	Poaceae	Plinthanthesis urvillei	
Flora	Flora	Poaceae	Poa labillardierei var. labillardierei	Tussock
Flora	Flora	Poaceae	Poa meionectes	
Flora	Flora	Poaceae	Poa sieberiana	Snowgrass
Flora	Flora	Poaceae	Poa sieberiana var. sieberiana	Snowgrass
Flora	Flora	Poaceae	Poa sieberiana var. sieberiana (fine leaf form)	
Flora	Flora	Poaceae	Polypogon monspeliensis	Annual Beardgrass
Flora	Flora	Poaceae	Rytidosperma bipartitum	Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma caespitosum	Ringed Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma monticola	Mountain Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma pallidum	Redanther Wallaby Grass; Silvertop Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma pilosum	Smooth-flowered Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma racemosum	Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma racemosum var. racer	Wallaby Grass
Flora	Flora	Poaceae	Rytidosperma setaceum	Small-flowered Wallaby-grass
Flora	Flora	Poaceae	Rytidosperma spp.	
Flora	Flora	Poaceae	Setaria parviflora	
Flora	Flora	Poaceae	Setaria spp.	
Flora	Flora	Poaceae	Sporobolus africanus	Parramatta Grass
Flora	Flora	Poaceae	Sporobolus creber	Slender Rat's Tail Grass
Flora	Flora	Poaceae	Tetrarrhena juncea	Wiry Ricegrass
Flora	Flora	Poaceae	Themeda triandra	
Flora	Flora	Poaceae	Triticum spp.	
Flora	Flora	Polygalaceae	Comesperma ericinum	Pyramid Flower
Flora	Flora	Polygalaceae	Comesperma volubile	
Flora	Flora	Polygalaceae	Polygala japonica	Dwarf Milkwort
Flora	Flora	Polygonaceae	Acetosella vulgaris	Sheep Sorrel
Flora	Flora	Polygonaceae	Rumex brownii	Swamp Dock

BioNET search

Flora	Flora	Polygonaceae	<i>Rumex crispus</i>	Curled Dock	
Flora	Flora	Portulacaceae	<i>Calandrinia calyptрата</i>		
Flora	Flora	Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	
Flora	Flora	Proteaceae	<i>Banksia cunninghamii</i>		
Flora	Flora	Proteaceae	<i>Banksia ericifolia</i>	Heath-leaved Banksia	
Flora	Flora	Proteaceae	<i>Banksia marginata</i>	Silver Banksia	
Flora	Flora	Proteaceae	<i>Banksia oblongifolia</i>	Fern-leaved Banksia	
Flora	Flora	Proteaceae	<i>Banksia serrata</i>	Old-man Banksia	
Flora	Flora	Proteaceae	<i>Banksia spinulosa</i>	Hairpin Banksia	P
Flora	Flora	Proteaceae	<i>Banksia spinulosa</i> var. <i>spinulosa</i>		P
Flora	Flora	Proteaceae	<i>Grevillea juniperina</i>		
Flora	Flora	Proteaceae	<i>Grevillea laurifolia</i>	Laurel-leaf Grevillea	
Flora	Flora	Proteaceae	<i>Grevillea rosmarinifolia</i> subsp. <i>rosmarinifolia</i>	Rosmary Grevillea	
Flora	Flora	Proteaceae	<i>Hakea dactyloides</i>	Finger Hakea	
Flora	Flora	Proteaceae	<i>Hakea laevipes</i> subsp. <i>laevipes</i>		
Flora	Flora	Proteaceae	<i>Hakea teretifolia</i>	Needlebush	
Flora	Flora	Proteaceae	<i>Isopogon anemonifolius</i>	Broad-leaf Drumsticks	P
Flora	Flora	Proteaceae	<i>Isopogon anethifolius</i>	Narrow-leaf Drumsticks	P
Flora	Flora	Proteaceae	<i>Lomatia myricoides</i>	River Lomatia	
Flora	Flora	Proteaceae	<i>Lomatia silaifolia</i>	Crinkle Bush	P
Flora	Flora	Proteaceae	<i>Persoonia chamaepitys</i>	Mountain Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia lanceolata</i>	Lance Leaf Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia laurina</i> subsp. <i>laurina</i>		P
Flora	Flora	Proteaceae	<i>Persoonia levis</i>	Broad-leaved Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia mollis</i>	Soft Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia myrtilloides</i> subsp. <i>myrtilloides</i>	Myrtle Geebung	P
Flora	Flora	Proteaceae	<i>Persoonia rigida</i>		P
Flora	Flora	Proteaceae	<i>Petrophile pulchella</i>	Conesticks	P
Flora	Flora	Proteaceae	<i>Symphionema montanum</i>		
Flora	Flora	Proteaceae	<i>Telopea speciosissima</i>	Waratah	P
Flora	Flora	Pteridaceae	<i>Cheilanthes sieberi</i>	Rock Fern	
Flora	Flora	Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Rock Fern	
Flora	Flora	Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard	
Flora	Flora	Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine	
Flora	Flora	Ranunculaceae	<i>Clematis</i> spp.		
Flora	Flora	Ranunculaceae	<i>Ranunculus lappaceus</i>	Common Buttercup	
Flora	Flora	Ranunculaceae	<i>Ranunculus plebeius</i>	Forest Buttercup	
Flora	Flora	Restionaceae	<i>Empodisma minus</i>		

BioNET search

Flora	Flora	Restionaceae	Lepyrodia scariosa		
Flora	Flora	Rhamnaceae	Cryptandra amara var. amara		
Flora	Flora	Rhamnaceae	Discaria pubescens	Australian Anchor Plant	
Flora	Flora	Rhamnaceae	Pomaderris andromedifolia		
Flora	Flora	Rhamnaceae	Pomaderris andromedifolia subsp. andromedifolia		
Flora	Flora	Rhamnaceae	Pomaderris angustifolia		
Flora	Flora	Rhamnaceae	Pomaderris eriocephala		
Flora	Flora	Rhamnaceae	Pomaderris ligustrina	Privet Pomaderris	
Flora	Flora	Rosaceae	Acaena agnipila	Hairy Sheep's Burr	
Flora	Flora	Rosaceae	Acaena echinata	Sheep's Burr	
Flora	Flora	Rosaceae	Acaena novae-zelandiae	Bidgee-widgee	
Flora	Flora	Rosaceae	Acaena ovina	Acaena	
Flora	Flora	Rosaceae	Rosa rubiginosa	Sweet Briar	
Flora	Flora	Rosaceae	Rubus fruticosus sp. agg.	Blackberry complex	
Flora	Flora	Rosaceae	Rubus moluccanus var. trilobus	Molucca Bramble	
Flora	Flora	Rosaceae	Rubus parvifolius	Native Raspberry	
Flora	Flora	Rosaceae	Rubus spp.		
Flora	Flora	Rosaceae	Rubus ulmifolius	Blackberry	
Flora	Flora	Rosaceae	Sanguisorba minor subsp. muricata	Sheep's Burnet	
Flora	Flora	Rubiaceae	Asperula conferta	Common Woodruff	
Flora	Flora	Rubiaceae	Asperula scoparia	Prickly Woodruff	
Flora	Flora	Rubiaceae	Coprosma quadrifida	Prickly Currant Bush	
Flora	Flora	Rubiaceae	Galium gaudichaudii	Rough Bedstraw	
Flora	Flora	Rubiaceae	Galium propinquum	Maori Bedstraw	
Flora	Flora	Rubiaceae	Nertera spp.		
Flora	Flora	Rubiaceae	Opercularia aspera	Coarse Stinkweed	
Flora	Flora	Rubiaceae	Opercularia diphylla	Stinkweed	
Flora	Flora	Rubiaceae	Opercularia hispida	Hairy Stinkweed	
Flora	Flora	Rubiaceae	Opercularia varia	Variable Stinkweed	
Flora	Flora	Rubiaceae	Pomax umbellata	Pomax	
Flora	Flora	Rutaceae	Boronia microphylla	Small-leaved Boronia	P
Flora	Flora	Rutaceae	Boronia rigens	Stiff Boronia	P
Flora	Flora	Rutaceae	Phebalium squamulosum subsp. ozc	Alpine Phebalium	P
Flora	Flora	Rutaceae	Philothea myoporoides subsp. myoporoides		P
Flora	Flora	Rutaceae	Philothea obovalis		P
Flora	Flora	Rutaceae	Philothea spp.		P
Flora	Flora	Rutaceae	Zieria cytisoides	Downy Zieria	
Flora	Flora	Rutaceae	Zieria laevigata	Smooth Zieria	
Flora	Flora	Salicaceae	Populus nigra	Lombardy Poplar	

BioNET search

Flora	Flora	Salicaceae	<i>Salix fragilis</i> var. <i>fragilis</i>	Crack Willow	
Flora	Flora	Salicaceae	<i>Salix</i> spp.		
Flora	Flora	Salicaceae	<i>Salix x pendulina</i>	Weeping Willow	
Flora	Flora	Salicaceae	<i>Salix x sepulcralis</i> var. <i>chrysocoma</i>	Golden Weeping Willow	
Flora	Flora	Santalaceae	<i>Exocarpos cupressiformis</i>	Cherry Ballart	
Flora	Flora	Santalaceae	<i>Exocarpos strictus</i>	Dwarf Cherry	
Flora	Flora	Santalaceae	<i>Leptomeria acida</i>	Sour Currant Bush	
Flora	Flora	Schizaeaceae	<i>Schizaea bifida</i>	Forked Comb Fern	
Flora	Flora	Scrophulariaceae	<i>Verbascum thapsus</i> subsp. <i>thapsus</i>	Great Mullein	
Flora	Flora	Scrophulariaceae	<i>Verbascum virgatum</i>	Twiggy Mullein	
Flora	Flora	Selaginellaceae	<i>Selaginella uliginosa</i>	Swamp Selaginella	
Flora	Flora	Simaroubaceae	<i>Ailanthus altissima</i>	Tree of Heaven	
Flora	Flora	Solanaceae	<i>Cyphanthera albicans</i> subsp. <i>albicans</i>		
Flora	Flora	Solanaceae	<i>Solanum aviculare</i>	Kangaroo Apple	
Flora	Flora	Solanaceae	<i>Solanum chenopodioides</i>	Whitetip Nightshade	
Flora	Flora	Solanaceae	<i>Solanum cinereum</i>	Narrawa Burr	
Flora	Flora	Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	
Flora	Flora	Solanaceae	<i>Solanum physalifolium</i> var. <i>nitidibaccatum</i>		
Flora	Flora	Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade	
Flora	Flora	Solanaceae	<i>Solanum pungetium</i>	Eastern Nightshade	
Flora	Flora	Solanaceae	<i>Solanum</i> spp.		
Flora	Flora	Stackhousiaceae	<i>Stackhousia monogyna</i>	Creamy Candles	
Flora	Flora	Stackhousiaceae	<i>Stackhousia</i> spp.		
Flora	Flora	Stackhousiaceae	<i>Stackhousia viminea</i>	Slender Stackhousia	
Flora	Flora	Stylidiaceae	<i>Stylidium graminifolium</i>	Grass Triggerplant	
Flora	Flora	Stylidiaceae	<i>Stylidium lineare</i>	Narrow-leaved Triggerplant	
Flora	Flora	Thymelaeaceae	<i>Pimelea curviflora</i>	Rice Flower	
Flora	Flora	Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower	
Flora	Flora	Thymelaeaceae	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>		
Flora	Flora	Ulmaceae	<i>Ulmus procera</i>		
Flora	Flora	Urticaceae	<i>Urtica incisa</i>	Stinging Nettle	
Flora	Flora	Xanthorrhoeaceae	<i>Xanthorrhoea media</i>		P
Flora	Flora	Xanthorrhoeaceae	<i>Xanthorrhoea</i> spp.		P
Flora	Flora	Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	
Flora	Flora	Violaceae	<i>Melicytus dentatus</i>	Tree Violet	
Flora	Flora	Violaceae	<i>Viola betonicifolia</i>	Native Violet	
Flora	Flora	Violaceae	<i>Viola hederacea</i>	Ivy-leaved Violet	
Flora	Flora	Violaceae	<i>Viola odorata</i>	Sweet Violet	
Flora	Flora	Orobanchaceae	<i>Euphrasia collina</i> subsp. <i>paludosa</i>	Eyebright	

BioNET search

Flora

Flora

Orobanchaceae

Euphrasia collina subsp. *speciosa*



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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 17/06/19 16:43:33

[Summary](#)

[Details](#)

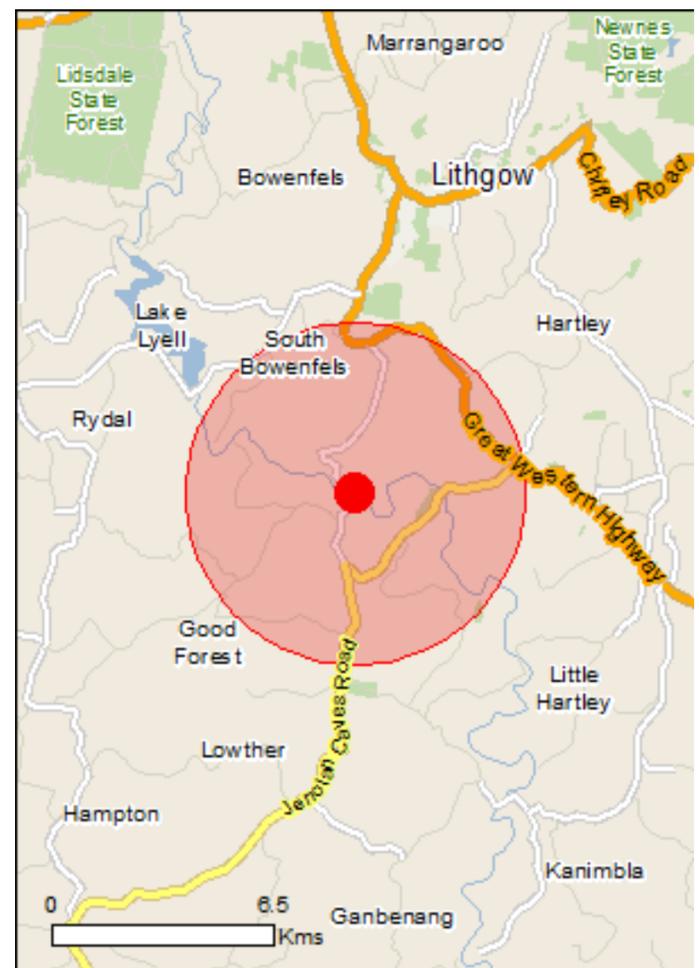
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

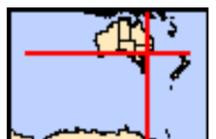
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km



Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	32
Listed Migratory Species:	13

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 <http://www.environment.gov.au/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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	38
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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.

Name	Status	Type of Presence
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat known to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area

Frogs

Name	Status	Type of Presence
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Insects		
Paralucia spinifera Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper [26335]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within 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]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia flocktoniae Flockton Wattle [3134]	Vulnerable	Species or species habitat likely to occur within area
Boronia deanei Deane's Boronia [8397]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus pulverulenta Silver-leaved Mountain Gum, Silver-leaved Gum [21537]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species

Name	Status	Type of Presence
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	habitat may occur within area Species or species habitat may occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat may occur within area
Pultenaea glabra Smooth Bush-pea, Swamp Bush-pea [11887]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-33.54992 150.12389

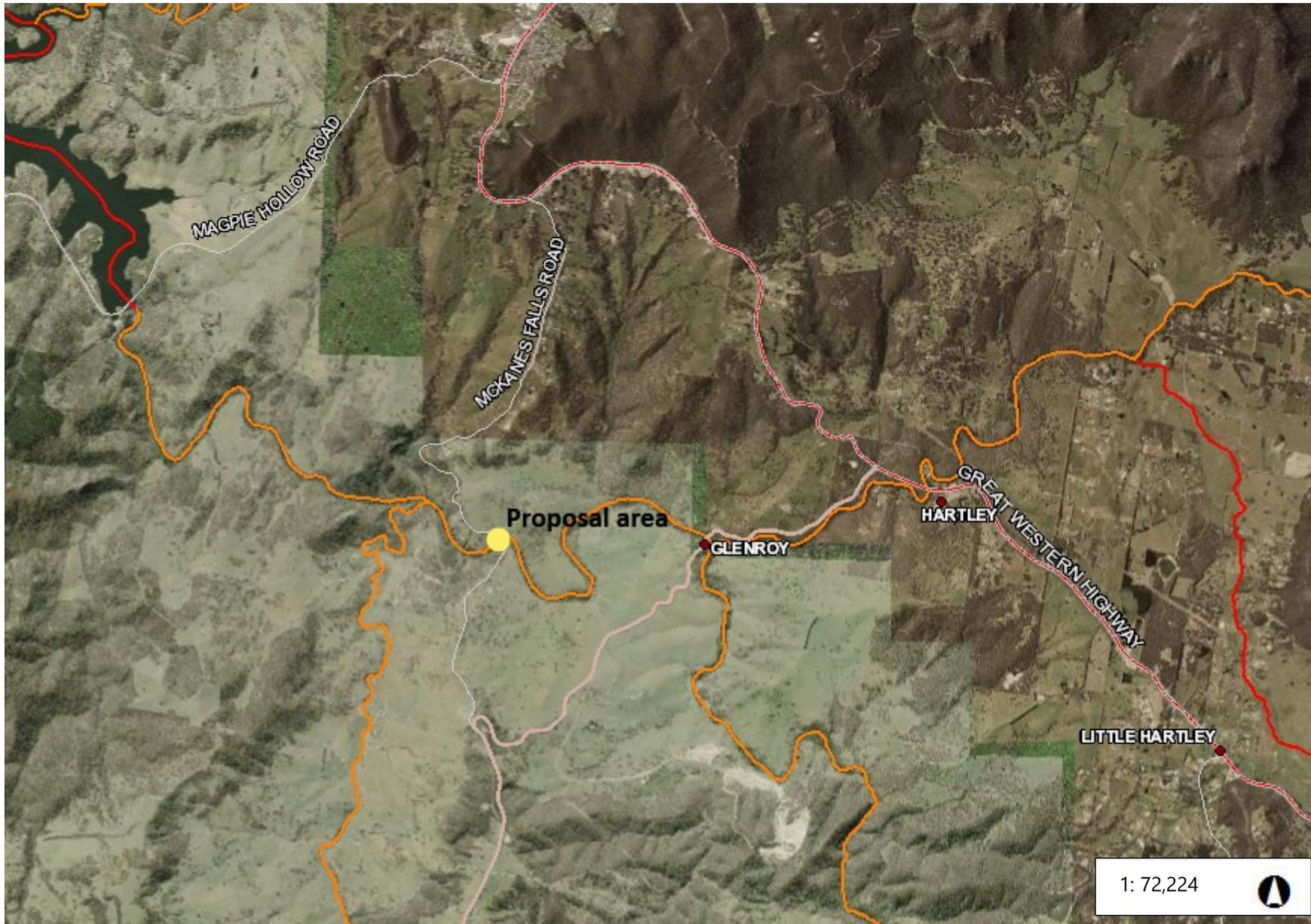
Acknowledgements

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

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

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

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



Legend

- Eastern Freshwater Cod
- Villages
- Localities
- Highways
- Regional Roads
- Major Roads
- Minor Roads
- Freshwater Fish Community Status
- Very Good
- Good
- Fair
- Poor
- Very Poor

1: 72,224



Notes

Key Fish Habitat LITHGOW



Source: data from the Australian Geoscience, NSW DPI, NSW DECC and NSW LPI
 Datum: Geocentric Datum of Australia (GDA)
 Grid: Mapping Grid of Australia (MGA94)

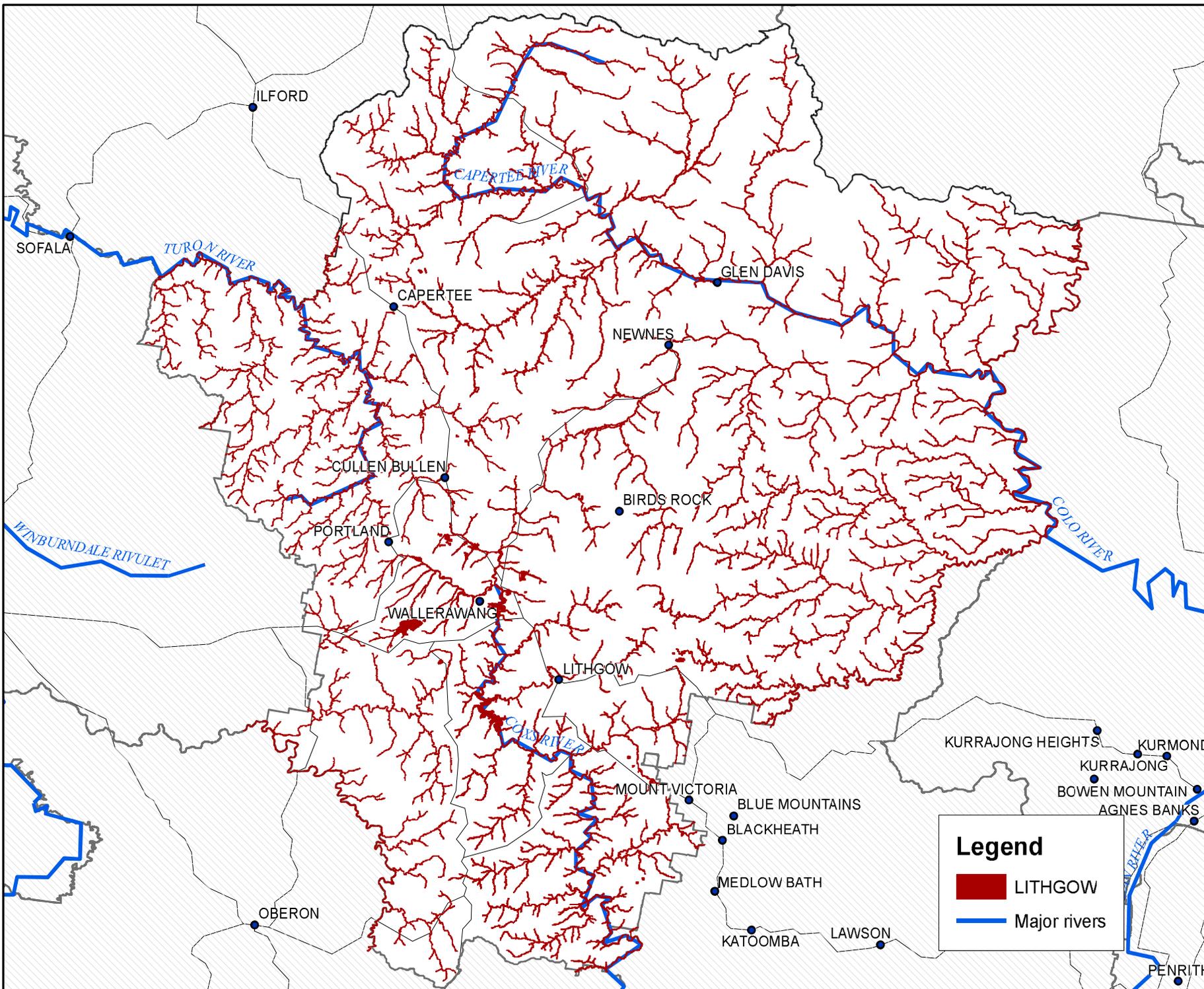
The State of New South Wales, the Department of Primary Industries, its employees, officers, agents or servants are not responsible for the result of any actions taken on the basis of the information contained on the map, or for any errors, omissions or inaccuracies that may occur on this map.

Prepared by GIS section, Fisheries Ecosystems Branch, Division of Agriculture & Fisheries, NSW DPI.



Legend

- LITHGOW
- Major rivers



Appendix F

Statement of Heritage Impact (SoHI)



Transport
Roads & Maritime
Services

Focus Bridge Engineering



NSW Roads and Maritime Services

McKanes Bridge BN1302 near Bowenfels, NSW

Statement of Heritage Impact for Proposed Capacity Upgrade

Revision 0

June 2018

Executive summary

McKanes Bridge

Constructed in 1893, McKanes Bridge has two 90 ft. McDonald timber truss spans supported by masonry abutments built in 1893 and a reinforced concrete pier replaced in 1987 after flood damage. The bridge is considered to be in poor condition and is currently load limited to 15 tonnes.

Project History

In 2012 Roads and Maritime Services (Roads and Maritime) started the process to rehabilitate McKanes Bridge. After extensive internal and external consultation, including consultation with the Office of Environment and Heritage (OEH), Roads and Maritime prepared extensive documentation including a Preferred Concept Options Report, Heritage Concept Sketches, a Conservation Management Plan and associated documentation. The project currently requires a Section 60 application be submitted for approval with a Statement of Heritage Impact as supporting information.

Heritage

Roads and Maritime considers that the retention of this structure would ensure that the oldest surviving example of a McDonald timber truss bridge in NSW is conserved. Conservation would be achieved by maintenance and necessary upgrades to the structure to offset the inherent lack of design capability. McKanes Bridge is one of four McDonald truss bridges and the only two span McDonald truss bridge in the operable Roads and Maritime timber truss bridge portfolio.

Summary of Heritage Impacts

Truss component	Significance grading*	Heritage impact*
Trusses		Overall Minor
Timber		
Top chords	Exceptional	Low
Bottom chords and butting blocks	Moderate	Minor
Principals and diagonals	High	Low
Cross girders	Little	Moderate
Metalwork		
Tension rods	Moderate	Low
Cast iron shoes	High	Low
Sway braces	High	Minor
Deck and railing		Overall Minor
Decking	Intrusive	Minor
Railing	Little	Minor
Monorail	Nil	Nil
Substructure		Overall Low
Abutments (masonry)	High	Low
Pier (concrete)	Little	Minor positive

* Significance grading by Roads and Maritime, * Heritage impact assessment by FBE

The overall heritage impacts have been assessed as of minor negative impact.

Recommendations

It is recommended that the works proceed on the basis of this assessment that the heritage impact of the proposed works would not result in a significant reduction of the heritage significance of McKanes Bridge. The proposal would enable Roads and Maritime to retain the bridges heritage significance as a rare example of a McDonald timber truss bridge providing a vital piece of road infrastructure and still performing the function for which it was originally designed and built.

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Appendices

Appendix A – Statutory and non-statutory heritage register search results

Appendix B – Overarching CMP policies comparison against the proposed capacity upgrade

Appendix C – Capacity upgrade heritage concept design sketches

1. Introduction

Focus Bridge Engineering (FBE) has been engaged by NSW Roads and Maritime Services (Roads and Maritime) to complete a Statement of Heritage Impact (SOHI) for the proposed strengthening works on McKanes Bridge over the Cocks River at Bowenfels.

This SOHI has been prepared in support of an application under Section 60 of the NSW *Heritage Act* 1977 to undertake modifications in order to strengthen the bridge to make it suitable for current traffic and loading requirements.

1.1 General

The Bridge over the Cocks River on McKanes Falls Road, 10 km south of Bowenfels is also known as McKanes Bridge (see Figures 1-1 and 3-2) and currently has a 15-tonne load limit.

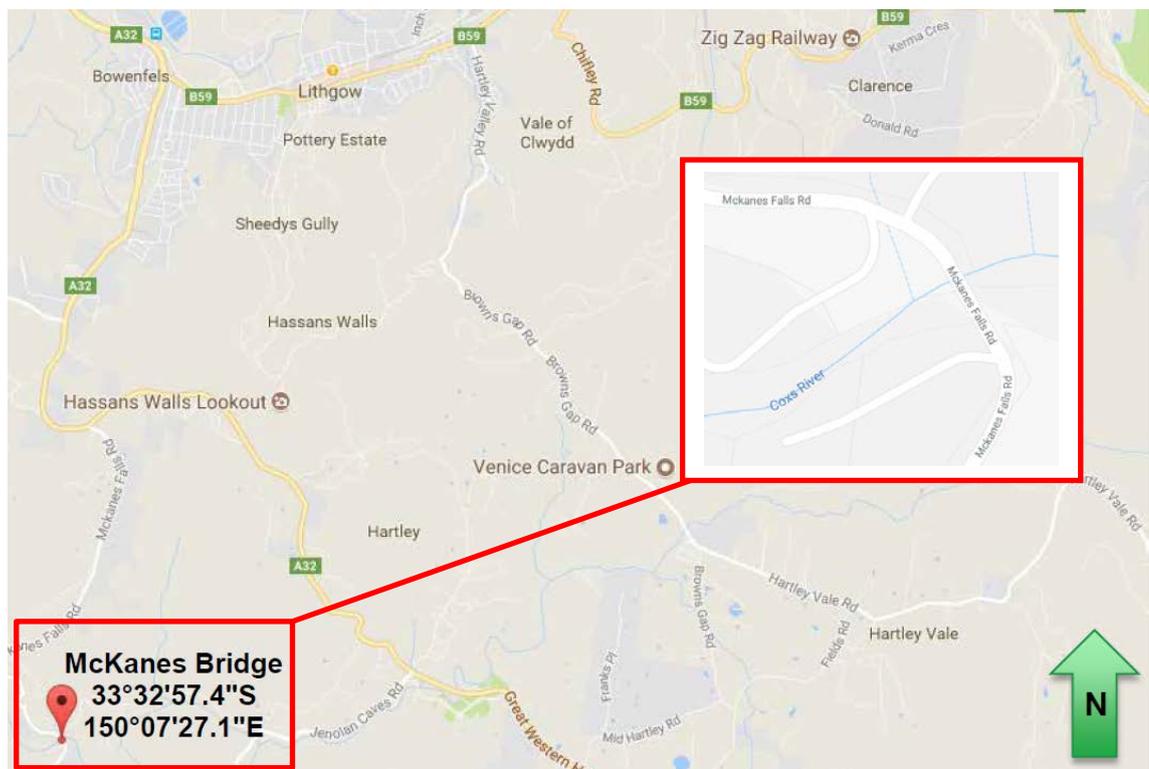


Figure 1-1 McKanes Bridge location plan (Source: Roads and Maritime)

The bridge is a McDonald timber truss bridge constructed in 1893 and is one of only four McDonald timber truss bridges remaining in NSW. The bridge has previously been assessed as being of State heritage significance and is listed on the NSW State Heritage Register (SHR).

1.2 Project background

In 2012 Roads and Maritime identified the need to upgrade the load capacity of McKanes Bridge in order to meet current load and safety requirements. In December of that year the NSW State Government announced that this work would be completed within the next 5 years and \$8 m was allocated to fund the project.

The bridge is currently in poor condition due to deterioration of the timber elements and is load limited to 15 tonnes. The current unrestricted weight of a vehicle travelling within the NSW network is 42.5 tonnes. There is a risk that a GML 42.5 tonne vehicle travelling across the bridge could cause significant damage.

Furthermore, the timber rails are substandard and do not meet current safety requirements for traffic barriers. There is a risk that if even a light vehicle (weight less than 2 tonnes, such as a car) hits the rail, it will travel through the rail and off the edge of the bridge deck, which could result in injury or loss of life of vehicle occupants.

Roads and Maritime has developed a bridge capacity upgrade design in response to these issues. The strengthening design includes replacing some timber elements with steel, replacing cast and wrought iron components with steel or new castings, modifying the bottom chord of the trusses, replacing the current timber decking with a Stress Laminated Timber (SLT) deck, supplementing the existing sway braces with steel knee braces and installing a steel traffic barrier across the truss spans.

1.3 Supplied information

The information supplied by Roads and Maritime is shown in Table 1-1.

Table 1-1 Supplied documents (Source: Roads and Maritime)

Document or reference	Date
Existing bridge information	
RMS Level 2 inspection	31 October 2017
RMS capacity and condition assessment report	February 2017
Copies of original WAE bridge plans sheet 1 to 15	1891 and 1892
Project information	
Project timeline excel spreadsheet prepared by RMS	April 2018
NSW Timber Truss Road Bridges Overarching Conservation Management Plan by RMS	February 2018
Updated RMS project brief P.0007222	18 January 2018
McKanes Bridge over Coxs River Conservation Management Plan by RMS	December 2017
Safety upgrade – preferred option selection report by RMS	December 2016
Concept heritage drawings revision B by Bridge Engineering	30 November 2016
Traffic barrier risk assessment by RMS	29 November 2016
OEH correspondence and clarifications 288 pages by RMS	June 2016
Heritage impacts in relation to SHR listing prepared by RMS	Unknown

FBE has not been supplied with the original Section 60 application or any associated supporting documentation.

1.4 Project limitations

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information provided by Roads and Maritime 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.

1.5 Project scope

Focus Bridge Engineering has been engaged by Roads and Maritime to undertake an analysis of the proposed strengthening works, and, based on that analysis, to prepare a SOHI for the proposed works covering:

- An assessment of the heritage impact of the proposed works on the bridge's significance.
- Comparative analysis of the proposed strengthening upgrade scope of works against the McKanes Bridge Conservation Management Plan (CMP) currently lodged with the Office of Environment and Heritage (OEH) and the NSW Timber Truss Road Bridges Overarching CMP recently endorsed by OEH.
- Prepare a formal Statement of Heritage Impact in accordance with NSW Heritage Manual requirements.
- Provide conclusions and recommendations based on the outcomes of this study.

This report may only be used and relied on by Roads and Maritime for the purposes agreed to between FBE and Roads and Maritime as set out in this report and our proposal dated 6 March 2018.

The scope of work was modified as per Section 2 of this report as the project progressed.

2. SOHI format

On 19 April 2018 a meeting was held in Sydney between Roads and Maritime and FBE to review the project's history, examine the extensive bridge documentation and agree on the revised format and presentation of the SOHI.

2.1 Project history

Roads and Maritime prepared a brief summary of the project chronology for the proposed McKanes Bridge capacity upgrade, which is funded under the Bridges for the Bush programme and is shown in Table 2-1.

Table 2-1 Project history (Source: Roads and Maritime)

Key date	Activity
November 2012	Project brief prepared and development work started.
December 2012	RMS announced McKanes Bridge would be upgraded as part of the Bridges for the Bush program.
7 February 2014	Initial design meeting held.
November 2015	Section 60 application submitted to OEH for the heritage upgrade design.
14 April 2016	OEH responded to the Section 60 application with a large number of queries, going back to questioning many of the fundamentals of RMS' approach to this type of upgrade. Ian Berger of RMS subsequently met with the relevant OEH Heritage Officer, and they exchanged further emails on the proposal.
December 2016	Preferred Option Report written, as requested by OEH, to support the Section 60 application.
January 2017	OEH advised RMS that in order to assess this and future Section 60 application, the following documents would be required: <ol style="list-style-type: none"> 1. Conservation Management Plan (CMP) for all RMS Timber Truss Bridges. This is the overarching document outlining RMS' approach to managing timber truss bridges in general. 2. CMP for each Timber Truss Bridge Type. This will outline the heritage conservation principles to be followed for the management of each timber truss bridge type (Allan, McDonald, Dare...etc). 3. CMP for each Individual Timber Truss Bridge. For each individual timber truss bridge (McKanes, Warroo, Beryl...etc). However since the McKanes Bridge Section 60 application had previously been submitted, OEH advised that a CMP would not be required for that Section 60 application to be assessed.

Table 2 1 continued... Project history (Source: Roads and Maritime)

Key date	Comment
February 2017	<p>Structural assessment was performed to determine the present load capacity of the bridge. The assessment found that the capacity of the bridge was currently less than one third of the original 16 tonne capacity. The assessment further identified damage to the bridge due to vehicle overloading as well as general deterioration of structural timber elements.</p> <p>The structural assessment determined the bridge was no longer deemed safe for use by vehicles other than light vehicles with gross mass less than or equal to 4.5 tonnes.</p> <p>It was further identified that if the condition of the bridge continues to deteriorate (either through exposure to the environment or damage caused by vehicle overloading) there was a real risk of significant damage to the structure.</p>
27 February 2017	4.5 tonne load limit signs installed on approach to the bridge.
March 2017	Section 60 application (submitted Nov 2015) withdrawn by RMS. The decision to withdraw the Section 60 was made by RMS Environment branch following advice received from OEH that the McKanes Bridge Section 60 application would require CMP's before OEH would complete an assessment.
August 2017	Temporary timber packing blocks were installed to temporarily strengthen the bridge.
6 October 2017	4.5 tonne load limit signs changed to 15 tonnes after review of the success of the temporary timber packing blocks.
December 2017	A CMP for the bridge was prepared and a final draft submitted to OEH for comment.
January 2018	Site meeting between RMS and OEH was held, where OEH confirmed the Section 60 Application for the bridge strengthening upgrade design could now be resubmitted, provided it was accompanied by the individual CMP and a SOHI.
16 January 2018	Project brief updated with the new project milestones.
2 February 2018	Bridge CMP and checklist submitted to OEH for assessment.
20 February 2018	Overarching CMP endorsed by Heritage Council.
March 2018	Focus Bridge Engineering engaged to prepare SOHI.

2.2 Fundamental heritage documentation

Roads and Maritime has prepared fundamental heritage documents that inform this SOHI, the two key reports being:

1. NSW Timber Truss Road Bridges Overarching Conservation Management Plan prepared in February 2018 and endorsed by OEH and the Heritage Council.
2. McKanes Bridge over Coxs River Conservation Management Plan prepared in December 2017 and currently under review by OEH.

Roads and Maritime has requested that this information be reviewed but not reinvented or restated in full as part of this SOHI. As the overarching CMP has been endorsed by OEH that document takes precedence over the yet to be endorsed McKanes Bridge CMP where relevant information is presented or cross referenced in this report.

2.3 Proposed SOHI format

The revised SOHI format was deemed necessary because the traditional SOHI approach appeared to be resulting in an overly long and complex report to comprehensively cover the extensive documentation and work completed to date. This was further complicated by the presentation in the supplied documents (Table 1-1) of the same information in slightly different formats and outputs, for example: the options presentation is covered by the preferred options report, McKanes Bridge CMP, heritage concept design drawings and the extensive project correspondence.

In addition, the repetition of a large amount of previously prepared documentation did not appear to meet and support in a succinct manner the requirements for the re-lodgement of the revised Section 60 application proposed by Roads and Maritime and OEH.

Roads and Maritime believed that the Section 60 could be re-submitted as long as the following was covered by the new submission:

1. Accompanying SOHI.
2. Clearly identify that the proposed works in the new Section 60 application align with the:
 - a. Overarching CMP
 - b. Bridge specific CMP
3. Supporting documentation (SOHI) has been independently written and provides an independent verification of the proposal, with particular reference to the overarching and bridge specific CMP's.

Consequently, in discussions with Roads and Maritime, it has been agreed that to make this SOHI as succinct as possible by adopting the following approach:

- Provide any additional new information solely for the purpose of informing or confirming the assumptions and work to date, rather than repetition of key documents. This covers:
 - Bridge condition
 - Bridge capacity
 - Proposal summary
- Remove sections comprehensively covered by the overarching and McKanes Bridge CMPs:
 - History and significance of McKanes Bridge
 - Brief history of timber truss bridges in NSW
- Cross reference the fundamental heritage documents only under:
 - Heritage listings and significance

- Schedule of significant forms and fabric
- Undertake heritage impact assessments independent of the previous CMPs:
 - Analysis of heritage impacts
 - Conclusions including summary of impacts
 - Recommendations
- Split the bridge structure into the following distinct elements for presentation and assessment throughout the report:
 - Truss capacity upgrade and strengthening
 - Deck replacement and traffic barrier upgrade
 - Substructure works including abutment strengthening and pier maintenance

Lastly, it was also proposed that the SOHI cross reference key documents rather than extract and replicate them in this report. Wherever possible new or the most current information has been presented or the existing documents summarised and succinctly presented to inform the SOHI.

3. McKanes Bridge

3.1 Description

The Bridge over the Coxs River on McKanes Falls Road, 10 km south of Bowenfels is also known as McKanes Bridge (see Figure 3-1 and 3-2).



Figure 3-1 McKanes Bridge (Source: Roads and Maritime)

The bridge was built in 1893 and has 2 spans consisting of timber McDonald trusses with a timber plank deck. The bridge carries one lane of traffic within a carriageway width between kerbs of 4.496 m. Each span is 27.432 m (90 ft.) long, making the total bridge length 54.864 m.

The bridge spans are supported by a central reinforced concrete pier and stone abutments. The central pier was constructed in 1987 after the original masonry structure suffered severe damage in a flood the previous year.

3.2 Conservation strategy

The existing McKanes Bridges was included as part of the *Timber Truss Bridge Strategy* completed by Roads and Maritime in July 2012. The strategy was developed to address the long-term management of timber truss bridges in NSW. The strategy, undertaken in consultation with the Heritage Council of NSW, aimed to establish a balance between infrastructure provision and heritage conservation.

McKanes Bridge was assessed as part of the strategy. The strategy found that:

“The retention of this structure would ensure that the oldest surviving example of a McDonald truss bridge in NSW is conserved. Conservation would be achieved by maintenance and necessary upgrades to the structure to offset inherent lack of design capability. McKanes Bridge is one of four McDonald truss bridges, and the only two span McDonald truss bridges in the operable RTA timber truss bridge portfolio.”

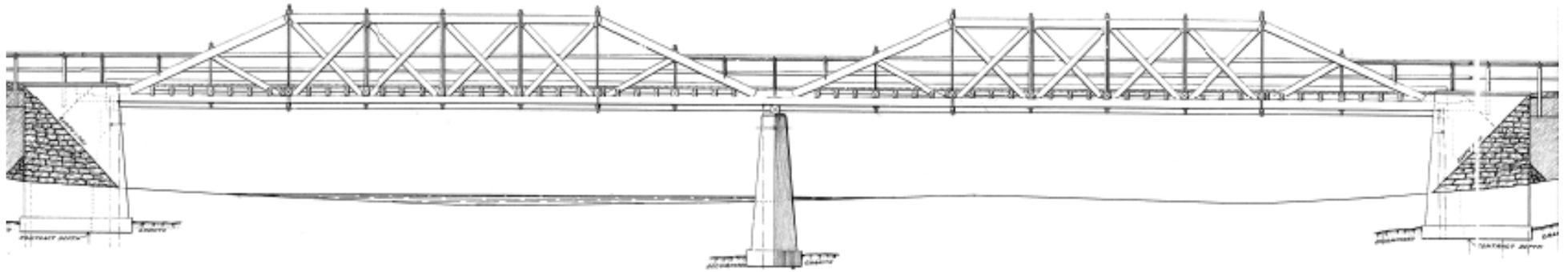


Figure 3-2 McKanes Bridge (Source: Roads and Maritime)

4. Bridge condition

Roads and Maritime undertakes Level 2 visual inspections annually on timber truss bridges as required by the current business rules. The last L2 inspection was completed on 31 October 2017 and is summarised in Table 4-1.

Roads and Maritime considers the bridge to be in poor condition.

Table 4-1 Physical condition summary (Source: Roads and Maritime)

BN1302		McKanes Bridge over Coxs River			Quantities: RMS			
Inspection Date:					Inspector: Bill Walker			
Element Code	Element Description	Health Rating	Total Qty*	Unit	Estimated quantity or percentage of total in Condition State			
					1	2	3	4
CPIR	Concrete-pier (excl hstk)	As-built	50	m ²	50	0	0	0
MAPP	Approach carriageway	As-built	2	ea	2	0	0	0
MATT	Misc attachments	As-built	2	Item	2	0	0	0
MBAT	Batter protection	As-built	96	m ²	96	0	0	0
MGCL	General cleaning	As-built	2	ea	2	0	0	0
MMAS	Brick/masonry/reinf earth	As-built	86	ea	86	0	0	0
MWES	Wearing surface	As-built	258	m ²	258	0	0	0
MWWY	Waterway	As-built	1	ea	1	0	0	0
RPNT	Railing paint work	Poor	118	m	0	0	0	118
TRIM	Timber railing	Good	118	m	0	118	0	0
TBJB	Truss butting/jack block	As-built	6	ea	6	0	0	0
TCHS	Capwales/headstocks/sill	As-built	3	ea	3	0	0	0
TDHO	Deck bolts	As-built	2	ea	2	0	0	0
TLSH	Decking	Poor	272	m ²	44	0	200	28
TPCH	Top/bottom chord	Fair	12	ea	10	1	1	0
TPTT	Truss paintwork	Poor	56	m	0	0	0	56

Table 4-1 continued... Physical condition summary (Source: Roads and Maritime)

BN1302		McKanes Bridge over Coxs River			Quantities: RMS			
Inspection Date					Inspector: Bill Walker			
Element Code	Element Description	Health Rating	Total Qty*	Unit	Estimated quantity or percentage of total in Condition State			
					1	2	3	4
TSBR	Truss bracing	As-built	12	ea	12	0	0	0
TSHO	Truss metal shoe	As-built	20	ea	20	0	0	0
TSTT	Truss strut	Poor	40	ea	29	5	3	3
TTCG	Truss cross girder	Fair	68	ea	51	13	4	0
TTIE	Truss tie (wrought iron)	Poor	24	ea	0	12	12	0

The L2 inspection rates the following elements as:

4.1.1 Poor condition

- Railing paint work.
- Decking.
- Timber truss paintwork.
- Timber truss struts (sway braces).
- Half of the truss ties (wrought iron hanger rods).

4.1.2 Fair condition

- Top/bottom chords.
- Truss cross girders.

4.1.3 Good condition

- Timber railing.

4.1.4 As-built

- Concrete pier.
- Masonry abutments.
- Wearing surface.
- Truss butting/jacking blocks.
- Capwales/headstocks.
- Deck bolts.
- Truss bracing.
- Truss metal shoes.

4.1.5 Maintenance actions

The last L2 report outlines the defects and required maintenance actions for McKanes Bridge and can be found in Table 4-2.

Table 4-2 Defects and required maintenance actions (Source: Roads and Maritime)

Bridge Number and Name: McKanes Bridge BN1302							
Description: 2 span McDonald timber truss bridge							
Inspector: Bill Walker							
Element Code	Defect Number	Activity	Inspectors Comment on Defect Severity and Required Action	Estimated Quantity	Unit	$R_f = P_f \times C_f$	Activity Inaction Risk
TLSH	1	M762 replace long sheet / decking	Replace longitudinal sheeting	272	m ²	9	Medium
TPCH	2	M757 replace principals / chords	Replace one top chord (marked on L2 inspection plan)	1	ea	9	Medium
TPTT	3	Repaint timber truss	Repaint timber truss	56	m ²	9	Medium
TSTT	4	M757 replace struts and ties	Replace six struts (marked on L2 inspection plan)	6	ea	16	High
TTCG	5	M757 replace truss cross girder	Remove and replace four cross girders (marked on L2 inspection plan)	4	ea	9	Medium
TTIE	6	M757 replace ties (steel, wrought iron)	Put camber back in trusses	24	ea	9	Medium

Where activity inaction risk (R_f) = probability (P_f) x consequence (C_f), and where probability (P_f) of safety or structural problem due to inaction = 1. Rare, 2. Could, 3. Might, 4. Will, 5. Expected, and consequences (C_f) of inaction = 1. Insignificant, 2. Minor, 3. Moderate, 4. Major, 5. Catastrophic.

5. Bridge capacity

The following is a brief summary of the *February 2017 Capacity and Condition Assessment of McKanes Bridge* prepared by Roads and Maritime.

5.1 Site investigations

The site investigations focused on the following key elements:

- Bottom chords.
- Principals.
- Connections.
- General deterioration.

5.1.1 Bottom chords

The report highlighted “*visual indications of overstress in the bottom chord would include opening of joints and loss of alignment*” as shown in Figure 5-1 and 5-2.



Figure 5-1 Bottom chord flitches opening of joints (Source: Roads and Maritime)



Figure 5-2 Bottom chord loss of alignment (Source: Roads and Maritime)

Furthermore, the report found that “*the most heavily stressed connection in the McDonald truss is the connection between the butting block and the bottom chord, which is a simple timber to timber connection. At the pier, the bottom chord is beginning to show signs of failure by crushing at this butting block connection detail*” as shown in Figure 5-3.



Figure 5-3 Bottom chord shear keys crushing (Source: Roads and Maritime)

5.1.2 Principals

The report also highlights “clear evidence of rot of both flitches at the interface with the timber spacer (the timber could be removed by hand). It is possible that this rot is due to the presence of sapwood, and therefore its extent would be limited to the corners of the timber. It is also possible (and likely) that the flitches contain heart, and the deterioration extends for the depth of the member at the interface with the spacer, thereby significantly weakening the principal” and “crushing of timber at locations of tension rods. Also of concern is the loose fit of the principal into the shoe”. Principal rot and crushing (typical) is shown in Figure 5-4.



Figure 5-4 Principal rot and crushing (Source: Roads and Maritime)

5.1.3 Connections

The report found that “the most heavily stressed wrought iron tension rods are threaded through bored holes in these cross girders, and so movement of cross girders has caused these tension rods to be damaged (bent). If one of the pair of tension rods fails then the truss will fail – there is no redundancy” and that “the principals have been packed with metal plates between the principals and the butting blocks to take up the slack of the elongated bottom chord, but the short timber diagonal below the principal is not sufficiently long or strong to restrict the primary cross girders from lateral movement. This means that the cross girders will continue to move and the tension rods continue to be bent.”

5.1.4 General deterioration

The report also found that “sometime in the past, concrete walls were installed to provide a barrier between the ends of the timber truss bottom chords and butting blocks and the soil retained by the masonry abutments. At three out of four locations these concrete walls are

working well. However, at one location, significant amounts of dirt have been collected so that the bottom chord is effectively buried in the dirt and there is also dirt on the butting block with grass growing in the dirt. It is not possible to inspect the timber at this location, but it is highly likely that the timber would be much deteriorated.

This is of considerable concern because of the criticality of the butting block to bottom chord connection which is a very heavily stressed timber to timber connection.”

5.2 Structural analysis

The theoretical analysis presented in the report for the bottom chord is shown in Table 5-1 and for the principals is shown in Table 5-2.

Table 5-1 Bottom chord capacity assessment (Source: Roads and Maritime)

Bottom Chord	Original	Existing
Timber type (strength)	Ironbark (joint group 1)	Various (joint group 2)
Laminate arrangement	Small number of long timbers	Large number of short timbers
Metal splice plates	Large long central metal plates	No splice plates
Ultimate Capacity (Tension)	2030 kN	615 kN
Design Capacity (Tension)	1220 kN	370 kN
Design Load for T44 + SW	1630 kN	1660 kN
Design Load for Self-Weight	520 kN	550 kN

Table 5-2 Principals capacity assessment (Source: Roads and Maritime)

Principal	Original	Existing
Timber type	Ironbark, no heart or sapwood	Various with heart & sapwood
Base spacer arrangement	Single large solid spacer	Two small spacers side by side
Ultimate Capacity (Compression)	2855 kN	1415 kN
Design Capacity (Compression)	2140 kN	1060 kN
Design Load for T44 + SW	1630 kN	1660 kN
Design Load for Self-Weight	510 kN	525 kN

5.3 Summary of findings

The report concluded that *“the truss bottom chords, connections and principals have been modified from the original design. The capacity of the bridge due to these modifications is approximately one third of original capacity.*

The truss timber is deteriorated and the bridge is beginning to show signs of structural distress.

The bridge is not likely to last 15-20 years without substantial work as was thought in the workshop. Rather, the bridge is in a condition that will require replacement or major upgrade in the short term.”

6. Heritage listings and significance of McKanes Bridge

McKanes Bridge was one of the last McDonald timber truss bridges built in NSW, being at the very juncture of the cessation of the construction of McDonald trusses in 1894 and the introduction of the later and highly successful Allan truss design in 1893. There are no known adjacent heritage items that contribute to the heritage significance of McKanes Bridge.

6.1 Heritage listings

Searches of statutory and non-statutory local, State and Commonwealth heritage registers have been undertaken. The result of the register searches is shown in Table 6-1. The results of the searches can also be found in Appendix A.

Table 6-1 Statutory and non-statutory listings (Source: see Table)

Heritage Listing	Status
Australian Heritage Database	Not listed
National Heritage List	Not listed
OEH State Heritage Register	Listed as item 01473
OEH State Heritage Inventory	Listed
Lithgow Local Environment Plan 2014	Listed as item A077
NSW National Trust Register	Not listed
Engineering Heritage Australia Engineering Heritage Register	Listed
NSW Roads and Maritime Services' S170 Heritage and Conservation Register	Listed

The statutory listings that are relevant to the proposed works are the SHR and Roads and Maritime's Section 170 register. As the bridge is listed on the SHR a Section 60 application to the OEH is required for the proposed works.

6.2 Heritage assessment

The NSW *Heritage Manual* document "Assessing heritage significance" provides guidance on assessing both the overall heritage significance of a heritage item or place and for determining the relative heritage significance of different components of a heritage item or place and thus the contribution each element makes to the overall significance of the item or place (NSW Heritage Office, 2001). This level of assessment can then provide guidance to owners or managers of heritage items or places regarding the likely impact of changes to individual components upon the significance of an item as a whole.

The NSW heritage assessment criteria used to assess the overall significance of a heritage item or place encompass the four values in the *Australia ICOMOS Burra Charter*, which are commonly accepted across the heritage profession in Australia and by government agencies, being:

- Historical significance
- Aesthetic significance
- Scientific significance
- Social significance

In NSW these values are expressed as criteria in more detailed form in order to; maintain consistency with the criteria of other Australian heritage agencies; minimise ambiguity during the assessment process and avoid the legal misinterpretation of the completed assessments of listed items. In NSW only two levels of significance are recognised, State and local. An item is considered to be of heritage significance if it meets one or more of the NSW heritage assessment criteria listed below.

6.3 NSW heritage assessment criteria

An item will be considered to be of State (or local) heritage significance if it meets one or more of the following criteria:

- Criterion (a)** – an item is important in the course, or pattern, of NSW’s cultural or natural history (or the cultural or natural history of the local area);
- Criterion (b)** – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW’s cultural or natural history (or the cultural or natural history of the local area);
- Criterion (c)** – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);
- Criterion (d)** – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;
- Criterion (e)** – an item has potential to yield information that will contribute to an understanding of NSW’s cultural or natural history (or the cultural or natural history of the local area);
- Criterion (f)** – an item possesses uncommon, rare or endangered aspects of NSW’s cultural or natural history (or the cultural or natural history of the local area);
- Criterion (g)** – an item is important in demonstrating the principal characteristics of a class of NSW’s
 - cultural or natural places; or
 - cultural or natural environments.(or a class of the local area’s
 - cultural or natural places; or
 - cultural or natural environments.)

Heritage significance is an expression of the cultural (or heritage) value afforded a place or item.

The following assessment and statement of significance is taken from the bridge’s SHR listing and the 2017 CMP as criteria b and e were not addressed in the SHR listing.

6.4 Heritage assessment and statement of significance

Table 6-2 NSW State Heritage Register listing

<p><i>Criteria a</i> <i>Historical significance</i></p>	<p><i>McDonald truss bridges have historical significance because timber truss bridges were developed and refined in Australia to achieve the highest level of timber bridge construction for the time of their design and the McDonald truss is an important recognisable design in the evolution of timber truss bridges in NSW. The bridge also has a historical link with the evolution of the local community. The probable association with Archibald McKane and his involvement with Mitchell's third expedition also lends some significance to the crossing itself. McKanes bridge is a relic of the NSW government's policies of the late nineteenth century which focused on the provision of land areas to facilitate an increase in production and trade throughout the state. Is associated with John A McDonald, designer of the McDonald Truss and a significant figure in the area of bridge design and construction in NSW.</i></p>
<p><i>Criteria b</i> <i>Associative significance</i></p>	<p><i>McKanes Bridge is the longest span surviving McDonald truss bridge in New South Wales. The excellence in design of the McDonald truss is historically significant as the second of five stages of timber truss road bridge design in New South Wales, showing the growing knowledge of timber as a structural material, and also the increasing vehicle weights requiring stronger bridges than before. McKanes Bridge is one example of the McDonald design which performed well beyond the expectations of the original designer, with four still remaining today after almost 125 years. The bridge is therefore able to demonstrate the State historical theme of "Technology". McKanes Bridge provided an essential link for the safe and reliable transport of produce and stock as well as enhancing a popular tourist and recreational route. It is historically significant through its association with the expansion of the New South Wales road network, and the contribution of that road system to settlement, development and economic activity throughout New South Wales. The bridge is therefore able to demonstrate the State historical theme of "Transport". The hardwood timbers used in the construction of timber truss bridges were second to none in Australia, and indeed compared favourably, both for strength and durability, with any timbers in the world. The original design demonstrates a time long gone when large dimensioned quality hardwood timber was plentifully available, and the later history of the bridge demonstrates the diminishing resource. McKanes Bridge meets this criterion at a State level.</i></p>
<p><i>Criteria c</i> <i>Aesthetic and technical significance</i></p>	<p><i>McDonald truss bridges have aesthetic significance because they are evocative of Australian methods of bridge construction, in their materials, scale and</i></p>

	<p>configuration they reflect and express nineteenth century technologies and experiences and for the time of their design and construction they demonstrate the best quality design available. The dark green painting and the valley setting complement the surrounding rural environment. McKanes Bridge is an excellent example of a two span McDonald Truss type bridge. The scale of the structure, the natural timber and other materials allow the bridge to meld with the surrounding landscape.</p>
<p>Criteria d Social significance</p>	<p>McDonald truss bridges have social significance because their size and location contribute directly to the local area and they are a strong element in the local environment. McKanes Bridge is located in farming country and is isolated, with few residents nearby. For these reasons there is little contemporary community association. However, the bridge forms part of local school bus routes and consequently is well known to the wider community. The bridge has been an important feature of one of the old routes to the Jenolan caves tourist area since its construction in 1893. Built to provide better access for traffic from Bowenfels to Lowther, Hampton and Jenolan Falls, it played a significant role for those people living, working and holidaying in the surrounding area.</p>
<p>Criteria e Research potential</p>	<p>McKanes Bridge contains some metal elements which are likely to be original, including cast iron shoes and wrought iron tension rods. These provide a future opportunity for materials testing and analysis to yield further information about the properties of iron used in bridges in the late 1800s. McKanes Bridge also contains original masonry fabric on both abutments, which may provide a future opportunity to yield further information about masonry construction in the late 1800s. However, the information gained by this analysis would not be substantial, and would also be available elsewhere. There is no known archaeological potential in the vicinity of the bridge. McKanes Bridge therefore does not meet this criterion at either a State or local level.</p>
<p>Criteria f Rarity</p>	<p>One of only four remaining McDonald truss bridges out of approximately 90 constructed, and the only remaining 90' span structure. One of very few timber truss bridges remaining in the Lithgow area. It is also the only surviving example of a twin span McDonald Truss road bridge in NSW McKanes Bridge meets this criterion at a State level.</p>

<p><i>Criteria g Representativeness</i></p>	<p><i>McKanes Bridge is a representative example of a two span, 90' McDonald truss bridge. The bridge is also representative of the first truss bridge design which can be considered uniquely Australian due to its local design and use of native timbers. The bridge is an example of the design which led to a rapid expansion in bridge construction throughout NSW and an excellent example of a twin span McDonald Truss in in good condition and easily accessible. The bridge still performs the function for which it was designed and built, which is to carry road traffic, although it is currently load limited.</i></p> <p><i>McKanes Bridge meets this criterion at a State level.</i></p>
<p><i>Integrity/Intactness</i></p>	<p><i>Elements of the truss are true to the original design although most or all of the timbers have been replaced as part of routine maintenance as with other parts of the bridge. The like for like replacement of timbers and other elements does not affect the integrity or intactness of the structure as timber truss bridge designs from the McDonald truss onwards were designed with replacement of elements in mind, knowing that timber elements would have a limited life, much shorter than the intended lifespan of the bridge.</i></p> <p><i>The masonry abutments are intact and have a high degree of integrity. The concrete central pier is a new addition having been installed after the original pier suffered irreparable damage in a flood. The concrete pier has reduced the integrity of the bridge as a whole.</i></p> <p><i>Despite this reduction in integrity the bridge still meets this criterion at a State level.</i></p>
<p><i>Assessed significance</i></p>	<p><i>State.</i></p>

6.5 Statement of significance

The SHR listing for McKanes Bridge provides the following statement of significance:

This bridge is a McDonald timber truss road bridge. Timber truss road bridges were extensively used in New South Wales because of the high quality of local hardwoods and the shortage of steel during the early decades of settlement of the state. The timber truss was highly developed for bridges in New South Wales, perhaps more so than anywhere else in the world at that time.

The McDonald truss is a significant evolutionary link in the development of timber road bridges in New South Wales and has three standard span lengths, 65'/19.96m, 75'/22.86m and 90'/27.43m. At March 1998 there were seven McDonald truss road bridges remaining in New South Wales, McKanes Falls Bridge being one of two with a 27.43m span and one of two in a double span configuration.

The bridge has been assessed as being of State heritage significance.

7. Schedule of significant forms and fabric

7.1 Criteria for assigning levels of significance to bridge elements

The *NSW Heritage Manual* document “Assessing heritage significance” provides guidance on assessing the relative heritage significance of different components of a heritage item or place and thus the contribution each element makes to the overall significance of the item or place (NSW Heritage Office, 2001).

This level of assessment can then provide guidance to owners or managers of heritage items or places regarding the likely impact of changes to individual components upon the significance of an item as a whole. Table 7-1 outlines the criteria used in the *NSW Heritage Manual* for determining the heritage significance of individual components.

Table 7-1 Grading system used for heritage significance (NSW Heritage Office, 2001)

Grading	Justification	Status
EXCEPTIONAL	Rare or outstanding element directly contributing to an item’s local or State significance.	Fulfils criteria for local or State listing.
HIGH	High degree of original fabric. Demonstrates a key element of the item’s significance. Alterations do not detract from significance.	Fulfils criteria for local or State listing.
MODERATE	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
LOW	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.
INTRUSIVE	Damaging to the item’s heritage significance.	Does not fulfil criteria for local or State listing.

7.2 Schedule of significant forms and fabric, McKanes Bridge

As part of the conservation management plan (page 117) Roads and Maritime has assessed the significant forms and fabric as shown in Table 7-2.

Roads and Maritime has requested that FBE adopt the significance grading presented in the *McKanes Bridge CMP (December 2017)* and only provide very brief comments without extensive justification if another significance grading could be considered.

Table 7-2 Summary of McKanes Bridge elements grading of significance prepared by Roads and Maritime (Source: McKanes Bridge CMP)

Bridge component	Significance grading
Trusses	
Timber	
Top chords	Exceptional
Bottom chords and butting blocks	Moderate
Principals and diagonals	High
Cross girders	Little
Metalwork	
Tension rods	Moderate
Cast iron shoes	High
Sway braces	High
Deck and railing	
Decking	Intrusive
Railing	Little
Monorail	Nil
Substructure	
Abutments (masonry)	High
Pier (concrete)	Little

In general, FBE is in agreement with the assessment shown in Table 7-2. However, FBE considers some elements could be assessed differently as follows:

7.2.1 Trusses

Timber

Bottom chords as EXCEPTIONAL given their detailing, splicing, shear keys and butting blocks are only found on McDonald trusses, of which only four remain.

Metalwork

Cast iron shoes as EXCEPTIONAL given that similar elements are only found on McDonald or old PWD trusses.

7.2.2 Deck and railing

Decking and railing as MODERATE given the evolution and changes over time of these elements providing an associated narrative of the bridge's history, as well as the type of fabric, but not the form, remaining unchanged. As per the guidance provided in the overarching CMP (page 20), a grading of intrusive significance should only be used if an element (or elements) have been modified to such an extent that it creates difficulty in interpreting not only the element, but also the bridge as a whole. Both the deck and the railing are easily interpreted, and thus do not affect the ability to interpret either of these elements or the bridge as a whole.

The monorail has been included in this bridge component. It is of nil significance and does not affect the significance of the bridge as a whole in a negative or positive manner.

7.2.3 Substructure

Pier as INTRUSIVE given its dominance of the bridge's overall aesthetic, both its form and fabric being unsympathetic to the bridge and as defined by the use of intrusive significance when assessing heritage timber truss bridges in the overarching CMP (page 20).

8. Project development

8.1 Background to the project

There were 407 timber truss road bridges originally constructed but most have been replaced with new structures on the same or similar alignments. Those that remain have difficulty in meeting modern road and traffic requirements, which in the longer term, will necessitate substantial upgrading or bridge replacement.

McKanes Bridge is one of these remaining structures and has been identified for capacity upgrading and strengthening. Whilst Roads and Maritime recognises the limitations of this bridge, it has been identified for retention in its *Timber Truss Bridge Conservation Strategy* (RMS 2012). Consequently, Roads and Maritime proposes to upgrade and strengthen the existing bridge in order to meet current load standards (T44 loading). In December 2016 a *Preferred Options Report* was prepared by Roads and Maritime.

8.2 Conservation policies

The key conservation policies for timber truss bridges are provided in the overarching CMP (page 34), ensuring timber truss bridges have a role and use in the life of local communities. The conservation policies compared against the projects objectives can be found in Appendix B and those key policies that relate specifically to this project are as follows:

8.2.1 Policy 6 – Use of the bridge

The continued use of these bridges as functioning crossings for vehicles and pedestrians is integral to their cultural significance and their survival. New work will be required to adapt the bridges to changing transportation needs.

8.2.2 Policy 7 – Maintenance and repair

The timber in timber truss bridges is generally not original fabric, and requires replacement from time to time. Some of the original designs were specifically detailed to accommodate these regular replacements of timber elements, and so the removal of deteriorated fabric and its replacement with new timber fabric of suitable species is essential for the conservation of these bridges.

8.2.3 Policy 8 – New work

New work will be required to adapt the bridges to changing transportation needs. The endorsed Strategy acknowledges the need to include the use of modern materials in capacity upgrades for most of the timber truss bridges to be retained in order to ensure that they have sufficient strength and safety for modern vehicles. The Strategy highlighted in particular that ancillaries (piers, abutments, approach spans and railings) will generally require replacement with modern materials and designs, and truss spans will often require some form of sympathetic strengthening.

The above policies aim to ensure that new works and new materials are not damaging to heritage significance, but are comparable with the old in quality and do not dominate the trusses in bulk, scale or character. Appropriate contemporary design using modern materials and techniques can be an effective way of distinguishing new work from original so long as it is used with care and design excellence.

In a more general manner the proposed works also align with Policy 1: Retention of cultural significance of the timber truss bridge population, and Policy 4: Conservation of a representative timber truss bridge population. Appendix B of this report contains a table in which the proposed works are assessed against each of the conservation policies in the overarching CMP.

Table 10-1 in Section 10 of this report summarises the effectiveness and success of this process during the concept design development phase of the capacity upgrade project.

8.3 Option development and assessment

Roads and Maritime identified six options during the development process:

1. Do nothing.
2. Like for like replacement.
3. Upgrade truss capacity only.
4. Upgrade truss and traffic barrier load capacity.
5. Demolish and replace the bridge.
6. Convert the bridge to a pedestrian bridge.

Option 4 was selected as the preferred option.

For further detail of the other five options and why they were discounted, see the *Preferred Option Report* prepared by Roads and Maritime dated December 2016.

8.4 Upgrade truss and traffic barrier load capacity

Option 4 involves upgrading the load capacity of the McDonald timber trusses to allow access to General Mass Limits (GML) vehicles (42.5 tonne semi-trailers) with acceptable levels of safety for vehicle loads. This option would require relatively minor changes to the truss bottom chords and replacement of brittle cast iron elements with steel. In this option, the timber traffic barriers would be replaced with stronger steel barriers.

To support the steel barriers, some timber elements (such as cross girders) would need to be replaced with steel elements. The existing timber deck format cannot meet the increased load requirement, so a stronger deck type is required.

In order to make the existing sway bracing on the truss effective for lateral restraint, steel knee braces would also be added to each sway brace in order that they not act as tension and compression members and instead act to restrain lateral movement of the top chord.

The stress laminated timber (SLT) deck format provides added safety benefits to cyclists by eliminating the risk of bicycle wheels becoming stuck between the gaps in the current timber plank type deck sheeting. This has occurred at McKanes Bridge in the past, resulting in a cyclist being thrown from their bicycle and sustaining serious injuries.

The brief summary of the advantages and disadvantages of the proposed capacity upgrade are shown in Table 8-1.

Table 8-1 Capacity upgrade advantages and disadvantages (Source: FBE)

Advantages	Disadvantages
<ul style="list-style-type: none"> • All project objectives are met. • Minimal heritage impact. • The bridge load capacity would be suitable for safe access of GML ST42.5t vehicles. • Bridge traffic barrier safety improved. • Consistent with Roads and Maritime's Timber Truss Bridge Conservation Strategy. 	<ul style="list-style-type: none"> • Greater heritage impact than purely like for like replacement option.

The proposed modifications are shown in the plans for the upgraded design in Appendix C.

9. The Proposal

The proposed McKanes Bridge capacity upgrade heritage concept design drawings prepared by Roads and Maritime Bridge and Structural Engineering Branch can be found in Appendix C.

9.1 Proposal background and objectives

Roads and Maritime proposes to upgrade the capacity of and strengthen McKanes Bridge with the primary intention of ensuring the rehabilitated structure meets current community needs, expectations and legal requirements whilst maintaining the heritage value of the structure.

The operational constraints which arise from McKanes Bridge remaining a functioning part of the NSW road network centre upon the need for Roads and Maritime to ensure that the bridge operates in a safe manner and fulfils traffic requirements. Therefore, it is essential that the bridge be able to meet current traffic load requirements and that no load limit be applied to the bridge. Roads and Maritime requires its bridges to meet the minimum ST42.5 vehicle loading. The bridge is currently load limited to 15 tonnes. Even with load limit warnings in place, there is no guarantee that drivers of vehicles exceeding 15 tonnes will not try to cross the bridge, with potentially catastrophic results.

The proposed works would result in an upgraded structure that is able to be retained as a functioning road bridge without a load restriction. Whilst the works would have an impact upon the form, fabric and thus heritage significance of the bridge, they have been designed to be as respectful as possible of that significance whilst ensuring it can remain in use. The ability of the bridge to continue to function as a road bridge is important in retaining its heritage significance.

9.2 Proposed upgrade and strengthening works

The proposed works are summarised in Table 9-1 and shows how they align with the original design, current arrangements on the bridge and the proposed design for the capacity upgrade works.

Table 9-1 Bridge elements by original design, current arrangement versus proposed design (Source: FBE)

Bridge element	Original design	Current arrangement	Proposed design	Summary of change
Trusses				
Timber				
Top chords	Single flitch member, heart free timber	Single flitch member, mixture of heart free and boxed heart	Single flitch member with boxed heart	All timbers to be boxed heart
Bottom chords	Bolt laminated long timbers with timber shear keys at butting blocks and notches to accommodate cross girders	Bolt laminated short spliced timbers with timber shear keys at butting blocks and no notches for cross girders	Bolt laminated short timbers with external steel strengthening plates, steel shear keys at butting blocks, reinstate cross girder notch, original bolting arrangement	Introduction of external steel plates and steel shear keys to strengthen the new short timbers with restoration of cross girder notching and bolting arrangements
Principals and diagonals	Principals double flitch, diagonals single or double flitches	Principals double flitch, diagonals single or double flitches	Principals double flitch, diagonals single or double flitches	No change
Cross girders	Timber	Timber	Steel main and timber intermediate	Steel rather than timber cross girders at main truss panel points
Metalwork				
Tension rods	Wrought iron rods	Wrought iron rods	Steel rods	Change in material but no change in dimensions
Cast iron shoes	Cast iron	Cast iron	Spheroidal graphite (SG)* cast iron	Change in material strength/properties
Sway braces	Wrought iron	Wrought iron	Steel replacement and new vertical knee brace	Change in material and additional vertical brace

Table 9-1 continued... Bridge elements by original design, current arrangement versus proposed design (Source: FBE)

Bridge element	Original design	Current arrangement	Proposed design	Summary of change
Deck and railing				
Deck	Diagonal transverse planks	Longitudinal deck planks only	Stress laminated timber deck	New SLT deck
Monorail	Not included	Existing galvanised monorail	New monorail	Upgraded monorail
Railing	Small rectangular section timbers connected to the truss diagonals and principals	Timber ordnance railing	Modern architecturally designed steel traffic barrier	New barrier design with a change in fabric from timber to steel and change in colour from white to grey
Substructure				
Abutments	Masonry blockwork and timber sill logs	Masonry blockwork, hidden concrete curtain wall and timber sill logs	New hidden concrete curtain wall, new steel sill beam and rock scour protection. Original masonry blockwork to be retained	New steel sill beam, concrete curtain wall and scour protection
Pier	Masonry pier	Two reinforced concrete piles supported by concrete headstock	No change, bridge grey protective coating only	Application of anti-graffiti protective coating

* Spheroidal graphite cast iron is a form of ductile cast iron as a result of the graphite being in the form of spherical nodules, hence the name spheroidal graphite. In contrast, the graphite flakes found in grey cast iron makes this material brittle and non-ductile.

10. Assessment of heritage impact

The impact of the proposed capacity upgrade of the bridge upon its heritage significance has been assessed in the most part using the questions listed in the NSW HO, DUAP document “Statements of Heritage Impact” (HO, DUAP, 1996). The intent of preparing a SOHI is to enable the impacts of proposed work upon a heritage item to be understood, and thus to enable an informed decision to be made on whether to allow the works to proceed. The following questions are presented in “Statements of Heritage Impact” as the minimum response required to properly address proposals for works on heritage items which would result in the alteration of an item.

Appendix B provides two comparison tables of the proposed works compliance with the *Overarching Timber Truss Road Bridges CMP* policies (Table B1) and *McKanes Bridge CMP* policies (Table B2).

Note as the existing monorail is of nil heritage significance and the proposed upgraded monorail would not be of any greater or lesser significance, its replacement has been assessed as being of nil heritage impact and is not addressed further in the following section of this report.

10.1 Does the proposal align with the overarching and individual CMPs?

The proposed capacity upgrade by bridge element has been briefly described and compared against the overarching and bridge specific CMPs for consistency and a brief assessment on the heritage impacts has been prepared as shown in Table 10-1. The impacts of the proposal are discussed further in the following sections of the SOHI.

Table 10-1 The capacity upgrade proposal alignment with overarching and specific CMP's and summary of heritage impacts (Source: FBE)

Bridge element	Proposed capacity upgrade	Aligns with overarching CMP	Aligns with bridge specific CMP	Summary of heritage impact(s)
Trusses				Overall MINOR negative
Timber				
Top chords	New timber with no changes in dimensions	Yes	Yes	Low
Bottom chords	New external steel strengthening plate and new steel butting block shear keys	Yes	Yes	Minor negative
Principals and diagonals	New timbers with no changes in dimensions	Yes	Yes	Low
Cross girders	New painted steel main panel point cross girder, new timber intermediate girders with no changes in dimensions	Yes	Yes	Moderate negative
Metalwork				
Tension rods	New steel rods with no changes in dimensions	Yes	Yes	Low
Cast iron shoes	New SG cast shoes to match existing	Yes	Yes	Low
Sway braces	New strengthened knee brace New additional vertical steel sway brace	Yes – new strengthened Not presented	Yes – new strengthened Not presented by policy but proposed in Appendix A heritage sketch 4 of 8	Minor negative – introduces new element which would be observable from the deck and side view vantages

Table 10-1 continued... The capacity upgrade proposal alignment with overarching and specific CMPs and summary of heritage impacts (Source: FBE)

Bridge element	Proposed capacity upgrade	Aligns with overarching CMP	Aligns with bridge specific CMP	Summary of heritage impact(s)*
Deck and railing				Overall MINOR negative
Deck	Stress laminated timber deck	Yes	Yes	Minor negative
Railing	Modern architecturally designed steel traffic barrier painted bridge grey	Yes	Yes	Minor – new modern design traffic barrier/railing
Substructure				Overall LOW
Abutments	Repair and strengthen	Yes	Yes	Low
Pier	Painting & protective coating	Yes	Yes	Minor positive

* **Note:** The rationale behind ascribing different degrees of heritage impacts is as follows:

Major negative impact - substantially affects fabric or values of State significance, *Moderate negative impact* - irreversible loss of fabric or values of local significance; minor impacts on State significance, *Minor negative impacts* - reversible loss of locally significant fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values.

Nil, Negligible or Low impacts - does not affect heritage values either negatively or positively.

Major positive impacts - enhances conservation of State or local significance, encourages sympathetic planning and sustainable development, *Moderate positive impacts* - enhances access to, understanding or conservation of fabric or values of State significance, *Minor positive impact* - enhances access to, understanding or conservation of fabric or values of local significance.

10.2 What aspects of the Proposal respect or enhance the heritage significance of McKanes Bridge?

The overall proposal seeks to respect and enhance the heritage significance of McKanes Bridge by retaining the form of the trusses, deck and substructure as close as possible to the original design and restoring all deteriorated fabrics to their original condition.

The proposal aims to ensure that it remains in operation as a road bridge, whilst retaining its aesthetic and technical significance.

The proposed works have an extensive project history and are compliant with the *Overarching Timber Truss Road Bridges CMP, February 2018*.

10.2.1 Trusses

The proposal seeks to respect and enhance the aesthetic significance of the bridge by keeping the form and fabric of the trusses as close as possible to the original design. The proposed works would also enhance the bridge's technical significance by restoring the original truss geometry and design details; making the size and interconnections of the most significant truss members more faithful to McDonald's 1891 design than at present.

10.2.2 Deck and railing

The proposed SLT deck installation respects the history of the bridge and timber bridges as a whole by adding to the narrative of timber deck evolution in NSW. In particular, timber truss bridge decks have changed over time to meet the inevitable changes in traffic volumes, usage, vehicle types and increased loading. SLT decks have been used in a number of bridge rehabilitations including Hinton, Dunmore, Glennies Creek and Tharwa Bridges.

The new traffic barrier railing has been developed by Roads and Maritime in conjunction with OEH to minimise the impacts on the aesthetics of timber truss bridges by being less visually intrusive in form and colour than previous steel barrier designs (See Figure 10-1). Recent rehabilitations have incorporated metal safety barriers installed on timber truss bridge capacity upgrades.



Figure 10-1 Monkerai Bridge urban design visualisation of the proposed traffic barrier railing identical to that proposed for McKanes Bridge (Source: KI Studio)

10.2.3 Substructure

The proposed works to the bridge abutments would reduce the rate of decay of important timber truss elements that abut the sill beam and would require less frequent removal of the top courses of masonry, with the attendant risk of damage to the masonry every time.

Consequently, the new works would protect the butting blocks of the bottom chord from rotting and deteriorating which are critical structural elements in retaining the bottom chord to principal geometry and ensuring a true structural truss action.

The concrete curtain wall and placement of rock as scour protection should reduce the risk of scouring of the abutment fill and thus ensure the abutments would be better protected than at present in the event of a major flood.

The proposed painting of the pier would reduce the current negative aesthetic impact of the pier upon the whole bridge and its place in the surrounding environment, and the application of a protective, anti-graffiti coating would also reduce the negative aesthetic impact of graffiti on the structure.

10.3 What aspects of the Proposal could have a detrimental effect on the heritage significance of McKanes Bridge?

The proposal would require the removal of some significant fabric from McKanes Bridge and the addition of non-original fabric in selected critical locations.

The replacement of selected critical elements with non-original fabric is required because the original design incorporating the original fabric is unable to meet current legal load carrying capacity and durability requirements.

From a conservation perspective it is preferable to keep the bridge operating, even if it requires replacing original fabric and changing the form of some elements than have the bridge no longer in use. The heritage impact of the bridge being removed from service as a road bridge would be greater than the heritage impact of replacing the critical elements as detailed below.

10.3.1 Trusses

In general, the proposed truss modifications would not have a detrimental effect on the heritage significance of the bridge. The heritage concept sketches have been prepared to meet as much as is feasibly possible the original intent of the McDonald truss design. Whilst also respecting, retaining or reinstating, to the greatest extent possible, the features that distinguish a McDonald truss from other timber truss bridge designs.

Whilst the original form cannot be completely replicated for reasons of constructability, load capacity and lack of large section size Australian hardwood timber; the proposed design is more sympathetic to the original design than the current arrangements on the bridge (for details on existing bridge see *McKanes Bridge CMP analysis of modifications and the Capacity and Condition Assessment Report February 2017*).

However, the truss is being reproduced in most aspects including the top chords, principals, diagonals and connections. The long lengths of timber that are a feature of the original bottom chord design can no longer be obtained. The shorter bottom chord timbers also require strengthening with external steel plates, but restoration of the original notching for the cross girders and bolting arrangements would be restored.

The primary timber cross girders would be replaced with steel box girders resulting in an alteration of the fabric. However, this is an important change to enable the increase in load carrying capacity and ensuring truss geometry. This modification is also entirely reversible.

The new proposed vertical knee brace would be observable from the deck and side view vantages of the McDonald trusses. In addition, this would also introduce a change in how the truss design and sway bracing performs. However, the knee brace is required to strengthen and support the top chord and deemed an essential component to the proposed capacity upgrade.

The overall impact of the proposed modifications on the trusses has been assessed as being of minor negative heritage impact.

10.3.2 Deck and railing

The replacement of the existing deck would not have a detrimental effect on the heritage significance of the bridge. The form of the current deck is not original, and whilst an element that has changed in form is not necessarily of little significance or intrusive, its replacement forms part of the continuum of changes to timber bridge decks over time. It is important to emphasise that the decks of timber bridges have evolved over time and have been adapted to meet the changes in available timber, local artisan timber bridge skills, the type of vehicles using the bridge, the weight of vehicles and the speed at which they travel.

The overall heritage impact on the deck has been assessed as of minor negative impact.

The replacement of the existing white painted timber ordnance railing with a modern architecturally designed grey coloured metal safety barrier has the potential to negatively affect the aesthetic significance of the bridge. However, this option has been developed in conjunction with OEH to meet vehicle impact design loads and resolve current aesthetic concerns with previous barrier proposals.

The heritage impact is considered to be minor and the first of this barrier type was approved by OEH in November 2017 for Monkerai Bridge, a SHR listed Old Public Works Department timber truss bridge managed by Roads and Maritime.

10.3.3 Substructure

The proposal would not have a detrimental effect upon the abutments as the changes are minimal and would enable ongoing conservation of the masonry fabric and reduce the risk of rapid deterioration of truss components where they meet the abutment sill beams. This would also mean that the masonry blocks at the top of each abutment would not need to be removed as frequently, as there is a risk each time that the blocks are removed and reinstalled that they would suffer damage. The placement of rock scour protection would also help to protect the abutment, and thus the bridge as a whole, from damage during a major flood event.

The overall impact on the substructure has been assessed as having a minor positive heritage impact as the modifications result in less potential for damage to the original abutment fabric and helps protect the timber trusses from decay.

10.4 Have more sympathetic solutions been considered and discounted? Why?

The proposed capacity upgrade works have been assessed against the like-for-like replacement option that would retain the current form and fabric of the bridge, which has been substantially modified over time from the original design. However, this option would not achieve the required increase in structural capacity to meet current legal vehicle loads. It is also noted that the bridge at present has multiple elements that are not part of the original design, in particular the central pier.

The proposed modifications both comply with the conservation policies in the overarching timber truss road bridges CMP (see Appendix B) and balance Roads and Maritime's environmental, operational and social responsibilities with its heritage commitments and requirements.

Roads and Maritime's preferred upgrade option retains the essential form and fabric of the bridge whilst generally upgrading structurally critical bridge elements with visually unobtrusive, structurally superior and more durable elements.

10.4.1 Trusses

The most sympathetic solution for the trusses would be to restore them to their original design and use the same fabric for the metal components (wrought and cast iron instead of SG cast iron and steel) and use timber of the same dimensions and durability. However, this is not possible due to a combination of the project's objectives and the overarching CMP policies to meet increased load requirements and sustainability, as well as the lack of availability of very large pieces of old-growth royal species timber.

Timber

No change in fabric is proposed to the top chords of the truss, other than boxed heart timber would be used rather than heart-free timber for the sole reason that heart-free, royal species hardwood timber in the large sections required is no longer available. Whilst boxed heart timber is not as durable as heart-free timber, it is of sufficient strength for use in the top chords.

Reconstruction of the bottom chord to the original design is not possible for three reasons:

1. The length of some timber pieces in the original design exceeded 16 m in length. The maximum length of suitable timber available today is approximately 10 m.
2. Even if timber of suitable quality and length were available, the original design would not be strong enough to meet current and future load carrying requirements.

The retention of the primary timber cross girders would be the most sympathetic option as it would remain true to the original bridge design. However, this is not feasible as it would prevent the bridge from meeting current design vehicle loads and supporting a code complying traffic barrier design.

In addition, the crushing of the timber cross girders locally where they meet and support the diagonals has been a key contributor to the trusses losing their geometry inevitably leading to the bridge being load limited.

Consequently, the same size painted steel box girders would be installed and from the deck, or at a distance, would not be readily observed as a change. This modification has been completed on a number of timber truss bridge upgrades including Abercrombie, Hinton, Dunmore, Junction and Glennies Creek Bridges.

Metalwork

The original metal components of the trusses are as follows:

- Cast iron shoes and washer plates.
- Wrought iron tension rods.
- Cast iron saddle plates on bottom chords.
- Wrought iron wedges at timber truss diagonals to primary cross girders.
- Wrought iron sway braces.

Retention of the existing metalwork would be the most sympathetic option, as, other than the masonry abutments, these metal components are the most likely components of the bridge to be original fabric. However, this has been discounted for the following reasons:

- **Cast iron shoes and washer plates.** The original cast iron shoes and washer plates are brittle and prone to sudden failure, posing an unacceptable safety risk.
- **Wrought iron tension rods.** All the wrought iron tension rods remaining on the bridge (some have already been replaced) are suffering corrosion at the threaded ends. The threads are the location most susceptible to fatigue and some have been bent as the trusses have moved out of alignment.
- **Cast iron saddle plates.** The cast iron top and bottom chord saddle plates support the hanger tension rods. They are made of grey cast iron and are brittle and can fail without warning and consequently all require replacement.
- **Iron wedges.** The iron wedges ensure the truss geometry where the diagonals meet the bottom chords and primary cross girders. These are small structural elements that would be incorporated during the detailed design of the capacity upgrade.
- **Wrought iron sway braces.** The existing sway braces are ineffective at providing adequate lateral restraint, which can lead to buckling of the top chords on the trusses. Roads and Maritime has explored a number of options including increasing section size, new section elements and the introduction of an additional new vertical knee brace.

Additional new vertical knee brace

The addition of a new vertical knee brace to each sway brace would help to prevent distortion of the top chords of the newly restored trusses. Roads and Maritime has investigated other options but has stated that *“the simplest and most effective way of making the sway bracing effective for lateral restraint would be to add a knee brace to the sway bracing”* as shown in Figure 10-2 and as detailed in section 6.2.6 of the *Draft Guide to the Design and Assessment of Timber Bridges* (January 2017).

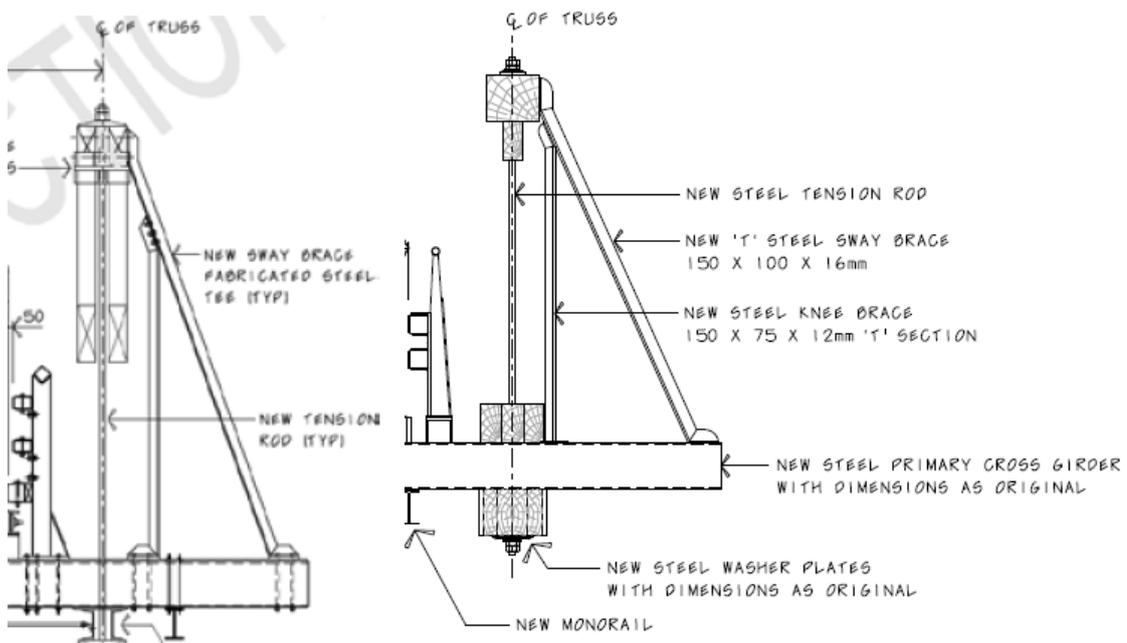


Figure 10-2 Draft timber bridge design guide extract from figure 173 “making sway” (LHS) and extract from proposed heritage concept sketch (RHS) (Source: Roads and Maritime)

The McKanes Bridge CMP considers new strengthened sway braces in original locations only as the preferred solution from a number of options (CMP Page 138) but the drawings (CMP Appendix A – schedule of conservation works) first introduces the new vertical knee brace on sketch no. KA872HCS sheet number 4 of 8.

10.4.2 Deck and railing

The most sympathetic option would be to retain the existing deck and railing systems, or even return them to their original form. However, this is not possible if the bridge is also to be upgraded to meet modern load and safety requirements. Roads and Maritime is obliged to meet current design standards and ensure the safety of the travelling public and the bridge itself in the event of a vehicle impact on the bridge.

10.4.3 Substructure

Whilst the modifications to the abutment would constitute new work, there would be a low heritage impact associated with the work and the changes are considered sufficiently sympathetic.

The most sympathetic treatment for the central pier would be to paint the piles and headstock as proposed by Roads and Maritime.

10.5 Are the alterations sympathetic to the bridge? In what way?

The most sympathetic solution from a heritage perspective would be to retain the bridge in its current condition or even reinstate some components unique to McDonald's original design (for example the bottom chord). However, taking no conservation action would result in the severe and irreversible decay of the bridge and ultimately its closure with the associated loss of heritage value.

The proposed strengthening and upgrade works would bring McKanes Bridge up to the required safe load carrying capacity for general access vehicles in the most sympathetic manner possible and are reversible in the event that the operational needs of the bridge are changed in the future.

10.5.1 Trusses

The alterations to the trusses appear sympathetic whilst achieving the required strengthening. The main alteration to the McDonald trusses includes the introduction of external steel strengthening plates that would be visually unobtrusive once installed and painted. This augmentation has been necessary on a number of timber truss bridge capacity upgrade projects; examples include Morpeth, Hinton, Dunmore, Junction and Abercrombie Bridges.

The remaining alterations to the form and fabric of the trusses, includes replacement of some metal components which may be original fabric, have been planned with the intent of keeping the bridge in operation whilst respecting its heritage significance. The dimensions and shape of the metal shoes, washer plates, tension rods, saddles and wedges would remain the same as original.

The addition of new vertical knee braces introduces a new element into the McDonald timber truss design. Nevertheless, the work is deemed necessary to achieve the structural capacity, whilst improving the durability of the trusses and is reversible.

10.5.2 Deck and railing

The SLT deck represents a significant change in decking type from the original and current deck systems. Whilst the form of the deck is very different to the past and current decks on the bridge, it is still a timber deck, and in this sense respects the heritage significance of the bridge and its design by continuing the use of timber as a deck fabric.

The proposed new railings/safety barrier is the least sympathetic aspect of the proposed works. However, as the existing and original railing designs do not have any vehicle impact capacity and in order to upgrade the barrier to even partially meet modern safety requirements, the introduction of a barrier of entirely different form, fabric and dimensions is necessary.

10.5.3 Substructure

The proposal to modify abutments A and B is sympathetic in that this solution would result in improved maintenance access and provides a positive solution to the issue of accelerated deterioration due to moisture damage and insect infestation of the bottom chords and butting blocks. The proposed replacement of the timber sill beam at each abutment with a steel sill beam is entirely reversible.

The alterations to the abutments are minimal in nature and of low heritage impact, and thus are sympathetic to the bridge.

10.6 Statement of heritage impact

The proposed works would result in a minor reduction in the heritage integrity of the bridge. Ideally, the form and fabric of all bridge components would remain unchanged and the bridge would continue to be used without a load restriction. However, the load requirements of today's local road network far exceed the load carrying capacity of the original McDonald design.

Roads and Maritime has made a commitment to retain this bridge as a functioning bridge in recognition of its individual heritage significance and also as an example of a McDonald timber truss bridge.

If McKanes Bridge was not upgraded to meet modern load and safety requirements there is the risk that vehicles exceeding the current 15 tonne load limit would disregard the signage and use the bridge, resulting in serious damage to the structure.

The only other option would be to close the bridge to road traffic and build a new bridge alongside. Closing the bridge to traffic would also result in a loss of heritage significance as part of the significance embodied in all functioning timber truss road bridges is that they have remained in use for the purpose for which they were built. In this instance McKanes Bridge has serviced the local and NSW community for over 125 years, despite the considerable increase in traffic volume and loads compared to the that for which the bridge was originally designed.

Adaptive re-use of the bridge for pedestrian and cycle use only is not an option, as the bridge would still require significant and ongoing costly maintenance and periodic rebuilding as timber elements age and decay. In addition, a previous accident involving serious head injuries sustained by a cyclist due to the existing uneven deck would mean that the deck would have to be replaced regardless. Donating the bridge to a local council or history group is not an option, as there is multiple example of this having occurred in the past and all have resulted in decay, and in most instances inevitably leads to the demolition of the bridges due to lack of funding and the required engineering and artisan skills to maintain.

The proposed works have been developed to create the best possible heritage outcome for the bridge whilst addressing the current capacity and safety issues that are affecting its ongoing use.

Many aspects of the work are reversible except for the replacement of potentially original metal components, examples of which Roads and Maritime proposes to retain (see Section 12 below).

11. Conclusions

11.1 Summary of impacts

The summary of heritage impacts is shown in Table 11-1.

Table 11-1 Summary of significance grading and heritage impacts (Source: FBE)

Truss component	Significance grading*	Heritage impact†
Trusses		Overall Minor
Timber		
Top chords	Exceptional	Low
Bottom chords and butting blocks	Moderate	Minor
Principals and diagonals	High	Low
Cross girders	Little	Moderate
Metalwork		
Tension rods	Moderate	Low
Cast iron shoes	High	Low
Sway braces	High	Minor
Deck and railing		Overall Minor
Decking	Intrusive	Minor
Railing	Little	Minor
Monorail	Nil	Nil
Substructure		Overall Low
Abutments (masonry)	High	Low
Pier (concrete)	Little	Minor positive

Note: * Significance grading by Roads and Maritime, † Heritage impact assessment by FBE

The overall heritage impacts have been assessed as of minor negative impact.

11.2 Statutory obligations

As the proposed works involve changes to significant form and fabric, some of which is irreversible, they cannot be considered minor, and are not covered under the gazetted standard exemptions prepared by the Heritage Council of NSW. Therefore, an approval to conduct the works would be required in accordance with Section 57 of the NSW *Heritage Act 1977*. An application under Section 60 of the Act would be required in order to undertake the works and the works cannot take place unless approval is given.

12. Recommendations

It is recommended that the works proceed on the basis of this assessment that the heritage impact of the proposed works would not result in a significant reduction of the heritage significance of McKanes Bridge. The proposal would enable Roads and Maritime to retain the bridges heritage significance as a rare example of a McDonald timber truss bridge providing a vital piece of road infrastructure crossing Coxs river for which it was originally designed and built.

It is recommended that policy 11 of the overarching CMP – Archival recording be implemented for the works, which encompasses more than the standard archival photographic recording undertaken prior to modification or demolition of heritage items. If element d) – 3D mapping (laser scanning) has not yet been undertaken, it is recommended that this should be completed prior to the commencement of the works. Lastly, representative key metal components should be retained and displayed on site and/or as part of Roads and Maritime’s movable heritage collection.

13. References

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Roads and Maritime Services January 2017 *Draft Guide to the Design and Assessment of NSW Timber Bridges*

Roads and Maritime Services February 2017 *Capacity and Condition Assessment of McKanes Bridge*

Roads and Maritime Services 2017 *McKanes Bridge over Coxs River Conservation Management Plan*, Roads and Maritime Services

Roads and Maritime Services 2018 *NSW Timber Truss Bridges Overarching Conservation Management Plan*, Roads and Maritime Services

Appendices

Appendix A – Statutory and non-statutory heritage register search results



Home > Topics > Heritage places and items > [Search for heritage](#)

McKanes Falls Bridge

Item details

Name of item:	McKanes Falls Bridge
Other name/s:	McKanes Bridge
Type of item:	Built
Group/Collection:	Transport - Land
Category:	Road Bridge
Location:	Lat: -33.5495127485 Long: 150.1243908350
Primary address:	Jenolan Caves Road, Lithgow, NSW 2790
Local govt. area:	Lithgow
Local Aboriginal Land Council:	Bathurst

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Jenolan Caves Road	Lithgow	Lithgow			Primary Address
Lithgow to Oberon Road	Lithgow	Lithgow			Alternate Address

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
Roads and Maritime Services	State Government	

Statement of significance:

This bridge is a McDonald timber truss road bridge. Timber truss road bridges were extensively used in New South Wales because of the high quality of local hardwoods and the shortage of steel during the early decades of settlement of the state. The timber truss was highly developed for bridges in New South Wales, perhaps more so than anywhere else in the world at that time. The McDonald truss is a significant evolutionary link in the development of timber road bridges in New South Wales and has three standard span lengths, 65'/19.96m, 75'/22.86m and 90'/27.43m . At March 1998 there were seven McDonald truss road bridges remaining in New South Wales, McKanes Falls Bridge being one of two with a 27.43m span and one of two in a double span configuration. The bridge has been assessed as having State significance.

Date significance updated: 15 Jun 05

Note: There are incomplete details for a number of items listed in NSW. The Heritage Division intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Designer/Maker: John McDonald, NSW Engineer for Bridges

Builder/Maker: NSW Public Works

Construction years: 1892-1893

Physical description: The bridge consists of two 90' (27.43m) truss spans supported at each end by sandstone masonry abutments. The centre pier was built as stone but replaced with a reinforced concrete pier in the 1980,s following flood damage. The bridge with a 4.57m (15') between kerbs at its narrowest. There is no footway. The deck is made up of lateral timber cross girders supporting longitudinal timber decking. The cross girders are bearing on the bottom chords of the trusses. The substructure consists of two sandstone abutments and a central concrete pier.

Physical condition and/or Archaeological potential: Generally good condition following major repairs carried out in the last few years

Date condition updated:15 Jun 05

Modifications and dates: c1925 - brushbox decking laid 1934 - bridge screwed up 1941 - dismantling and erecting squared timber 1951 - 86 - repairs and maintenance 1986 - New reinforced concrete central pier replaced original stone pier after severe flooding. 1986+ A metal flashing has been placed over all top chords and principals to shed water. Regular maintenance by RTA.

Current use: Road bridge

Former use: Road bridge

History

Historical notes: The design of the McDonald Truss was greatly influenced by the needs of the time. During the period 1865-1885, the Public Works Department was attempting to tap the resources of inland Australia and to redirect the line of trade from Melbourne to Sydney. To achieve this most funds were directed at the railways. As more people were moving to the rural areas it was necessary to link farms and towns to nearby railheads, with consequent road and bridge requirements. The McDonald Truss was designed by John A McDonald M.I.C.E. and was the answer to the need for more bridges, the technical faults of the old PWD design and limited funds.

It is most probable that McKanes Falls, McKanes Crossing and McKanes Bridge are named after Archibald McKane. He was born in Edinburgh in 1807 and was trained as a joiner and ploughwright. He was convicted of cattle stealing in 1830 and transported to Australia for 7 years. He was sentenced to another 7 years for larceny in 1833. He was appointed as overseer of carpenters in the 1830s. He was involved in expeditions with Mitchell and was commended for his duties as a carpenter. He was granted his certificate of freedom in 1844.

The road on which the bridge sits was built in the late 1870s to connect Bowenfels and Hampton. With the increase in road use in the early 1890s due to tourism (Jenolan Caves) but mainly farm production, especially wool, the road was upgraded and the bridge was built in 1893.

Tenders were called to erect a bridge over Cox's River in September 1891 and was under construction by 1892. The bridge was constructed to shorten the distance for traffic going from Bowenfels to Lowther, Hampton and Jenolan Falls. The earlier route had run via Hartley.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy- Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	(none)-

Assessment of significance

SHR Criteria a)

[Historical significance]

McDonald truss bridges have historical significance because timber truss bridges were developed and refined in Australia to achieve the highest level of timber bridge construction for the time of their design and the McDonald truss is an important recognisable design in the evolution of timber truss bridges in NSW. The bridge also has a historical link with the evolution of the local community. The probable association with Archibald McKane and his involvement with Mitchell's third expedition also lends some significance to the crossing itself. McKanes bridge is a relic of the NSW government's policies of the late nineteenth century which focused on the provision of land areas to facilitate an increase in production and trade throughout the state. Is associated with John A McDonald, designer of the McDonald Truss and a significant figure in the area of bridge design and construction in NSW.

SHR Criteria c)

[Aesthetic significance]

McDonald truss bridges have aesthetic significance because they are evocative of Australian methods of bridge construction, in their materials, scale and configuration they reflect and express nineteenth century technologies and experiences and for the time of their design and construction they demonstrate the best quality design available. The dark green painting and the valley setting complement the surrounding rural environment. McKanes Bridge is an excellent example of a twin span McDonald Truss type bridge. The scale of the structure, the natural timber and other materials allow the bridge to meld with the surrounding landscape.

SHR Criteria d)

[Social significance]

McDonald truss bridges have social significance because their size and location contribute directly to the local area and they are a strong element in the local environment. McKanes Bridge is located in farming country and is isolated, with few residents nearby. For these reasons there is little contemporary community association. However, the bridge forms part of local school bus routes and consequently is well known to the children of the wider community. The bridge has been an important feature of one of the old routes to the Jenolan caves tourist area since its construction in 1893. Built to provide better access for traffic from Bowenfels to Lowther, Hampton and Jenolan Falls, it played a significant role for those people living, working and holidaying in the surrounding area.

SHR Criteria f)

[Rarity]

One of six remaining McDonald truss bridges, one of two 90' span bridges. One of very few timber truss bridges remaining in the Lithgow area. The only surviving example of a twin span McDonald Truss road bridge in NSW and one of only five surviving in NSW and still in use.

SHR Criteria g)

[Representativeness]

Representative example of a two span, 90' McDonald truss bridge. Representative of the first truss bridge design which can be considered uniquely Australian due to its local design and use of native timbers. Is an example of the design which led to a rapid expansion in

bridge construction throughout NSW and an excellent example of a twin span McDonald Truss in in good condition and easily accessible

Integrity/Intactness:

Elements of truss true to original design although most or all of the timbers have been replaced as part of routine maintenance as with other parts of the bridge. The Central stone pier replaced with concrete pier.

Assessment criteria:

Items are assessed against the  **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Procedures /Exemptions

Section of act	Description	Title	Comments	Action date
21(1)(b)	Conservation Plan submitted for comment	Draft CMP submitted for information		
57(2)	Exemption to allow work	Standard Exemptions	<p style="text-align: center;">SCHEDULE OF STANDARD EXEMPTIONS</p> <p>HERITAGE ACT 1977</p> <p>Notice of Order Under Section 57 (2) of the Heritage Act 1977</p> <p>I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order:</p> <p>1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and</p> <p>2. grant standard exemptions from subsection 57(1) of the Heritage Act 1977, described in the Schedule attached.</p> <p>FRANK SARTOR</p> <p>Minister for Planning</p> <p>Sydney, 11 July 2008</p> <p>To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below.</p>	Sep 5 2008

 **Standard exemptions** for works requiring Heritage Council approval

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page

Heritage Act - State Heritage Register		01473	20 Jun 00	-	-
Heritage Act - s.170 NSW State agency heritage register	Roads & Traffic s.170				

References, internet links & images

Type	Author	Year	Title	Internet Links
Tourism		2007	McKanes Falls Bridge	View detail
Tourism	Attraction Homepage	2007	McKanes Falls Bridge	View detail

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name: Heritage Office
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McKanes Falls Bridge over Cox River

Item details

Name of item:	McKanes Falls Bridge over Cox River
Other name/s:	RTA Bridge No. 1302
Type of item:	Built
Group/Collection:	Transport - Land
Category:	Road Bridge
Location:	Lat: 150.12439083 Long: -33.54951275
Primary address:	Lithgow to Oberon Road, McKanes Fall, Lithgow, NSW 2790
Local govt. area:	Lithgow

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Lithgow to Oberon Road, McKanes Fall	Lithgow	Lithgow			Primary Address
Cox's River	Lithgow	Lithgow			Alternate Address

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
Roads and Maritime Services	State Government	

Statement of significance:

The McKanes Falls Bridge in Lithgow is of State significance. Completed in 1893, it is one of the seven McDonald timber truss road bridges remaining in New South Wales. Timber truss road bridges were extensively used in New South Wales because of the high quality of local hardwoods and the shortage of steel during the early decades of settlement of the state. The timber truss was highly developed for bridges in New South Wales, perhaps more so than anywhere else in the world at that time. The McDonald truss is a significant evolutionary link in the development of timber road bridges in New South Wales and has three standard span lengths, 65 ft (19.96m), 75 ft (22.86m) and 90 ft (27.43m). McKanes Falls Bridge is one of two with a 27.43m span and one of two in a double span configuration.

Date significance updated: 02 Apr 09

Note: The State Heritage Inventory provides information about heritage items listed by

local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the [OEH copyright and disclaimer](#).

Description

Designer/Maker:	John McDonald, NSW Engineer for Bridges
Builder/Maker:	NSW Public Works
Construction years:	1892-1893
Physical description:	The bridge consists of two 90' (27.43m) truss spans supported at each end by sandstone masonry abutments. The centre pier was built as stone but replaced with a reinforced concrete pier in the 1980,s following flood damage. The bridge with a 4.57m (15') between kerbs at its narrowest. There is no footway. The deck is made up of lateral timber cross girders supporting longitudinal timber decking. The cross girders are bearing on the bottom chords of the trusses. The substructure consists of two sandstone abutments and a central concrete pier.
Physical condition and/or Archaeological potential:	Original condition assessment: 'Generally good condition following major repairs carried out in the last few years.' (Last updated: 15/07/2002.) 2007-08 condition update: 'Fair.' (Last updated: 17/4/09.) Date condition updated: 17 Apr 09
Modifications and dates:	c1925 - brushbox decking laid 1934 - bridge screwed up 1941 - dismantling and erecting squared timber 1951 - 86 - repairs and maintenance 1986 - New reinforced concrete central pier replaced original stone pier after severe flooding. 1986+ A metal flashing has been placed over all top chords and principals to shed water. Regular maintenance by RTA.
Current use:	Road bridge
Former use:	Road bridge

History

Historical notes:	The design of the McDonald Truss was greatly influenced by the needs of the time. During the period 1865-1885, the Public Works Department was attempting to tap the resources of inland Australia and to redirect the line of trade from Melbourne to Sydney. To achieve this most funds were directed at the railways. As more people were moving to the rural areas it was necessary to link farms and towns to nearby railheads, with consequent road and bridge requirements. The McDonald Truss was designed by John A McDonald M.I.C.E. and was the answer to the need for more bridges, the technical faults of the old PWD design and limited funds.
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It is most probable that McKanes Falls, McKanes Crossing and McKanes Bridge are named after Archibald McKane. He was born in Edinburgh in 1807 and was trained as a joiner and ploughwright. He was convicted of cattle stealing in 1830 and transported to Australia for 7 years. He was sentenced to another 7 years for larceny in 1833. He was appointed as overseer of carpenters in the 1830s. He was involved in expeditions with Mitchell and was commended for his duties as a carpenter. He was granted his certificate of freedom in 1844.

The road on which the bridge sits was built in the late 1870s to connect Bowenfels and Hampton. With the increase in road use in the early 1890s due to tourism (Jenolan Caves) but mainly farm production, especially wool, the road was upgraded and the bridge was built in 1893.

Tenders were called to erect a bridge over Cox's River in September 1891 and was under construction by 1892. The bridge was constructed to shorten the distance for traffic going from Bowenfels to Lowther, Hampton and Jenolan Falls. The earlier route had run via Hartley.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy- Developing local, regional and national economies	Technology-Activities and processes associated with the knowledge or use of mechanical arts and applied sciences	(none)-
3. Economy- Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	(none)-

Assessment of significance

SHR Criteria a)

[Historical significance]

McDonald truss bridges have historical significance because timber truss bridges were developed and refined in Australia to achieve the highest level of timber bridge construction for the time of their design and the McDonald truss is an important recognisable design in the evolution of timber truss bridges in NSW.

The bridge also has a historical link with the evolution of the local community.

The probable association with Archibald McKane and his involvement with Mitchell's third expedition also lends some significance to the crossing itself.

McKanes bridge is a relic of the NSW government's policies of the late nineteenth century which focused on the provision of land areas to facilitate an increase in production and trade throughout the state.

Is associated with John A McDonald, designer of the McDonald Truss and a significant figure in the area of bridge design and construction in NSW.

SHR Criteria c)

[Aesthetic significance]

McDonald truss bridges have aesthetic significance because they are evocative of Australian methods of bridge construction, in their materials, scale and configuration they reflect and express nineteenth century technologies and experiences and for the time of their design and construction they demonstrate the best quality design available.

The dark green painting and the valley setting complement the surrounding rural

environment.

McKanes Bridge is an excellent example of a twin span McDonald Truss type bridge

The scale of the structure, the natural timber and other materials allow the bridge to meld with the surrounding landscape.

SHR Criteria d)
[Social significance]

McDonald truss bridges have social significance because their size and location contribute directly to the local area and they are a strong element in the local environment. McKanes Bridge is located in farming country and is isolated, with few residents nearby. For these reasons there is little contemporary community association. However, the bridge forms part of local school bus routes and consequently is well known to the children of the wider community.

The bridge has been an important feature of one of the old routes to the Jenolan caves tourist area since its construction in 1893.

Built to provide better access for traffic from Bowenfels to Lowther, Hampton and Jenolan Falls, it played a significant role for those people living, working and holidaying in the surrounding area.

SHR Criteria e)
[Research potential]

McDonald truss bridges have technical/research significance because they exhibit advanced technical use of Australian hardwoods and economical bridge construction of the period.

The visually simple form helps to demonstrate itself in structural terms and can be easily interpreted by non technical observers.

The use of local hardwood and the dimensions in which they were used demonstrates the nature and availability of local timber at the time of the construction.

SHR Criteria f)
[Rarity]

One of six remaining McDonald truss bridges, one of two 90' span bridges. One of very few timber truss bridges remaining in the Lithgow area.

The only surviving example of a twin span McDonald Truss road bridge in NSW and one of only five surviving in NSW and still in use.

SHR Criteria g)
[Representativeness]

Representative example of a two span, 90' McDonald truss bridge. Representative of the first truss bridge design which can be considered uniquely Australian due to its local design and use of native timbers.

Is an example of the design which led to a rapid expansion in bridge construction throughout NSW and an excellent example of a twin span McDonald Truss in good condition and easily accessible

Integrity/Intactness:

Elements of truss true to original design although most or all of the timbers have been replaced as part of routine maintenance as with other parts of the bridge. The Central stone pier replaced with concrete pier.

Assessment criteria:

Items are assessed against the  **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Recommended management:

Continued sympathetic maintenance by RTA

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - s.170 NSW State agency heritage register					

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
New Bridge over Bombala River at Bibbenluke - Heritage Significance Study	1996		NSW RTA and HTL Reinhold		Y e s
New Bridge over Bombala River at Bibbenluke - Heritage Significance Study	1996		NSW RTA and HTL Reinhold		Y e s
New Bridge over Bombala River at Bibbenluke - Heritage Significance Study	1996		NSW RTA and HTL Reinhold		Y e s
McDonald Truss Road Bridges in NSW	1998		NSW RTA and Hughes Trueman Reinhold		Y e s
McDonald Truss Road Bridges in NSW	1998		NSW RTA and Hughes Trueman Reinhold		Y e s
McDonald Truss Road Bridges in NSW	1998		NSW RTA and Hughes Trueman Reinhold		Y e s
Heritage Assessment and Conservation Management Plan McKanes Bridge	1998		RTA and Hughes Trueman Reinhold (Peter Seligman)		Y e s

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	Allan, Percy	1924	Highway Bridge Construction - The Practice in NSW	
Written	Colin O'Connor	1985	Spanning Two Centuries	
Written	Gutteridge Haskins & Davey (GHD) and Austral Archaeology	2002	McKanes Falls Bridge, Lithgow. Conservation Management Plan April	
Written	NSW Dept of Main Roads (DMR)	1987	Timber Truss Bridge Maintenance Handbook	
Written	Trueman, E. G.	1982	Timber Bridge Conservation in NSW	
Written	unknown	1951	Main Roads Vol XVII, No. 1	
Written	unknown	1939	A Survey of Bridge Building in Australia	

Note: internet links may be to web pages, documents or images.



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McKanes Bridge, Cox's River, Lithgow, 1893- Description

In 1884, John A McDonald, one of the first Bridge design specialists, introduced the timber truss design which bears his name and which was a significant technical improvement on earlier designs.

McDonald's bridges were easier to build and maintain, carried more load and made some allowance for future increases in vehicular loads.

This 1893 bridge is an excellent example of its type, about 90 were built but only 6 survive.

McDonald bridges played a significant part in the development of the colonial road network and this bridge made an important contribution to the transport links within the Lithgow region.

This bridge makes up a part of the representatives of McDonald Truss Road Bridges, 1893.

Division

- [Sydney \(SYD\) \(/portal/engineering-heritage-search/?title=&division=237\)](https://portal.engineering-heritage-search/?title=&division=237)

Marker Type

- HEM: Historic Engineering Marker (to 2008)

Documentation

Nomination

- [McKanes Bridge - Nomination \(PDF 4.86 MB\)](https://www.engineersaustralia.org.au/portal/system/files/engineering-heritage-australia/nomination-title/McKanes_Bridge_Nomination.pdf)
(https://www.engineersaustralia.org.au/portal/system/files/engineering-heritage-australia/nomination-title/McKanes_Bridge_Nomination.pdf)

Report

- [McKanes Bridge - Ceremony Report \(PDF 1.86 MB\)](https://www.engineersaustralia.org.au/portal/system/files/engineering-heritage-australia/report-title/McKanes_Bridge_Ceremony%20Report.pdf)
(https://www.engineersaustralia.org.au/portal/system/files/engineering-heritage-australia/report-title/McKanes_Bridge_Ceremony%20Report.pdf)

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Lithgow Local Environmental Plan 2014

Current version for 13 October 2017 to date (accessed 17 March 2018 at 13:19)

Schedule 5

Schedule 5 Environmental heritage

(Clause 5.10)

Part 1 Heritage items

Locality	Item name	Address	Property Description	Significance	Item no
Ben Bullen	Ben Bullen Railway Station and Platform	Castlereagh Highway		State	I174
Blackmans Flat	Berwindi	1470 Castlereagh Highway	Lot 1, DP 666540	Local	I206
Capertee	Capertee Lock-Up	Castlereagh Highway	Lot 2, Section 3, DP 758222	Local	I123
Capertee	Cottage 3	Castlereagh Highway	Lot 1, DP 1115443	Local	I128
Capertee	Cottage and store	Castlereagh Highway	Lots 1 and 2, Section 1, DP 758222	Local	I125
Capertee	School Masters Residence	35 Castlereagh Highway	Lot 13, DP 755758	Local	I124
Capertee	Store and cottage	65 Castlereagh Highway	Lot 14, DP 755758	Local	I126
Capertee	Royal Hotel	67 Castlereagh Highway	Lot 1, DP 578843	Local	I127
Capertee	Airly	4428 Castlereagh Highway	Lot 8, DP 755758	Local	I172
Capertee	Bernina	4428 Castlereagh Highway	Lot 42, DP 755758	Local	I171
Capertee	Glengar	5016 Castlereagh Highway	Lot 44, DP 755778	Local	I130
Capertee	Carinya	Glen Davis Road	Lot 87, DP 755757	Local	I173
Capertee	Goolooinboin Station	2280 Glen Davis Road	Lot 109, DP 751640	Local	I327
Capertee	Capertee Railway Station	Railway Street		Local	I120
Capertee	Cottage 1	Railway Street	Lot 9, Section 5, DP 758222	Local	I121
Capertee	Cottage 4	Short Street	Lot 3, Section 11, DP 758222	Local	I129
Capertee	Green Gully	Torbane Road	Lot 3, DP 709009	Local	I132
Capertee	Pise House	Torbane Road	Lot 3, DP 709009	Local	I133

Lithgow Local Environmental Plan 2014 [NSW]

Clarence	Great Zig Zag Railway and deviation tunnels	Bells Line of Road	Lot 9, DP 788554	State	I443
Clarence	Clarence House	off Chifley Road	Lot 16, DP 751650	Local	I221
Clarence	The Oaks	off Chifley Road	Lot 16, DP 751650	Local	I222
Clarence	Clarence Homestead	855 Chifley Road	Lot 191, DP 875912	Local	I223
Cullen Bullen	Cullen Bullen School	15–23 Castlereagh Highway	Lot 82, DP 755769	Local	I117
Cullen Bullen	Miners cottages	1 Old Company Cottages Road	Lots 1, 2, 4 and 6, DP 242575	Local	I115
Glen Alice	Church (multi-denominational) and cemetery	Glen Alice Village	Lot 40, DP 755796; Lot 1, DP 1129153	Local	I413
Glen Alice	Glen Alice Sunday School	Upper Nile Road	Lot 20, Section 4, DP 758445	Local	I417
Hampton	Rosehaven	30 Dowdells Road	Lot B, DP 389469	Local	I096
Hampton	Montana	1716 Jenolan Caves Road	Lot 2, DP 851993	Local	I090
Hampton	Slab cottage	1716 Jenolan Caves Road	Lot 2, DP 851993	Local	I089
Hampton	Jenolan Half Way House Motor Inn	1856 Jenolan Caves Road	Lot 1, DP 716400	Local	I091
Hampton	The Stone Cottage	1991 Jenolan Caves Road	Lot 1, DP 120952	Local	I092
Hampton	Cottage	1994 Jenolan Caves Road	Lot 9, DP 114863	Local	I094
Hampton	Hampton Road House	1994 Jenolan Caves Road	Lot 37, DP 665099	Local	I093
Hampton	Hillroy	2058 Jenolan Caves Road	Lot 50, DP 757041	Local	I095
Hampton	St Thomas Anglican Church	32 Wicketty War Road	Lot 20, DP 1117347	Local	I097
Hampton	Cottage 2	139 Wicketty War Road	Lot 2, DP 1031694	Local	I098
Hampton	Hickory Hill	139 Wicketty War Road	Lot 2, DP 1031694	Local	I100

Hartley	Hartley Historic Site Group	Old Great Western Highway	Lot 7302, DP 1165392; State Lots 100–103, DP 1185278; Lot 1000, DP 1185293; Lot 11, DP 1185533; Lots 142 and 143, DP 1186102; Lots 11–18, DP 1186105; Lot 59, DP 1186129; Lot 1617, DP 1186130; Lots 45 and 46, DP 1186137; Lot 13, DP 1186138; Lot 100, DP 1186140; Lot 7, DP 247477; Lots 1 and 2, DP 259495; Lots 1 and 2, DP 513933; Lot 1, DP 566148; Lots 8–11, Section 9, DP 758503; Lots 5–9 and 11–14, Section 3, DP 758503; Lots 9–14, Section 2, DP 758503; Lots 1–5, 16 and 17, Section 10, DP 758503; Lots 5–10, Section 15, DP 758503; Lot 8, Section 14, DP 758503		I030
Hartley	St John the Evangelist's Anglican Church	1 Old Great Western Highway	Lot 9, Section 14, DP 758503	Local	I029
Hartley	Bungarribee	17 Old Great Western Highway	Lot 14, Section 14, DP 758503	Local	I031
Hartley Vale	Valley Farm	2 Allen Street	Lot 51, DP 867197	Local	I010
Hartley Vale	Southleigh	573 Browns Gap Road	Lot 119, DP 751650	Local	I015
Hartley Vale	Vellacott Park	687 Browns Gap Road	Lot 52, DP 751650	Local	I014
Hartley Vale	Collits Inn	Hartley Vale Road	Lot 50, DP 1026523	State	I012
Hartley Vale	Comet Inn	Hartley Vale Road	Lot 4, DP 836542; Lots 6 and 7, DP 986316	Local	I003
Hartley Vale	Hartley Vale School-House	Hartley Vale Road	Lot 1, DP 543475	Local	I004
Hartley Vale	Mummulgun	Hartley Vale Road	Lot 41, DP 1128436	Local	I001
Hartley Vale	Hillview	104 Hartley Vale Road	Lot 2, DP 773638	Local	I013
Hartley Vale	Wondalga	254 Hartley Vale Road	Lot 92, DP 664550	Local	I011
Hartley Vale	Cottage	400 Hartley Vale Road	Lot 1, DP 818567	Local	I002
Hartley Vale	Schoolmasters Residence	JR Street	Lot 101, DP 1084186	Local	I005
Hartley Vale	The Glen	347 JR Street	Lot 1, DP 196405	Local	I008
Hartley Vale	Homedale	355 JR Street	Lot 6, Section A, DP 193313	Local	I009

Lithgow Local Environmental Plan 2014 [NSW]

Hartley Vale	Vizzard Cottage complex	358 JR Street	Lots 4–8, Section B, DP 193313	Local	I007
Hartley Vale	Timber slab cottage, “Crazy Cottage”	Mid Hartley Road	Lot 1, DP 304523	Local	I017
Hartley Vale	Cottage	Wood Road	Lot 102, DP 1084186	Local	I006
Kanimbla	Moyne Farm	302 Coxs River Road	Lot 176, DP 751644	Local	I027
Kanimbla	Kanimbla Woolshed	641 Coxs River Road	Lot 40, DP 834766	Local	I316
Kanimbla Valley	Duddawarra	40 Clarke Simpson Road	Lot 330, DP 1108595	Local	I084
Kanimbla Valley	Kanimbla Valley Congregational Church Hall	Cullenbenbong Road	Lot 1, DP 790431; Lot 201, DP 821843	Local	I077
Kanimbla Valley	Wingebelaley	324 Cullenbenbong Road	Lot 181, DP 757051	Local	I079
Kanimbla Valley	Glen Shee	1033 Cullenbenbong Creek Road	Lot 102, DP 1093836	Local	I075
Kanimbla Valley	Yarandoo	1688 Gangbenang Road	Lot 106, DP 1060618	Local	I081
Kanimbla Valley	Belmont	1691 Gangbenang Road	Lot 279, DP 1013624	Local	I080
Kanimbla Valley	Mt Sandy Cottage	916 Peach Tree Road	Lot 16, DP 1010564	Local	I076
Lidsdale	Braemai	Castlereagh Highway	Lot 3, DP 650334	Local	I193
Lidsdale	The Cottage	Castlereagh Highway	Lot 101, DP 829410	Local	I191
Lidsdale	Meadowside	200 Castlereagh Highway	Lot 88, DP 1079253	Local	I192
Lidsdale	Lidsdale House and Gardens	1384 Castlereagh Highway	Lots 5 and 7, DP 1084545	Local	I203
Lidsdale	House opposite Lidsdale House	1385–1387 Castlereagh Highway	Lots 30 and 31, DP 18837	Local	I204
Lidsdale	Farmhouse	1449 Castlereagh Highway	Lot 101, DP 1145705	Local	I205
Lidsdale	Windmill Lad Stud	35 Ian Holt Drive	Lot 1, DP 531335	Local	I197
Lidsdale	Square and Compass Inn (former)	70 Ian Holt Drive	Lot 9, DP 1088207	Local	I198
Lidsdale	Woodlands	111 Ian Holt Drive	Lot 2, DP 574754	Local	I199
Lidsdale	Maddox Lane Group	10,16–24 Maddox Lane	Lots 1–6, DP 237078	Local	I202
Lidsdale	The Meadows	41 Maddox Lane	Lot 173, DP 666814	Local	I201
Lidsdale	Cottage and Stone Barn	10 Skelly Road	Lot 2, DP 829137	Local	I196
Lidsdale	Uniting Church	23 Wolgan Road	Lot 201, DP 1047676	Local	I194
Lidsdale	Cottage	25 Wolgan Road	Lot 202, DP 751651	Local	I195
Lithgow	Cottage	27–29 Albert Street	Lot 1, DP 1102434	Local	I282

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Lithgow	Coerwull House	Off Andrew Street	Lot 14, DP 253969	Local	I072
Lithgow	Showground Grandstand and Buildings	Barton Street	Lot 1, DP 1123449	Local	I340
Lithgow	Colliery Managers Cottage	Bells Road	Lot 1, DP 934032	Local	I236
Lithgow	Brighton Cottage	166 Bells Road	Lots 25 and 26, DP 17462	Local	I240
Lithgow	Former LVC Managers Residence	67 Bent Street	Lot 31, DP 600256	Local	I273
Lithgow	Doctors Surgery (former LVC Managers Office)	69 Bent Street	Lot 1, DP 1005128	State	I272
Lithgow	Langs Dairy	Brewery Lane	Lot 4, DP 102985	Local	I239
Lithgow	Former Zig Zag Brewery and Residence	Brewery Lane	Lot 1, DP 834082; Lot 1, DP 1098480	Local	I238
Lithgow	Union Theatre	Bridge Street	Lot 2, DP 1077295	Local	I321
Lithgow	Hoskins Memorial Presbyterian Church	Bridge and Mort Streets	Lot 1, DP 165879	Local	I314
Lithgow	Terrace	4 Bridge Street	Lots 4–6, Section 28, DP 2858	Local	I323
Lithgow	The Tin Shed	69 Bridge Street	Lot 1, DP 1077295	Local	I319
Lithgow	Greys Terrace	1–12 Brisbane Street, 2–13 Bragg Street	Lots 2–14 and 17, DP 7199; Lot 1, DP 1080735; Lots 1 and 2, DP 514250; Lots A and B, DP 401209; Lots A and B, DP 377435; Lots A and B, DP 400049; Lot 6, DP 834082	Local	I237
Lithgow	Former St Mary's Presbyterian Church	1 Church Street	Lot A, DP 39706	Local	I309
Lithgow	Directors House, Lithgow Valley Colliery	3 Coalbrook Street	Lot 1, DP 569626	Local	I247
Lithgow	The Hermitage	7 Coalbrook Street	Lot 102, DP 1075376	Local	I246
Lithgow	Rosebank	21 Coalbrook Street	Lot 4, DP 3227	Local	I248
Lithgow	Commonwealth Avenue Houses	1–3 Commonwealth Avenue	Lots 1–3, DP 833809	Local	I267
Lithgow	Bowenfels Railway Station	1 Coerwull Road	Lot 2999, DP 1195998	State	I101
Lithgow	Bowenfels Station Masters Residence	3 Coerwull Road	Lot 1, DP 1088726	State	I102
Lithgow	House	19 Cupro Street	Lots 307 and 308, DP 5255	Local	I255

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Lithgow	Hillcrest	off Eskbank Street	Lot 1, DP 875910	Local	I275
Lithgow	Methven	Evans Place	Lot 54, DP 605861	Local	I104
Lithgow	House	65 Ferro Street	Lot 1, DP 626657	Local	I256
Lithgow	Crossing Keepers House	Beyond 1 Fullagar Avenue	Lot 2999, DP 1195998	Local	I105
Lithgow	Lithgow Coal Stage Signal Box	Gas Works Lane	Lot 1, DP 1105168	State	I433
Lithgow	Sweet Briars	Great Western Highway	Lot 252, DP 1045308	Local	I066
Lithgow	Forty Bends Cottage	35 Great Western Highway	Lot 1, DP 195020	Local	I046
Lithgow	Forty Bends Monte Vista	35 Great Western Highway	Lot 1, DP 195020	Local	I047
Lithgow	Fairview	985 Great Western Highway	Lot 201, DP 1077344	Local	I065
Lithgow	Kanangra	989 Great Western Highway	Lot 6, DP 776529	Local	I068
Lithgow	Cottage (former Coerwull Academy)	993 Great Western Highway	Lot A, DP 345053	Local	I067
Lithgow	Rankin	1002 Great Western Highway	Lot 2, DP 173015; Lot A, DP 305256	Local	I070
Lithgow	Coerwull Presbyterian Church	1129 Great Western Highway	Lot 2, DP 514466	Local	I103
Lithgow	Fernhill	3109 Great Western Highway	Lot 10, DP 1134053	State	I043
Lithgow	Sunnyside	3110 Great Western Highway	Lot 2, DP 1187719	Local	I044
Lithgow	Emoh (Emu Store/ Corderoy's Store)	3431 Great Western Highway	Lot 1, DP 798073	Local	I051
Lithgow	Umera (Bowenfels Inn, Tricks House)	3449 Great Western Highway	Lot 1, DP 68390	Local	I052
Lithgow	Cottage and outbuildings	3532 Great Western Highway	Lot 120, DP 751650	Local	I060
Lithgow	Caldwells House	3534 Great Western Highway	Lot 1, DP 923403	Local	I061
Lithgow	Royal Hotel	3584 Great Western Highway	Lot 20, DP 1117668	Local	I062
Lithgow	Duplex	82-84 Hartley Valley Road	Lots 15 and 16, Section 3, DP 416	Local	I249
Lithgow	House	144 Hassans Walls Road	Lot 16, DP 5255	Local	I259
Lithgow	Edwardian House Group	173 Hassans Walls Road	Lot 1, DP 655435	Local	I261
Lithgow	House	21 Hayley Street	Lot 10, Section 47, DP 3955	Local	I285

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Lithgow	Inch Street Group	11, 15–21, and 126 Inch Street	Lot 14, Section 22, DP 1936; Lots A–C, DP 367579; Lot 5, Section 23, DP 1936	Local	I243
Lithgow	Eskbank House	70 Inch Street	Lot 1, DP 365722	Local	I312
Lithgow	Inch Street Group	104–110 Inch Street	Lots A, D and E, DP 107691	Local	I244
Lithgow	Stone viaduct	James Street	Lot 2999, DP 1195998	State	I436
Lithgow	Airdrie	Kirkley Street	Lot 3, DP 881717	Local	I064
Lithgow	Mossend	41 Laidley Street	Lot 1, DP 715230	Local	I242
Lithgow	Laurence Street Group	42–48 Laurence Street	Lots 478–481, DP 5255	Local	I254
Lithgow	Terrace	8–14 Lithgow Street	Lot 3, DP 233691	Local	I271
Lithgow	Cottage—duplex	16–18 Lithgow Street	Lot 5, DP 432373	Local	I270
Lithgow	House	20 Lithgow Street	Lot 4, DP 432373	Local	I269
Lithgow	House	22–24 Lithgow Street	Lot 1, DP 786694	Local	I268
Lithgow	Court House Hotel	1 Main Street	Lot 1, Section 1, DP 2308	Local	I383
Lithgow	Office building	31 Main Street	Lot 7, Section 1, DP 2308	Local	I338
Lithgow	The Grand Central Hotel	69 Main Street	Lot 1, DP 900325	Local	I393
Lithgow	ANZ Bank	71 Main Street	Lot 1, DP 911132	Local	I337
Lithgow	Tattersals Hotel	151 Main Street	Lot 2, DP 828975	Local	I335
Lithgow	National Australia Bank	156 Main Street	Lot 3, Section A, DP 360	Local	I376
Lithgow	Commercial Hotel	198 Main Street	Lot A, DP 944949	Local	I382
Lithgow	Theatre Royal	208 Main Street	Lot 1, DP 169176	Local	I351
Lithgow	Eskbank Railway Station Group including signal box	Main Western Railway	Lot 1, DP 1105168	State	I434
Lithgow	Stone Viaduct Farmers Creek Bowenfels	Main Western Railway	Lot 1, DP 1088058	State	I438
Lithgow	Gonna-Do	29 McKanes Falls Road and Lithgow Road	Lot 1, DP 87543	Local	I050
Lithgow	Small arms factory	Methven Street	Lot 21, DP 1174289	Local	I313
Lithgow	Former Tafe College	Mort Street	Lots 9–11, Section 2, DP 2308	Local	I326
Lithgow	Charles Hoskins Memorial Institute Library	Corner Mort and Bridge Streets	Lot 3, DP 1077295	Local	I341

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Lithgow	Cottage Group	86–88 Mort Street	Lot 1, DP 302077; Lot 5, DP 661003	Local	I252
Lithgow	Lithgow Court House	156 Mort Street	Lot 29, Section 1, DP 2308	Local	I307
Lithgow	Lithgow Public School Group	163 Mort Street	Lot 1, DP 793654	Local	I278
Lithgow	Former Methodist Church	169 Mort Street	Lot 3, Section 5, DP 2308	Local	I325
Lithgow	Lithgow Catholic Presbytery	227 Mort Street	Lot 5, DP 930738	Local	I308
Lithgow	Presbyterian Church Bowenfels	12 Mudgee Street	Lots 15 and 16, Section 1, DP 758809	Local	I059
Lithgow	Parsonage Farm	14 Mudgee Street	Lot 14, DP 67883	Local	I058
Lithgow	Somerset House	34 Mudgee Street	Lots 10 and 11, Section 2, DP 758809; Lots 1 and 2, DP 984111; Lots 1 and 2, DP 580773	Local	I057
Lithgow	National School Group	70 Mudgee Street	Lot 372, DP 823384	State	I054
Lithgow	Ben Avon (former Royal Hotel)	76 Mudgee Street	Lot 1, DP 933110; Lot 2, DP 758809	Local	I053
Lithgow	Stone and timber cottage	24 Old Bathurst Road	Lot 1, DP 514845	Local	I045
Lithgow	Co-operative slaughter yards	51 Old Bathurst Road	Lot 1, DP 1085235	Local	I056
Lithgow	Daintree	Old Forty Bends Road	Lot 5, DP 1185788	Local	I048
Lithgow	Terrelaroy	24 Ordnance Avenue	Lot 1, DP 511164	Local	I264
Lithgow	Wenvoe	26 Ordnance Avenue	Lot 2, DP 221773	Local	I263
Lithgow	Avenue of plane trees	Park Parade	Lot 21, DP 1174289	Local	I266
Lithgow	Charles Lewins Memorial Rotunda	Queen Elizabeth Park, Main Street	Lot 45, DP 1096536	Local	I332
Lithgow	War Memorial Statue	Queen Elizabeth Park	Lot 45, DP 1096536	Local	I364
Lithgow	La Salle Academy (former Coerwull Academy)	96 Rabaul Street	Lot 321, DP 1142036	Local	I069
Lithgow	Former Co-op bakery and pharmacy	Railway Parade	Lot 100, DP 1130976	Local	I290
Lithgow	Lithgow Railway Station Group and Residence	Railway Parade	Lot 2999, DP 1195998	State	I435
Lithgow	Former Union offices (old Repco building)	Railway Parade	Lot 31, Section 39, DP 3466	Local	I292
Lithgow	St Paul's Anglican Church, Rectory and Hall	Railway Parade and Roy Street	Lot 26–28, Section 48, DP 3955	Local	I280

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Lithgow	Former Co-operative Store	3–5 Railway Parade	Lots 22 and 23, Section 41, DP 3466	Local	I289
Lithgow	Former Trades Hall	25 Railway Parade	Lot 32, Section 39, DP 3466	Local	I291
Lithgow	Former Post Office	31 Railway Parade and Roy Street	Lot 2, DP 777804	Local	I288
Lithgow	Waratah	39 Railway Parade	Lot 1, DP 817560	Local	I279
Lithgow	Railway Parade Cottages	41–59 Railway Parade	Lots 1–8, DP 21055; Lots 1 and 2, DP 532324	Local	I281
Lithgow	House	22 Sandford Avenue	Lots 9 and 10, Section 6, DP 4911	Local	I283
Lithgow	Florence	4 Spooner Street	Lot 1, DP 419406	Local	I286
Lithgow	House	8 Spooner Street	Lot 31, Section 47, DP 3955	Local	I287
Lithgow	Former shop and residence	44–46 Tank Street	Lots 7 and 8, Section 33, DP 3364	Local	I293
Lithgow	Inverted A Frame Footbridge	Top Points Zig Zag Railway	Lot 2, DP 932875	State	I437
Lithgow	Braemar House	50 Tweed Road	Lot 10, DP 815871	Local	I071
Little Hartley	Ambermere	5 Ambermere Drive	Lot 12, DP 851241	Local	I022
Little Hartley	Bonnie Blink	Baaners Lane	Lot 12, DP 1036076	Local	I042
Little Hartley	Apple shed	57 Cranbrook Park Road	Lot 14, DP 776589	Local	I082
Little Hartley	Harp of Erin	Great Western Highway	Lot 1, DP 589557	Local	I028
Little Hartley	Rosedale	Great Western Highway	Lot 2, DP 594106	Local	I024
Little Hartley	Nioka	2209 Great Western Highway	Lot 344, DP 655748	Local	I025
Little Hartley	Billesdene Grange	2272 Great Western Highway	Lots 1 and 2, DP 540599	Local	I023
Little Hartley	House	2360 Great Western Highway	Lot 102, DP 1078863	Local	I021
Little Hartley	Meads Farm	2366 Great Western Highway	Lot 102, DP 1056042	Local	I020
Little Hartley	Lyndoch Orchard	2464–2468 Great Western Highway	Lot 1, DP 629411	Local	I019
Little Hartley	Hartley Public School	Mid Hartley Road	Lot 186, DP 751644	Local	I018
Lowther	Lowther Park	1296 Jenolan Caves Road	Lot 1, DP 1107415	Local	I085
Lowther	Lowther Presbyterian Church	1326 Jenolan Caves Road	Lot 148, DP 757063	Local	I318

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Lowther	Timber Cottage (Rushvale)	96 Larnach Baker Road	Lot 127, DP 757063	Local	I086
Lowther	The Old Chook Farm	89 Old Jenolan Caves Road	Lot 84, DP 757063	Local	I087
Marrangaroo	Stone Cottage	16 Gemalong Close	Lot 3, DP 242966	Local	I190
Marrangaroo	Lithgow Golf Club	Great Western Highway	Lot 1, DP 840412	Local	I106
Marrangaroo	River Cottage	587 Great Western Highway	Lot 3, DP 242965	Local	I110
Marrangaroo	Cottage (railway crossing keepers cottage)	Hughes Lane	Lot 1, DP 996243	Local	I111
Marrangaroo	Stone viaduct, Marrangaroo Creek	Main Western Railway		State	I442
Marrangaroo	Tunnel Hill tunnels and overbridge	Main Western Railway	Lot 1, DP 175470	Local	I439
Marrangaroo	Farmhouse	Oakey Forest Road	Lot 1, DP 876453	Local	I107
Marrangaroo	Fernbrook	Reserve Road	Lot 1, DP 998434	Local	I109
Marrangaroo	Marrangaroo Prayer Chapel	3 Reserve Road	Lot 40, DP 600845	Local	I108
Meadow Flat	Meadow Flat Public School	Great Western Highway	Lot 1, DP 782196	Local	I231
Meadow Flat	St Luke's Anglican Church	Off Sunny Corner Road	Lot 9, Section 2, DP 758663	Local	I232
Meadow Flat	Currency Lass	60–62 Thorpes Pinch Road	Lot 52, DP 588862	Local	I235
Meadow Flat	Mt Lambie Presbyterian Church	75 Thorpes Pinch Road	Lot 2, DP 1043887	Local	I234
Megalong Valley	Grandview	601 Peach Tree Road	Lot 11, DP 240967	Local	I073
Newnes	Railway Line Newnes—Zig Zag etc	Newnes		Local	I245
Newnes Juntion	Blue Hills	588–602 Sandham Road	Lots 361 and 362, DP 209982	Local	I224
Portland	Residence	1 Bellvue Place	Lot 1, DP 842893	Local	I177
Portland	Residence	2 Bellvue Place	Lot 4, DP 842893	Local	I180
Portland	Residence	4 Bellvue Place	Lot 5, DP 842893	Local	I181
Portland	Residence	5 Bellvue Place	Lot 3, DP 842893	Local	I179
Portland	Residence	6 Bellvue Place	Lot 6, DP 842893	Local	I182
Portland	Residence	7 Bellvue Place	Lot 9, DP 842893	Local	I183
Portland	Residence	8 Bellvue Place	Lot 7, DP 842893	Local	I184
Portland	Residence	10 Bellvue Place	Lot 8, DP 842893	Local	I185
Portland	Portland District Hospital	Kiln Street	Lot 21, DP 1134404	Local	I305

Portland	Kremer Park Portland	Corner Kiln and Laurie Streets	Lot 7002, DP 1075853; Local Lot 531, DP 902158		I306
Portland	Police Station Complex	Lett and Vale Streets	Lot 6, Section 2, DP 758855	Local	I303
Portland	Cottage	10 Paine Street	Lot 6, Section 25, DP 758855	Local	I294
Portland	Company Foremans Cottages (group)	8–18 Saville Street	Lots 11–16, DP 842893	Local	I186
Portland	Sydney House	31 Wallerawang Road	Lot 2, DP 856917	Local	I175
Portland	Portland House	51 Wallerawang Road	Lot 4, DP 856917	Local	I176
Portland	Portland Cement Works Group	Williwa Street	Lot 53, DP 755769; Lot 1 DP 109592; Lot 1, DP 1130700	State	I296
Portland	St Stephens Anglican Church and Hall	2 Williwa Street	Lot 1, DP 922029	Local	I297
Portland	Portland Post Office	17 Williwa Street	Lot 2, DP 813095	Local	I298
Portland	St Josephs Convent and Presbytery	95 Williwa Street	Lot 92, DP 755769; Lot 11, Section 25, DP 755769	Local	I187
Portland	St Josephs Catholic Church—school	99 Williwa Street	Lot 92, DP 755769	Local	I188
Portland	Cottage	101 Williwa Street	Lot 13, Section 25, DP 758855	Local	I189
Portland	Masonic Hall	20 Wolgan Street	Lots 21 and 22, Section 1, DP 4856	Local	I299
Portland	Uniting Church	41 Wolgan Street	Lot 5, Section 2, DP 3778	Local	I300
Portland	St Andrews Presbyterian Church and Hall	1–2 Vale Street	Lot 1, DP 667861	Local	I304
Portland	Co-operative Store	15 Vale Street	Lot 12, Section 1, DP 758855	Local	I302
Rydal	Alexander Hotel	Bathurst Street	Lots 3 and 18, Section 18, DP 758890	Local	I139
Rydal	Former General Store (former Post Office)	Bathurst Street	Lot 1, DP 559056	Local	I144
Rydal	Former police station	Bathurst Street	Lot 8, Section 18, DP 758890	Local	I145
Rydal	Former railway station	Bathurst Street		State	I140
Rydal	Union Church (former Anglican Church)	Bathurst Street	Lot 1, DP 918723	Local	I142
Rydal	Rydal Mount	Cartwright Street	Lot 70, DP 1134582	Local	I146
Rydal	St Matthew's Roman Catholic Church	Cartwright Street	Lots 8 and 9, Section 19, DP 758890	Local	I147

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Rydal	Outbuildings	11 Cheethams Flat Road	Lot 235, DP 757036	Local	I150
Rydal	Stone Viaduct 1–6	Main Western Railway	Lot 161, DP 1174477	State	I441
Rydal	Agricultural Showground	Market Street	Lot 100, DP 1045983; Lots 71 and 124, DP 751651; Lot 1, DP 1138698	Local	I148
Rydal	Cottage 3	Market Street	Lot 5, Section 38, DP 758890	Local	I136
Rydal	Chapel House Farm	22 Market Street	Lot 1, DP 1001275	Local	I138
Rydal	Highland House	209 Martins Road	Lot 122, DP 757036	Local	I169
Rydal	Hillcrest Cottage 1	Quarry Street	Lot 1, DP 912182	Local	I134
Rydal	Cottage 4	49B Railway Street	Lot 8, Section 38, DP 758890	Local	I137
Sodwalls	Wattle Grove	233 Anarel Road	Lot 107, DP 757076	Local	I160
Sodwalls	Timber Cottage	281 Anarel Road	Lot 243, DP 757076	Local	I159
Sodwalls	Pendari	302 Anarel Road	Lot 78, DP 757076	Local	I158
Sodwalls	Jerrys Mount	308 Anarel Road	Lot 236, DP 757076	Local	I157
Sodwalls	Kilcooly	21 Jerrys Meadows Road	Lot 201, DP 1078651	Local	I151
Sodwalls	Sodwalls Inn (former Sodwalls House)	329 Sodwalls Road	Lot 1, DP 737321	Local	I152
Sodwalls	Invergowrie	396 Sodwalls Road	Lot 68, DP 755794	Local	I153
Sodwalls	Old Sodwalls Public School	428 Sodwalls Road	Lot 7004, DP 1025924	Local	I154
Sodwalls	Railway Cottage	37 Station Road		Local	I155
Tarana	House	Corner Brewongle and O'Connell Roads	Lot 5, DP 557772	Local	I412
Tarana	Bangaroo	2273 Hazelgrove Road	Lot 6, DP 1016189	Local	I165
Tarana	Crown View	Honeysuckle Falls Road	Lot 22, DP 757076	Local	I315
Tarana	Church (former Methodist)	20 Mutton Falls Road	Lot 1, DP 1039964	Local	I411
Tarana	Crownlea	110 Mutton Falls Road	Lot 4, DP 1171948	Local	I410
Tarana	Tarana Hotel	O'Connell Road	Lot 1, DP 832370	Local	I167
Tarana	St Stephens Anglican Church	Sodwalls Road	Lot 621, DP 1142480	Local	I163
Tarana	Tarana Railway Station	Sodwalls Road	Lot 14, DP 1181440	State	I166
Tarana	The Crown	1197 Sodwalls Road	Lot 25, DP 1016189	Local	I161
Tarana	Westholme	1198 Sodwalls Road	Lot 1, DP 1085216	Local	I162

Tarana	Residence (former school masters residence)	1385 Sodwalls Road	Lot 12, DP 1192441	Local	I164
Wallerawang	Bottom Pub	Main Street	Lot A, DP 374050	Local	I207
Wallerawang	Church of St John the Evangelist	Main Street	Lot 1, DP 372255	State	I112
Wallerawang	Old Wallerawang School (former National School)	Main Street	Lot 4, DP 1087684	Local	I113
Wallerawang	Former Commercial Banking Co.	30 Main Street	Lot 15, DP 17727	Local	I212
Wallerawang	Post Office	32 Main Street	Lot 102, DP 1142511	Local	I211
Wallerawang	Wang Antiques and Emporium	48 Main Street	Lot 9, DP 17727	Local	I210
Wallerawang	Surgery	50 Main Street	Lot 1, DP 609279	Local	I209
Wallerawang	Former Wallerawang Public School	121–123 Main Street	Lots 10 and 11, DP 1177951	Local	I225
Wallerawang	Stone Viaduct Cox's River	Main Western Railway		State	I440
Wallerawang	Wallerawang Junction Railway Station	Main Western Railway		State	I208
Wallerawang	Cottages	57 Pipers Flat Road	Lot 12, DP 2527	Local	I218
Wallerawang	Cottage	61–63 Pipers Flat Road	Lot 2, DP 616176; Lot 103, DP 877661	Local	I217
Wallerawang	Willow Vale	401 Pipers Flat Road	Lot 3, DP 1041104	Local	I219
Wallerawang	Northbrook	581 Pipers Flat Road	Lot 2, DP 1124158	Local	I220
Wallerawang	Former Railway Cottage	98 Portland Road	Lot 2, DP 815106	Local	I216
Wolgan	Wolgan Homestead (Wolgan Valley Station)	Off Wolgan Valley Road	Lot 26, DP 751666	Local	I317

Part 2 Heritage conservation areas

Description	Identification on Heritage Map	Significance
Capertee Heritage Conservation Area	Shown by red hatching and marked "C1"	Local
Cook Street Heritage Conservation Area	Shown by red hatching and marked "C2"	Local
Eskbank Street Heritage Conservation Area	Shown by red hatching and marked "C3"	Local
Hartley Vale Heritage Conservation Area	Shown by red hatching and marked "C4"	Local
Hassans Walls Road Heritage Conservation Area	Shown by red hatching and marked "C5"	Local

Inch Street Heritage Conservation Area	Shown by red hatching and marked "C6"	Local
Lithgow Main Street Heritage Conservation Area	Shown by red hatching and marked "C7"	Local
Little Hartley Heritage Conservation Area	Shown by red hatching and marked "C8"	Local
Mort Street Heritage Conservation Area	Shown by red hatching and marked "C9"	Local
Portland Heritage Conservation Area	Shown by red hatching and marked "C10"	Local
Pottery Estate Heritage Conservation Area	Shown by red hatching and marked "C11"	State
Rydal Heritage Conservation Area	Shown by red hatching and marked "C12"	Local
Wallerawang Heritage Conservation Area	Shown by red hatching and marked "C13"	Local

Part 3 Archaeological sites

Locality	Site name	Address	Property description	Significance	Item no
Airly	Airly Bakery	Off Glen Davis Road		Local	A149
Airly	Airly Big Rock Cave Dwellings	Off Glen Davis Road		Local	A148
Airly	Airly, Torbane and Genowlan oil shale sites	Off Glen Davis Road		Local	A144
Airly	Airly Township and Mines Group	Off Glen Davis Road		Local	A145
Airly	Airly Village Church site	Off Glen Davis Road		Local	A146
Airly	Boiler and winding house	Off Glen Davis Road		Local	A158
Airly	Flying Fox rope way	Off Glen Davis Road		Local	A159
Airly	Gorrms House	Off Glen Davis Road		Local	A155
Airly	Magazine, spring, stone cave dwelling	Off Glen Davis Road		Local	A152
Airly	Managers Residence	Off Glen Davis Road		Local	A151
Airly	Martins Tunnel, ventilation tunnel and chimney	Off Glen Davis Road		Local	A156
Airly	Potts Point Dwelling Complex	Off Glen Davis Road		Local	A150
Airly	Skipway, stone retaining wall	Off Glen Davis Road		Local	A154

Airly	Spring shaft and stone house	Off Glen Davis Road		Local	A147
Airly	Stone dwelling complex	Off Glen Davis Road		Local	A153
Airly	Torbane railway cutting	Off Glen Davis Road		Local	A161
Airly	Torbane retort complex	Off Glen Davis Road		Local	A162
Airly	Ventilation chimney	Off Glen Davis Road		Local	A157
Airly	Ventilation shaft, dwelling, skipway	Off Glen Davis Road		Local	A160
Blackmans Flat	Blackmans Flat Roman Catholic Cemetery	Castlereagh Highway	Lots 68 and 69, DP 751636	Local	A111
Capertee	Galagher family cemetery	4428 Castlereagh Highway	Lot 44, DP 755758	Local	A104
Capertee	Former Kangaroo Flat Methodist Church	4959 Castlereagh Highway	Lots 91 and 92, DP 755778	Local	A059
Cullen Bullen	Back Cullen Cemetery	Back Cullen Road	Lot 7302, DP 1142032	Local	A053
Cullen Bullen	Beaumaris	Back Cullen Road	Lot 11, DP 249955	Local	A054
Cullen Bullen	Cullen Bullen General Cemetery	Castlereagh Highway	Lot 7005, DP 1026565	Local	A088
Dargan	Dargan Railway Dams	off Chifley Road	Lot 7301, DP 1123766	Local	A119
Dark Corner	Dark Corner General Cemetery	Dark Corner Road	Lots 23–26 and 6A, DP 755767; Lot 1, DP 668503	Local	A105
Glen Davis	Glen Davis town and oil-works	Glen Davis Road	Lots 4–6, DP 751639; Lots 3–5, DP 131480	Local	A087
Hartley	Hartley General Cemetery	Great Western Highway	Lots 7016–7018, DP 1057029; Lot 7320, DP 1165385	Local	A015
Hartley	Eliza Rodd Grave	200 Jenolan Caves Road	Lot 10, DP 830372	State	A019
Hartley	Glenroy	200 Jenolan Caves Road	Lot 10, DP 830372	State	A020
Hartley	Rev John Troughton gravemarker	1 Old Great Western Highway	Lot 9, Section 14, DP 758503	Local	A078
Hartley Vale	Rosedale	498 Blackman Creek Road	Lot 2, DP 749916	Local	A048
Hartley Vale	Blackman- Merrick family cemetery	498 Browns Gap Road	Lot 2, DP 749916	Local	A049
Hartley Vale	Collitts/Mt York burial ground	Hartley Vale Road	Lot 379, DP 720619	Local	A007
Hartley Vale	Lockyers Pass	Hartley Vale Road	Lot 3, DP 820928	Local	A180
Hartley Vale	Site of oil-shale works, Hartley Vale	400 Hartley Vale Road	Lot 1, DP 818567; Lot 52 DP 867197; Lot 3, DP 836542	Local	A001

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Kanimbla	Moyne Farm Cemetery	302 Coxs River Road	Lot 28, DP 751644	Local	A016
Kanimbla	Edmund Harvey Grave	675 Coxs River Road	Lot 44, DP 834766	Local	A042
Kanimbla	Norton Grave	89B Wards Road	Lot 2, DP 219769	Local	A034
Kanimbla	Old Kanimbla Homestead	89B Wards Road	Lot 2, DP 219769	Local	A035
Lithgow	Oakey Park Colliery Site	Bells Road	Lot 17, DP 1099804	Local	A095
Lithgow	Railway culvert of Ida Falls Creek	Off Bell Street	Lot 11, DP 831103	Local	A133
Lithgow	Lithgow Valley Pottery and Brickworks	Bent and Silcock Streets	Lots 2–6, DP 1005128; Lot 702, DP 1150747	State	A124
Lithgow	Bowens Creek Bridge Abutments	Bowens Hollow		Local	A026
Lithgow	Gun emplacements	Chifley Road and Hassans Walls Road	Lot 1, DP 413551; Lot 90, DP 751650	State	A176
Lithgow	Andrew Brown Private Cemetery	Coerwull Road	Lot 13, DP 253969	Local	A050
Lithgow	Lithgow No. 2 Dam	Farmers Creek	Lot 423, DP 1152284	Local	A120
Lithgow	Bowenfels Presbyterian Cemetery	Great Western Highway	Lot 62, DP 751650	Local	A030
Lithgow	Former Eagle and Child Inn	Great Western Highway	Lot 1, DP 195020	Local	A022
Lithgow	Lithgow General Cemetery	Great Western Highway	Lot 7306, DP 1142901; Lot 1, DP 1133793	Local	A032
Lithgow	Old Catholic Cemetery	Great Western Highway	Lot 336, DP 751650	Local	A029
Lithgow	Forty Bends Cemetery	35 Great Western Highway	Lot 1, DP 195020	Local	A023
Lithgow	Hassans Walls Stockade and Barracks	3124 Great Western Highway	Lot 1, DP 1187719	Local	A021
Lithgow	Road culvert and sustaining wall at Emoh	3431 Great Western Highway		Local	A027
Lithgow	Newvale Colliery and Coke-Ovens	Ida Falls Gully	Lot 2, DP 574705	Local	A140
Lithgow	Blast furnace site and coke ovens	Inch Street	Lot 2, DP 776568	State	A125
Lithgow	Gun emplacements	Off Kirkley Street	Lot 3, DP 1017922	State	A031
Lithgow	Coerwull Public School Bell	319 Main Street	Lot 1, DP 123135	Local	A170
Lithgow	Sorensen Memorial	Mort and Bridge Streets	Lot 1, DP 165879	Local	A123
Lithgow	Lithgow War Memorial	Queen Elizabeth Park, Main Street	Lot 45, DP 1096536	Local	A122

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Lithgow	State Mine Heritage Park	State Mine Gully Road	Lot 1, DP 242977	Local	A127
Lithgow	Lithgow Valley Colliery Quoits Field	Valley Drive	Lot 603, DP 1051775	Local	A186
Lithgow—South Bowenfels	McKanes Falls Bridge	McKanes Falls Road		State	A077
Lowther	Lowther general cemetery	Jenolan Caves Road	Lot 7301, DP 1148839; Lots 86 and 87, DP 757063	Local	A044
Lowther	Lowther/ Hampton district War Memorial	Jenolan Caves Road	Lot 151, DP 757063	Local	A185
Lowther	Lowther Park cemetery	96 Larnach Baker Road	Lot 233, DP 757063	Local	A043
Meadow Flat	Meadow Flat School Bell	Great Western Highway	Lot 1, DP 782196	Local	A092
Meadow Flat	Meadow Flat War Memorial	Great Western Highway	Lot 7001, DP 1021302	Local	A091
Meadow Flat	Meadow Flat General Cemetery	Meadow Flat Cemetery Road	Lots 7002 and 7004, DP 1052053	Local	A093
Meadow Flat	Mount Lambie Presbyterian Cemetery	75 Thorpes Pinch Road	Lot 2, DP 1043887	Local	A094
Megalong Valley	Six Foot Track	Megalong Valley		Local	A182
Mt Victoria	Hill Top Tramway above Hartley Vale	Darling Causeway	Lot 372, DP 41332	Local	A174
Mt Victoria	Hill Top Tramway above Hartley Vale	Darling Causeway	Lot 7010, DP 92868; Lot 372, DP 41332	Local	A175
Mt Victoria	Victoria Pass	Great Western Highway	Lot 7312, DP 1162788	Local	A183
Palmers Oakey	Palmers Oakey General Cemetery	Off Sunny Corner Road	Lot 111, DP 755795	Local	A106
Portland	Portland General Cemetery	Sunny Corner Road	Lot 7300, DP 1144082	Local	A107
Round Swamp	Round Swamp Cemetery	5249 Castlereagh Highway	Lot 3, DP 565109	Local	A061
Rydal	Old Roman Catholic Cemetery	Cartwright Street	Lot 8, Section 19, DP 758890	Local	A068
Rydal	Rydal General Cemetery	Cartwright Street	Lot 7311, DP 1140577; Lot 7011, DP 1020468	Local	A069
Rydal	Thomas Veays Isolated Grave	140 Cut Hill Road	Lot 1, DP 1107268	Local	A070
Rydal	Martha Power grave	Rydal Hampton Road	Lot 100, DP 829748	Local	A071
Sodwalls	Gravestone of Ellen Griffiths and Julia Beale	281 Anarel Road	Lot 243, DP 757076	Local	A143
Sodwalls	Sodwalls Cemetery	329 Sodwalls Road	Lot 1, DP 737321	Local	A141

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Tarana	Grave of Jeremiah Beale	Honeysuckle Falls Road	Lot 1, DP 876777	Local	A142
Tarana	Tarana Railway Station water tank	Sodwalls Road		State	A082
Wallerawang	Walker-Barton Private Cemetery	Foreshores Lake Wallace	Lot 1, DP 371608	Local	A109
Wallerawang	War Memorial	Main Street		Local	A184
Wallerawang	Wallerawang General Cemetery	Portland Road	Lots 408–414, DP 751651	Local	A108
Wolgan	Newnes Historic Site Group	Newnes Junction—Newnes		Local	A163
Wolgan	Christiana Williams grave	Wolgan Valley Road		Local	A110

Search Results

15 results found.

Cullen Bullen General Cemetery Lithgow - Mudgee Rd	Cullen Bullen, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Former Commonwealth Small Arms Factory Lithgow Methven St	Lithgow, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
Glen Alice General Cemetery Glen Alice Rd	Glen Alice, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Ironworks Blast Furnace Site Inch St	Lithgow, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Meadow Flat General Cemetery Scotts Creek Rd	Meadow Flat, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Meads Farm Great Western Hwy	Little Hartley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Old Catholic Cemetery Great Western Hwy	Hartley, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Private Cemetery on Bernina	Bernina via Capertee, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Round Swamp Private Cemetery Lithgow - Mudgee Rd	Round Swamp, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
The Greater Blue Mountains Area Great Western Hwy	Katoomba, NSW, Australia	(Declared property) World Heritage List
The Greater Blue Mountains Area - Additional Values Great Western Hwy	Katoomba, NSW, Australia	(Nominated place) National Heritage List

Umbrella Creek Geological Site	Glen Alice, NSW, Australia	(Removed from Register or IL) Register of the National Estate (Non-statutory archive)
Victoria Inn (former) Great Western Hwy	Little Hartley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Williams Store (former) Great Western Hwy	Little Hartley, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Willowvale Farm Portland Rd	Wallerawang, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)

Report Produced: Mon May 14 19:35:01 2018



Australian Government

Department of the Environment and Energy

Australia's National Heritage List

The National Heritage List is Australia's list of natural, historic and Indigenous places of outstanding significance to the nation.

Use our interactive map or select from the [list](#) below to find out more about a listed place.

[Australia's Heritage: National Treasures](#) is a journey around Australia exploring the stories of some of these National Heritage places.

-- Zoom to a National Heritage place on the map --

Customise map view

- Show all places
- NSW
- Vic
- Qld
- SA
- WA
- Tas
- NT
- ACT
- Antarctica
- External Territories

Note: for some places, the names given here may vary from the officially listed place names. For the official National Heritage place names (and numbers of listed places), see the [Australian Heritage Database](#).

Places	Location
Abbotsford Convent	VIC

Places	Location
Adelaide Park Lands and City Layout	SA
Australian Academy of Science Building	ACT
Australian Alps National Parks and Reserves	NSW, ACT, VIC
Australian Cornish Mining Sites (Burra)	SA
Australian Cornish Mining Sites (Moonta)	SA
Australian Fossil Mammal Sites (Naracoorte)	SA
Australian Fossil Mammal Sites (Riversleigh)	QLD
Australian War Memorial and the Memorial Parade	ACT
Batavia Shipwreck Site and Survivor Camps Area 1629 - Houtman Abrolhos	WA
Bondi Beach	NSW
Bonegilla Migrant Camp - Block 19	VIC
Brewarrina Aboriginal Fish Traps (Baiaames Ngunnhu)	NSW
Brickendon Estate	TAS
Budj Bim National Heritage Landscape - Mt Eccles Lake Condah Area	VIC
Budj Bim National Heritage Landscape - Tyrendarra Area	VIC
Cascades Female Factory	TAS
Cascades Female Factory Yard 4 North	TAS
Castlemaine Diggings National Heritage Park	VIC
Cheetup Rock Shelter	WA
City of Broken Hill	NSW
Coal Mines Historic Site	TAS
Cockatoo Island	NSW
Coranderrk	VIC
Cyprus Hellene Club - Australian Hall	NSW
Dampier Archipelago (including Burrup Peninsula)	WA
Darlington Probation Station	TAS
Dinosaur Stampede National Monument	QLD
Dirk Hartog Landing Site 1616 - Cape Inscription Area	WA
Echuca Wharf	VIC
Ediacara Fossil Site - Nilpena	SA
Elizabeth Springs	QLD
Eureka Stockade Gardens	VIC
First Government House Site	NSW

Places	Location
Fitzgerald River National Park	<u>WA</u>
Flemington Racecourse	VIC
Flora Fossil Site - Yea	VIC
Fraser Island	QLD
Fremantle Prison (former)	<u>WA</u>
Glass House Mountains National Landscape	QLD
Glenrowan Heritage Precinct	VIC
Gondwana Rainforests of Australia	<u>NSW</u> , QLD
Grampians National Park (Gariwerd)	VIC
Great Barrier Reef	QLD
Great Ocean Road	VIC
Greater Blue Mountains	<u>NSW</u>
HMAS Sydney II and HSK Kormoran	<u>WA</u>
HMS Sirius	EXT
HMVS Cerberus	VIC
Heard and McDonald Islands	EXT
Hermannsburg Historic Precinct	<u>NT</u>
High Court - National Gallery Precinct	<u>ACT</u>
High Court of Australia (former)	VIC
Hyde Park Barracks	<u>NSW</u>
ICI Building (former)	VIC
Jordan River Levee	TAS
Kakadu National Park	<u>NT</u>
Kamay Botany Bay: botanical collection sites	<u>NSW</u>
Kingston and Arthurs Vale Historic Area	EXT
Koonalda Cave	<u>SA</u>
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	<u>NSW</u>
Kurnell Peninsula Headland	<u>NSW</u>
Lesueur National Park	<u>WA</u>
Lord Howe Island Group	<u>NSW</u>
Macquarie Island	TAS
Mawsons Huts and Mawsons Huts Historic Site	ANTA
Melbourne Cricket Ground	VIC

Places	Location
Melbourne's Domain Parkland and Memorial Precinct	VIC
Moree Baths and Swimming Pool	<u>NSW</u>
Mount William Stone Hatchet Quarry	VIC
Murtoa No. 1 Grain Store	VIC
Myall Creek Massacre and Memorial Site	<u>NSW</u>
Newman College	VIC
Ngarrabullgan	QLD
North Head - Sydney	<u>NSW</u>
Old Government House and the Government Domain	<u>NSW</u>
Old Great North Road	<u>NSW</u>
Old Parliament House and Curtilage	<u>ACT</u>
Parramatta Female Factory and Institutions Precinct	<u>NSW</u>
Point Cook Air Base	VIC
Point Nepean Defence Sites and Quarantine Station Area	VIC
Porongurup National Park	<u>WA</u>
Port Arthur Historic Site	TAS
Purnululu National Park	<u>WA</u>
QANTAS hangar - Longreach	QLD
Recherche Bay (North East Peninsula) Area	TAS
Richmond Bridge	TAS
Rippon Lea House and Garden	VIC
Royal Exhibition Building and Carlton Gardens	VIC
Royal National Park and Garawarra State Conservation Area	<u>NSW</u>
Shark Bay, Western Australia	<u>WA</u>
Sidney Myer Music Bowl	VIC
Snowy Mountains Scheme	<u>NSW</u>
South Australian Old and New Parliament Houses	<u>SA</u>
Stirling Range National Park	<u>WA</u>
Sydney Harbour Bridge	<u>NSW</u>
Sydney Opera House	<u>NSW</u>
Tasmanian Wilderness	TAS
The Burke, Wills, King and Yandruwandha National Heritage Place	QLD, <u>SA</u>
The Goldfields Water Supply Scheme	<u>WA</u>

Places	Location
The Ningaloo Coast	WA
The West Kimberley	WA
Tree of Knowledge and curtilage	QLD
Uluru - Kata Tjuta National Park	NT
Warrumbungle National Park	NSW
Wave Hill Walk Off Route	NT
Western Tasmania Aboriginal Cultural Landscape	TAS
Wet Tropics of Queensland	QLD
Wilgie Mia Aboriginal Ochre Mine	WA
Willandra Lakes Region	NSW
Witjira-Dalhousie Springs	SA
Woolmers Estate	TAS
Wurrurrwuy stone arrangements	NT

Further information

[Australia's National Heritage List - the story so far](#)

[National Heritage Places map](#)

Appendix B – Overarching CMP policies comparison against the proposed capacity upgrade

Conservation Management Plan Verification

Tables B1 and B2 prepared by Roads and Maritime verify the proposed capacity upgrade conforms to the relevant Conservation Policies outlined in the Overarching Timber Truss Road Bridges CMP and McKanes Bridge CMP.

Table B1 – Overarching Conservation Management Plan verification of policies against the proposed capacity upgrade works

Overarching CMP Policies	How the proposed work complies with the Policy
Policy 1: Retention of cultural significance of the timber truss bridge population	
a) As the primary custodian of the remaining timber truss road bridges of NSW, Roads and Maritime will conserve a representative sample (as identified in the Strategy) that reflects the diversity of the original population for future generations as part of the operational road network.	The proposed works will ensure McKanes bridge is preserved as a functioning bridge within Roads and Maritime's bridge inventory. This will ensure operational use of the bridge by future generations.
b) Timber truss bridges are places of exceptional cultural significance and will be maintained and conserved in such a way which protects or enhances their cultural significance.	The proposed work conserves the original McDonald truss bridge design which ensures the cultural significance of this form of bridge is preserved.
c) Conservation of timber truss bridges will accord with the definitions and principles of The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance and include all significant components and attributes of the place and its setting.	The capacity upgrade has been designed in accordance with The Burra Charter, with particular focus on preserving the design intent of the bridge as a vehicle crossing.
d) All current and future owners, managers and consent authorities responsible for the care and management of timber truss bridges to be retained will be advised of, and be jointly responsible for, the conservation of the heritage significance of the bridges.	The capacity upgrade design has been developed in consultation with relevant internal Roads and Maritime staff responsible for bridge asset management activities, as well as external heritage experts in the Office of Environment and Heritage (OEH).
e) The conservation management of the timber truss bridges will be undertaken in consultation with heritage practitioners with relevant expertise and experience working in collaboration with structural engineers with relevant expertise and experience as required.	Structural engineers responsible for the upgrade design have developed the proposed design in consultation with heritage practitioners, both internal and external.
Policy 2: Adoption, implementation and review of the overarching CMP	
a) The conservation policies set out in this document will be formally adopted by Roads and Maritime as a guide to future conservation and development of timber truss bridges.	The conservation policies have been adopted in the proposed work.
b) Roads and Maritime will make resources available for the implementation of these policies during any works to the timber truss bridges or their setting, including routine maintenance.	Roads and Maritime have committed labour and funding resources to complete the proposed work as part of the Bridges for the Bush initiative.
c) Roads and Maritime will ensure that this document is both available for, and understood by staff co-ordinating and undertaking the ongoing maintenance of timber truss bridges.	Project management staff involved in the capacity upgrade work have been made aware of and provided with a copy of the Overarching Conservation Management Plan (OCMP).
d) This overarching CMP will be made available to the public. Copies of this CMP will be lodged with all relevant administrative, maintenance, heritage and archival bodies/agencies, as well as being held by Roads and Maritime, and be readily available for public reference.	N/A
e) This CMP will be reviewed every five years to incorporate any changes in conservation methodology or practice, changes in legislation or user requirements, and any new historical evidence that comes to light. The effectiveness of conservation treatments to the structures will also be considered and if required, corrective action recommended. The reviewed CMP will be submitted to the Heritage Council for endorsement.	N/A
Policy 3: Preparation of bridge specific Conservation Management Plans	
a) Roads and Maritime will prepare conservation management plans for each of the bridges to be retained to guide the management and conservation of these bridges. Conservation management plans will be submitted for endorsement by the Heritage Council of NSW or its delegate.	A bridge specific CMP has been prepared for McKanes Bridge. The CMP has been submitted for review and endorsement by OEH.
b) The SHR listings for the timber truss bridges to be retained will be updated to reflect the findings of the conservation management plans with regard to significance and history.	N/A
Policy 4: Conservation of a representative timber truss bridge population	
a) In keeping with the intent of the 2012 strategy, Roads and Maritime will review the list of bridges to be retained and those to be demolished.	Roads and Maritime is currently reviewing the list of bridges to be retained and those to be demolished. Due to the State Heritage listing of McKanes Bridge, the bridge will continue to be retained and there is presently no proposal to demolish the bridge.
b) The updated list will be submitted for endorsement by the Heritage Council of NSW.	N/A
Policy 5: Listings	
a) The bridges to be retained on the updated list will be nominated for inclusion on the State Heritage Register (SHR) if they are not already listed on the SHR.	McKanes Bridge is already included on the SHR.
b) For the replacement of bridges which are not viable for retention, applications to the Heritage Council for delisting will be accompanied by a statement of heritage impact (SOHI).	N/A
c) Any bridges owned by local Councils, acquired by Roads and Maritime for conservation will be added to the Roads and Maritime S170 register in addition to nomination to the SHR, where relevant.	N/A
Policy 6: Use of the bridges	
a) Roads and Maritime will continue to engage with local communities to ensure that the timber truss bridges to be retained are managed in a way that meets community needs.	Roads and Maritime has engaged with Lithgow Council, Lithgow City Busses and local residents regarding the need for capacity upgrade work. Lithgow City Busses have confirmed its needs to cross McKanes bridge with school busses which weigh more than the current capacity of the bridge. Local farmers require assess for heavy vehicles to collect and deliver livestock to farms.
b) Timber truss bridges to be retained will be used for vehicular traffic. The continued usage of these bridges as functioning crossings for both commercial (freight, farming machinery and buses) and private passenger vehicles is	The proposed capacity upgrade work will ensure the bridge can continued to be used by vehicle traffic. If the proposed work is not undertaken, the bridge capacity will not meet current or future transport needs, which will

Overarching CMP Policies	How the proposed work complies with the Policy
integral to their cultural significance.	result in the need to replace the bridge with a new concrete or steel bridge built to modern standards.
c) Unacceptable uses of timber truss bridges include any uses or activities that may cause or accelerate physical damage to the fabric or views to and from the bridges (e.g. utilities).	The proposed work will ensure McKanes Bridge continues to be used as vehicle bridge and receives appropriate maintenance to keep the bridge functioning as such. No utilities or other unacceptable bridge uses are proposed.
d) Roads and Maritime will seek to arrange for the removal and relocation of existing utilities from timber truss bridges where possible and when opportunity arises.	There are no utilities currently on the bridge. There are no proposals to install utilities on the bridge.
Policy 7: Maintenance and repair	
a) Ongoing repair and maintenance will be carried out to ensure that the minimum standards of maintenance under the Heritage Act are met, and that each significant element in each bridge retains its level of significance. Works will be undertaken by suitably skilled workers with proven expertise in the relevant field and under adequate supervision.	The maintenance components of the proposed work are required for Roads and Maritime to meet the minimum standards of maintenance under the Heritage Act. The capacity upgrade component of the work retains the level of significance of significant elements. The work will be undertaken by highly skilled bridge carpenters employed by Roads and Maritime, having experience working on timber bridges. Appropriate supervision will be provided for workers.
b) Roads and Maritime will develop a forward program to ensure that sufficient suitable high quality timber is made available for identified conservation works on timber truss bridges.	Due to Roads and Maritime's timber procurement program, timbers large enough for the proposed work have already been procured.
c) Roads and Maritime will ensure that the knowledge, skills, techniques and practices that support the continued conservation of timber truss bridges is maintained. Specialist engineering and technical knowledge will be captured, further developed and passed on.	Roads and Maritime continues to run internal training in timber truss bridge management, including maintenance and repair techniques required for continued conservation of timber bridges.
d) Roads and Maritime will prepare an Incident Response Plan for each bridge to be retained to minimise the risk and duration of emergency works, and manage such works so that the public and the bridges are kept safe, and so that works do not impact significant fabric.	Incident Response Plans will be developed to manage the risks of different types of incidents that could potentially affect the bridge (ie flood, fire, vehicle impact, malicious damage).
e) Timber elements in trusses will be replaced as required before deterioration affects the safety or serviceability of a bridge. New timbers will be cut to the original design dimensions as shown on original design drawings (unless modified dimensions are approved by the Heritage Council of NSW as required for strength or due to availability of timbers) and original detailing using NSW hardwood of suitable strength and durability.	The existing bridge timbers have deteriorated to a point where safety and serviceability of the bridge has been affected. The proposed work will replace all deteriorated timber and where possible will use timber members of the same dimensions of those shown on the original design drawings. "Royal species" NSW hardwood will be used.
Policy 8: New work	
a) Elements of the bridges will be conserved in accordance with their level of significance.	The proposed work conserves significant bridge elements by retaining as much of the existing bridge form and fabric as possible, and making as minimal changes as possible, in order for the bridge to continue to be used by heavier present-day vehicles.
b) Timber truss bridges will continue to carry traffic appropriate to their place in the road network. They may be adapted to ensure their continued serviceability provided this does not compromise their heritage significance. Subject to relevant approvals, this may include introducing new materials to meet load, safety and durability requirements in order to enable the bridge to remain as a vital part of the NSW road network, strengthening truss spans to ensure loads can be carried safely and to ensure effective traffic barriers can be installed.	The proposed capacity upgrade work is considered the minimal work required for McKanes Bridge to continue to carry traffic safely. The work includes minor changes to meet load and safety requirements which includes truss strengthening and installation of an effective traffic barrier. These changes are considered to not compromise the bridge's heritage significance.
c) Roads and Maritime will match the excellence of the originals in the quality of design and construction of any modifications or new works.	The proposed capacity upgrade work matches the original Australian hardwood timber fabric, form and function. Where ever possible there is no introduction of non-original materials, however, cast iron elements will be replaced with steel or SG cast iron, the timber sill beams will be removed and replaced with steel, a concrete curtain wall will be installed behind each abutment and scour protection will be added.
d) Roads and Maritime will continue to explore and develop means by which these bridges may continue to effectively fulfil their required function. This may include the use of new methods and materials to strengthen the structures, extend their usable life, ensure their operability and achieve conservation objectives where this can be done in a subtle and sympathetic way and where this is reasonable and feasible. Such changes are subject to the standard approval processes of the Heritage Act 1977 for those bridges on the SHR.	The proposed capacity upgrade design represents the latest engineering design methodologies and materials to strengthen timber bridges.
e) For works not covered by Standard or Specific Exemptions or by exemptions identified in an endorsed bridge specific CMP, applications to the Heritage Council for approval for specific works will be submitted, accompanied by a statement of heritage impact(SOHI) and, if required, the relevant statutory application under the Heritage Act.	This SOHI has been prepared to accompany the Section 60 Application for the capacity upgrade design, to be submitted for approval by OEH.
Policy 9: Interpretation	
a) The heritage significance of the timber truss bridge population and each of the timber truss bridges to be retained will be communicated through effective heritage interpretation.	Heritage interpretation will be included in the proposed work.
b) Interpretation of the timber truss bridges will be based on the historical themes and historical analyses documented in the bridge specific CMPs and this overarching CMP.	Noted.
c) In accordance with the Strategy, Roads and Maritime will continue to develop a heritage interpretation strategy that will apply to both bridges to be retained and to the sites and materials from bridges that have been replaced, to identify suitable means of capturing and sharing information about the heritage significance of these places.	Noted.
d) Interpretation will conform to the Heritage Division's Interpreting Heritage Places and Items Guidelines and with Roads and Maritime's Heritage Interpretation Guideline.	Noted.
e) In accordance with the Strategy, Roads and Maritime will commission a comprehensive publication on the heritage significance of the timber truss bridges of New South Wales.	Noted.
Policy 10: Protection and enhancement of visual setting	
a) Any development proposed for the land adjacent to a bridge, whether inside or outside the curtilage, should be considered carefully to ensure that it does not have an unacceptable visual impact which could cause a reduction in	No developments are proposed for land adjacent to McKanes Bridge as part of the proposed work.

Overarching CMP Policies	How the proposed work complies with the Policy
the aesthetic significance of the bridge.	
b) Signage in the vicinity of the bridges should be minimised to what is necessary for safety and identification so that it does not create visual clutter and block views.	The proposed work will increase the load capacity of the bridge which will allow the current load limit signs on approach to the bridge (which are obscuring the view of the bridge) to be removed.
c) Vegetation in the vicinity of the bridges should be kept to a minimum. Weeds should be removed, and vegetation clearance should be taken with a view to improving the visual setting, and to reduce the risk of fire by creating a cleared area that acts as a fire break.	Routine vegetation clearing and weed management activities will be undertaken to gain access to the bridge for the proposed work.
d) Any relevant planning and statutory controls must be adhered to when considering development or works adjacent to a bridge.	Noted.
Policy 11: Archival recording	
a) The records created by Roads and Maritime relating to the timber truss bridges are recognised as an integral part of the heritage portfolio. They will be managed to ensure permanent retention as State records, but must also be made available so that they can be readily accessed by bridge managers, engineers and heritage practitioners where required.	Records relating to the proposed work will be stored on Roads and Maritime's electronic document management system, ensuring permanent retention as State records and accessibility by bridge managers, engineers and heritage practitioners.
b) Immediately before, during and after any works being undertaken, an inspection will be completed, detailing and photographing the condition and defects of all elements.	This will be completed as part of the works.
c) A complete archival recording will be undertaken of all extant timber truss bridges maintained by Roads and Maritime including 3D mapping (laser scanning) of the bridges.	This will be completed as part of the works.
d) All methods and materials used during any work done to any timber truss bridge (whether it is to be retained or demolished) will be fully documented with written information and appropriate photographs. Records, reports and photographs of any work carried out on the bridge will be placed in a permanent archive to enable retrieval of information afterwards.	This will be completed as part of the works.
e) A representative sample of original fabric assessed to be of heritage significance (such as cast iron shoes), but to be removed from the timber truss bridges will be suitably archived and recorded on the Roads and Maritime Section 170 Heritage and Conservation Register.	This will be completed as part of the works.
f) Information recorded will be used to promote and enhance interpretation both of individual bridges and of the timber truss bridge population in general to the communities of NSW.	Noted.
Policy 12: Sustainability	
a) In accordance with the Strategy, Roads and Maritime will implement the following sustainability policies in relation to the timber truss bridges: a. Implement the Recycling of used bridge timbers policy for all bridges to be removed. b. Implement the Timber Procurement Strategy to ensure adequate timber supply. c. Implement a skills development program to ensure the skills required for timber bridge conservation and maintenance are retained within Roads and Maritime.	Existing bridge timbers removed as part of the proposed work will be recycled where appropriate. Timber for the proposed work has already been procured. Roads and Maritime continues to provide training and personal development opportunities for staff involved in timber bridge work.
Policy 13: Archaeology	
a) Roads and Maritime will consult with relevant Aboriginal stakeholders about any proposed project or works that may impact on areas of Aboriginal archaeological potential or cultural significance. Wherever harm to Aboriginal relics is considered likely in the course of works, an AHIP shall be obtained, in accordance with Section 90(1) of the NPW Act 1974.	N/A.
b) Any subsurface disturbance of land that may have archaeological potential will be carried out in accordance with the Roads and Maritime Services Cultural Heritage Guidelines and the archaeological provisions of the Heritage Act 1977. A Due Diligence Assessment will be provided for any works which disturb the land outside of an AHIP area (including, cutting, filling, ground penetration, stockpiles, mounds, etc). The Assessment shall be in accordance with the NSW Office of Environment & Heritage's Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010).	Noted.
c) The Roads and Maritime Services Unexpected Heritage Items - Heritage Procedure 02, November 2015, must be followed to manage the discovery of all unexpected heritage items (both Aboriginal and non-Aboriginal) that are discovered during Roads and Maritime activities.	Noted.
Policy 14: Reporting to the NSW Heritage Council	
a) In accordance with the Strategy, Roads and Maritime will report to the NSW Heritage Council every two years on the following issues with the identified information: a. Management of the timber truss bridge portfolio b. Implementation of the bridge replacement program c. Implementation of the moveable span bridge operability heritage assessment d. Status of the heritage interpretation strategy e. Installation of on-site interpretation f. Status of the sustainable conservation actions	Noted.

Table B2 – McKanes Bridge Conservation Management Plan verification of policies against the proposed capacity upgrade works

McKanes Bridge CMP Policies	How the proposed work complies with the Policy
Policy 1 – Retention of cultural significance	
1.1 McKanes Bridge is a place of exceptional cultural significance which will be conserved.	The proposed work will conserve the bridge as a place of exceptional cultural significance.
1.2 McKanes Bridge will be maintained and conserved in such a way which protects or enhances the cultural significance of the bridge.	The proposed work will conserve to the greatest extent possible the original McDonald truss bridge design which ensures the cultural significance of this form of bridge design is preserved.
1.3 Conservation of McKanes Bridge will accord with the definitions and principles of The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance 2013, and include all significant components and attributes of the place and its setting.	The capacity upgrade has been designed in accordance with The Burra Charter, with particular focus on preserving the design intent of the bridge as a vehicle crossing and retaining to the greatest extent possible the original form and fabric of the bridge, whilst making it possible for new elements to be identifiable as such.
1.4 All current and future owners, managers and consent authorities responsible for the care and management of McKanes Bridge and/or its setting will be advised of, and be jointly responsible for, the conservation of the heritage significance of the bridge.	Noted.
Policy 2 – Adoption, implementation and review of the CMP	
2.1 The conservation policies set out in this document will be formally adopted by Roads and Maritime as a guide to future conservation and development of McKanes Bridge.	Noted.
2.2 Roads and Maritime will make resources available for the implementation of these policies during any works to the structure or its setting, including routine maintenance.	Roads and Maritime has committed labour and funding resources to complete the proposed work as part of the Bridges for the Bush initiative.
2.3 Roads and Maritime will ensure that this document is both available for, and understood by staff co-ordinating and undertaking the ongoing maintenance of McKanes Bridge.	Project management staff involved in the capacity upgrade work will be made aware of and provided with a copy of the McKanes Bridge CMP.
2.4 This CMP will be made available to the public. Copies of this CMP will be lodged with all relevant administrative, maintenance, heritage and archival bodies/agencies, as well as being held by Roads and Maritime, and be readily available for public reference.	N/A
2.5 This CMP will be reviewed every five years to incorporate any changes in conservation methodology or practice, changes in legislation or user requirements, and any new historical evidence that comes to light. The effectiveness of conservation treatments to the structure will also be considered and if required, corrective action recommended.	N/A
2.6 The conservation management of the bridge will be undertaken in consultation with heritage practitioners with relevant expertise and experience working in collaboration with structural engineers with relevant expertise and experience as required.	The capacity upgrade design has been developed in consultation with relevant internal Roads and Maritime staff responsible for bridge asset management activities, as well as external heritage experts in the Office of Environment and Heritage.
Policy 3 – Use of the bridge	
3.1 McKanes Bridge will be used for vehicular traffic. The continued usage of this bridge as a functioning crossing for vehicles and cyclists is integral to its cultural significance.	The proposed work will allow the bridge to continue to be used safely by vehicles and pedestrians.
3.2 Unacceptable uses of McKanes Bridge include any uses or activities that may cause or accelerate physical damage to the fabric or views to and from the bridge (e.g. utilities).	There are no utilities currently on the bridge. There are no proposals currently to install utilities on the bridge.
Policy 4 – Interpretation strategy for the bridge	
4.1 An Interpretation Strategy for McKanes Bridge will be prepared based on the historical themes and historical analyses documented in this report. Interpretation will conform to the Heritage Division's Interpreting Heritage Places and Items Guidelines and with Roads and Maritime's Heritage Interpretation Guideline.166. A suitably designed sign will be installed and maintained to provide interested visitors with relevant interpretive information.	Heritage interpretation will be included in the proposed work.
Policy 5 – Protection of the visual setting	
5.1 Any development proposed for the land adjacent to the bridge outside the curtilage should be considered carefully to ensure that it does not have an unacceptable visual impact which could cause a reduction in the aesthetic significance of the bridge.	No developments are proposed for land adjacent to McKanes Bridge as part of the proposed work.
5.2 Signage in the vicinity of the bridge should be minimised to what is necessary for safety and identification so that it does not create visual clutter and block views.	The proposed work will increase the load capacity of the bridge which will allow the current load limit signs on approach to the bridge (which are obscuring the view of the bridge) to be removed.
5.3 Vegetation in the vicinity of the bridge should be kept to a minimum. Weeds should be removed, and vegetation clearance should be taken with a view to improving the visual setting, and to reduce the risk of fire by creating a cleared area that acts as a fire break.	Routine vegetation clearing and weed management activities will be undertaken to gain access to the bridge for the proposed work.
Policy 6 – Archaeology	
6.1 Any subsurface disturbance of land that may have archaeological potential will be carried out in accordance with the Roads and Maritime Services Cultural Heritage Guidelines and the archaeological provisions of the Heritage Act 1977	Noted.
Policy 7 – Movable items	
7.1 A representative sample of original fabric assessed to be of heritage significance, but to be removed from the bridge will be suitably archived and recorded on the Roads and Maritime Section 170 Heritage and Conservation Register. This will include: <ul style="list-style-type: none"> • Three different types of original top chord shoes from a 90' McDonald truss • One of each of the original tension rod connectors (ie: saddle plates and washer plates) 	Noted.
Policy 8 – Listings	
8.1 McKanes Bridge will continue to be included on: <ul style="list-style-type: none"> • Lithgow Shire Council Local Environmental Plan (currently listed – A077) • RMS Section 170 Heritage and Conservation Register (currently listed - 4300003) 	Noted.

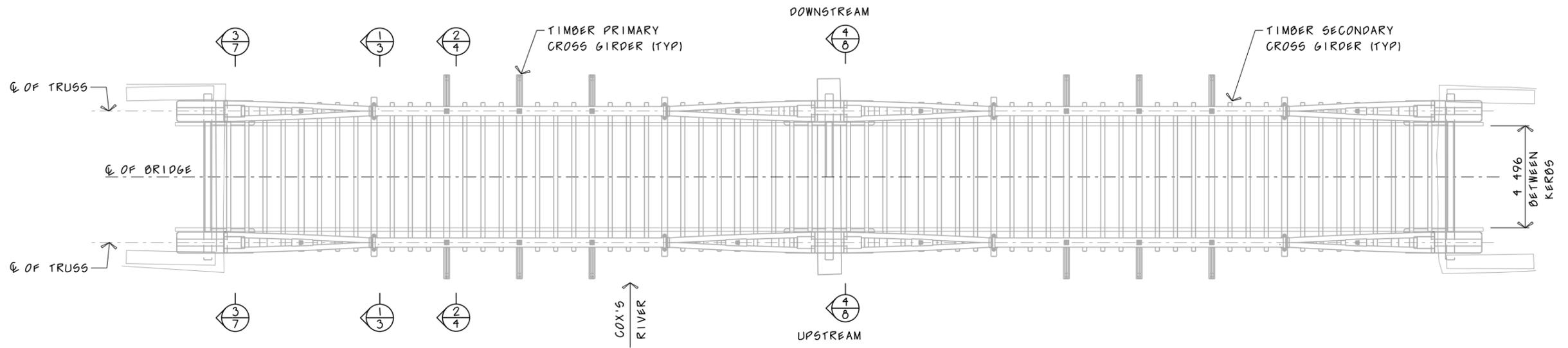
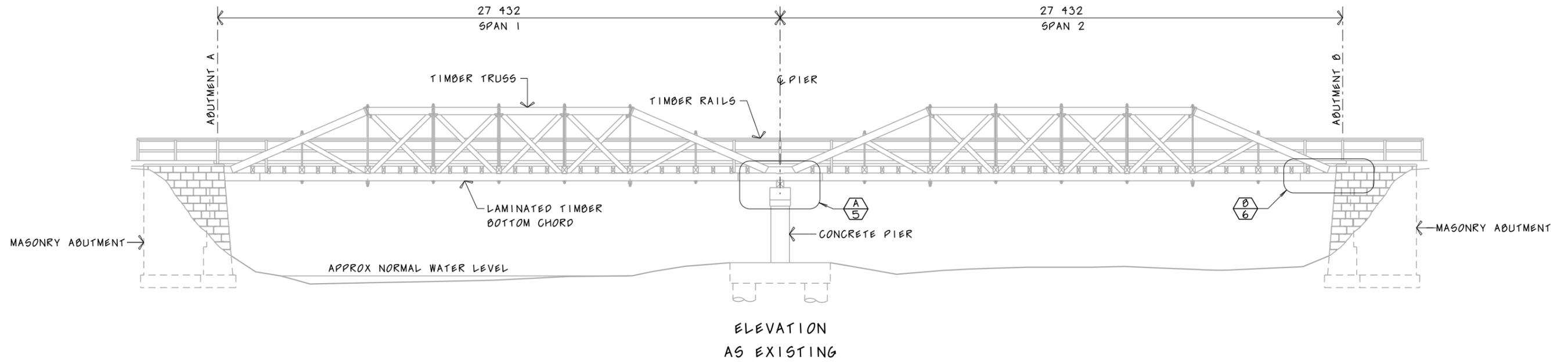
McKanes Bridge CMP Policies	How the proposed work complies with the Policy
<ul style="list-style-type: none"> New South Wales State Heritage Register (currently listed - SHR 01473) Engineers Australia Australian Historic Engineering Plaquing Program (currently listed) 	
Policy 9 – Maintenance and repair works generally	
9.1 The bridge is located on a public road and must not create a public safety hazard, but will be maintained both to support its ongoing functionality and its significant form.	The proposed capacity upgrade work will enhance safety by increasing bridge load capacity deck and traffic barrier safety, reducing safety hazards.
9.2 The bridge will be regularly inspected by specialists for the integrity of the structure. Any issues affecting public safety, if found, will be addressed by appropriate methods.	Noted.
9.3 A separate specialist will be engaged twice a year to inspect for and treat any termites.	N/A
9.4 Appropriate repair and maintenance works will be carried out on an ongoing basis. The works will ensure that the minimum standards of maintenance are met.	The proposed work includes maintenance and repair works to ensure the bridge is maintained to at least minimum standards, if not better.
9.5 Repair and maintenance works will be undertaken by suitably skilled workers with proven expertise in the relevant field and under adequate supervision.	The proposed work will be undertaken by highly skilled bridge carpenters employed by Roads and Maritime, having experience working on timber bridges. Appropriate supervision will be provided for workers.
9.6 In order to carry out maintenance and repair work safely, various support structures may be necessary including Bailey bridge (or equivalent), temporary props and access scaffolding. These structures are temporary in nature, and will be removed when no longer required.	Noted.
Policy 10 – Archival recording	
10.1 Immediately before, during and after any works being undertaken, an inspection will be completed, detailing and photographing the condition and defects of all elements.	Noted.
10.2 All methods and materials used during any work done to the bridge will be fully documented with written information and appropriate photographs.	Noted.
10.3 Records, reports and photographs of any work carried out on the bridge will be placed in a permanent archive to enable retrieval of information afterwards.	Noted.
Policy 11 – Exemptions and approvals	
11.1 Standard Exemptions currently apply (see Appendix B). Endorsement of this CMP by the Heritage Council will give effect to the Specific Exemptions identified in accordance with Section 57 of the Heritage Act 1977 for the following activities (see also Appendix A): <ul style="list-style-type: none"> Installation of non-permanent support structures which do not damage any significant fabric (such as Bailey bridging or props) for a period of up to 2 years in order to keep the bridge in use and safe while necessary repairs are being planned and carried out. Reconstruct any timber with new timber to original design dimensions and detailing. Design, installation and maintenance of suitable interpretative information. 	Noted.
11.2 For works not covered by Standard or Specific Exemptions, applications to the Heritage Council for approval for specific works will be accompanied by a statement of heritage impact (SOHI) and, if required, the relevant statutory application under the Heritage Act.	This SOHI has been prepared to accompany the Section 60 Application for the capacity upgrade design, to be submitted for approval by OEH.
Policy 12 – Top chords (exceptional significance)	
12.1 Top chords will be reconstructed to their original design dimensions and detailing using NSW hardwood of suitable strength and durability and steel splice plates.	This detail is shown in the capacity upgrade heritage concept design drawings.
12.2 The timber of the top chords, once reconstructed, will be preserved for as long as practical by ensuring that the protective coating (breathable white paint) is reapplied as necessary and that termite inspections and treatments are undertaken regularly.	Noted.
12.3 They will be replaced before deterioration affects safety or serviceability of the bridge.	The proposed work will allow the top chords to be replace before deterioration affects safety or serviceability of the bridge.
Policy 13 – Bottom chords and butting blocks (moderate significance)	
13.1 Bottom chords and butting blocks will be reconstructed to their original design dimensions and detailing as much as possible, using NSW Hardwood of suitable strength and durability, with suitably designed strengthening provided to allow the bridge to carry modern vehicles and to make up for the loss of capacity inherent in using shorter timbers. External steel plates have been determined to be the most appropriate option in this case.	This detail is shown in the capacity upgrade heritage concept design drawings.
13.2 The timber of the bottom chords and butting blocks, once reconstructed, will be preserved for as long as is practical by ensuring that the protective coating (breathable white paint) is reapplied as necessary and that termite inspections and treatments are undertaken regularly, and that the bolts in the bottom chord are kept tight.	Noted.
13.3 They will be replaced before deterioration affects safety or serviceability of the bridge.	The proposed work will allow bottom chords and butting blocks to be replace before deterioration affects safety or serviceability of the bridge.
Policy 14 – Principals and diagonal props (high significance)	
14.1 Principals and diagonal props will be reconstructed to their original design dimensions and detailing using NSW hardwood of suitable strength and durability.	This detail is shown in the capacity upgrade heritage concept design drawings.
14.2 The principals and diagonal props, once reconstructed, will be preserved for as long as is practical by ensuring that the protective coating (breathable white paint) is reapplied as necessary and that termite inspections and treatments are undertaken regularly.	Noted.
14.3 They will be replaced before deterioration affects safety or serviceability of the bridge.	The proposed work will allow principals and diagonal props to be replace before deterioration affects safety or

McKanes Bridge CMP Policies	How the proposed work complies with the Policy
	serviceability of the bridge.
Policy 15 – Diagonals (exceptional significance)	
15.1 Diagonals will be reconstructed to their original design dimensions and detailing using NSW hardwood of suitable strength and durability.	This detail is shown in the capacity upgrade heritage concept design drawings.
15.2 The diagonals, once reconstructed, will be preserved for as long as is practical by ensuring that the protective coating (breathable white paint) is reapplied as necessary and that termite inspections and treatments are undertaken regularly.	Noted.
15.3 They will be replaced before deterioration affects safety or serviceability of the bridge.	The proposed work will allow diagonals to be replaced before deterioration affects safety or serviceability of the bridge.
Policy 16 – Tension rods (moderate significance)	
16.1 Tension rods should be reconstructed to their original design dimensions and detailing with new metal components. They should be painted black to preserve the original aesthetic.	This detail is shown in the capacity upgrade heritage concept design drawings. Tension rods will be painted black to preserve the original aesthetic.
Policy 17 – Cast iron shoes (high significance)	
17.1 Cast iron shoes should be reconstructed in ductile cast iron to their original design dimensions and detailing. They should be painted black to preserve the original aesthetic.	This detail is shown in the capacity upgrade heritage concept design drawings. Cast iron shoes will be painted black to preserve the original aesthetic.
Policy 18 – Sway braces (high significance)	
18.1 The metal sway braces should be replaced with new strengthened metal sway braces at original locations only. They should be painted black to preserve the original aesthetic	This detail is shown in the capacity upgrade heritage concept design drawings. Sway braces will be painted black to preserve the original aesthetic.
Policy 19 – Cross girders (little significance)	
19.1 Secondary cross girders should be reconstructed to their original design dimensions and detailing using NSW Hardwood of suitable strength and durability.	This detail is shown in the capacity upgrade heritage concept design drawings.
19.2 Primary cross girders should be replaced with new steel primary cross girders which reflect the form and function of the original. The new steel primary cross girders should be painted white to restore the original aesthetic to the bridge and also to indicate as a form of interpretation that the original primary cross girders were timber.	This detail is shown in the capacity upgrade heritage concept design drawings. The new steel primary cross girders will be painted white to restore the original aesthetic.
Policy 20 – Decking (currently intrusive)	
20.1 The decking should be replaced with new decking which should reflect the fabric and function of the original and should restore the original aesthetic of the bridge.	The timber deck will be replaced with a Stress Laminated Timber (SLT) deck to reflect the fabric and function of the original. This detail is shown in the capacity upgrade heritage concept design drawings.
20.2 The decking including its wearing surface should be maintained in such a way to ensure the safety of those travelling across the bridge and to reduce the risk of damage to the bridge.	The SLT deck will have a sprayed bitumen wearing surface to provide traction for vehicles and cyclists using the bridge.
Policy 21 – Railing (little significance)	
21.1 The railing should be replaced with a new visually recessive but complying traffic barrier.	The upgrade design includes replacing the timber railing with a steel traffic barrier that meets minimum requirements for safety. Extensive design work performed in consultation with architects and OEH has been completed to develop the least visual impacting steel traffic barrier possible. Details of the steel traffic barrier can be seen in the capacity upgrade heritage concept design drawings.
Policy 22 – Abutments (high significance)	
22.1 The masonry abutments will be preserved for as long as is practical by ensuring that wombat holes are filled and scour protection is provided to avoid damage by undermining.	The proposed work will retain the original masonry abutments. Wombat holes will be filled in and scour protection will be provided to avoid damage by undermining.
22.2 If cleaning of the abutments is required in order to remove harmful substances and to reveal deterioration then a gentle method such as low pressure water spray will be used.	Noted.
22.3 If repair to abutment stone is required then the new stone will match the old as nearly as possible in colour, grain, bedding, durability, porosity and chemical composition.	Noted.
22.4 If repair to the abutment mortar is required then the composition of the mortar will match the original lime mortar as nearly as possible to avoid detrimental interaction.	Noted.
22.5 Where stones from the abutment require temporary removal to enable access for truss repair works, the stones will be reinstated to their original locations on completion of work.	Noted.
Policy 23 – Pier (little significance)	
23.1 The concrete pier will be painted dark grey with an anti-graffiti coating applied.	Noted.

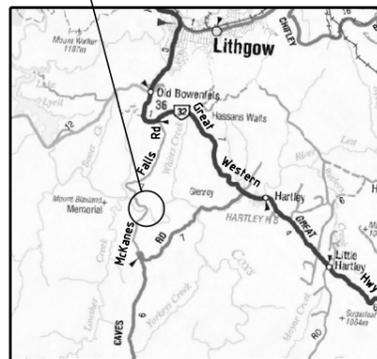
Appendix C – Capacity upgrade heritage concept design sketches

FROM SOUTH BOWENFELS

TO JENOLAN GAVES ROAD



BRIDGE SITE



LOCALITY PLAN

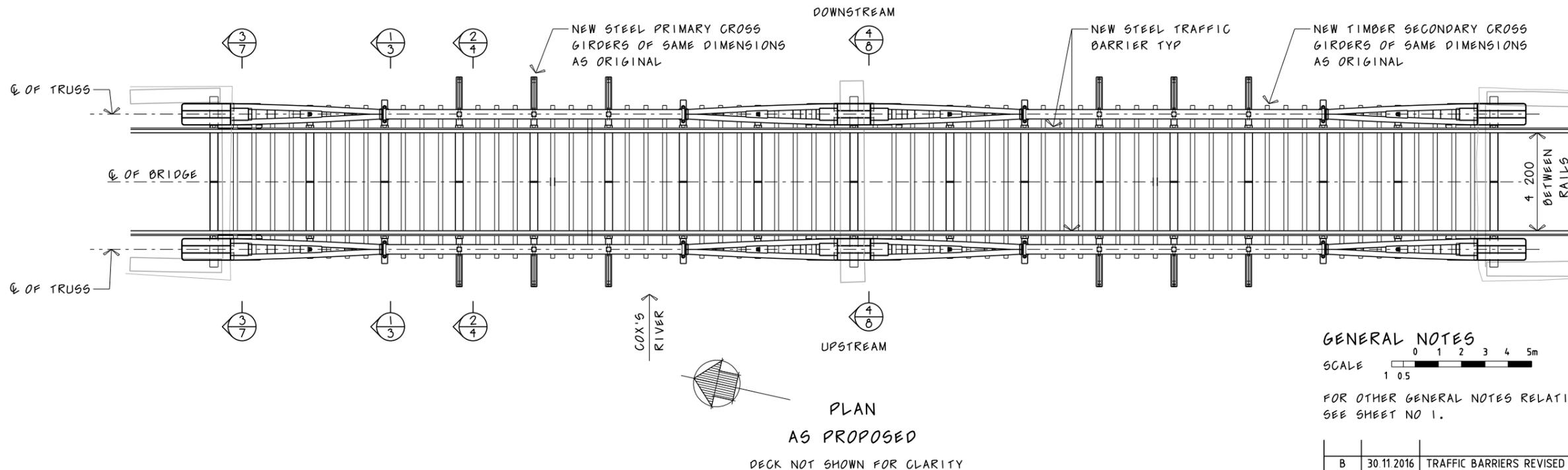
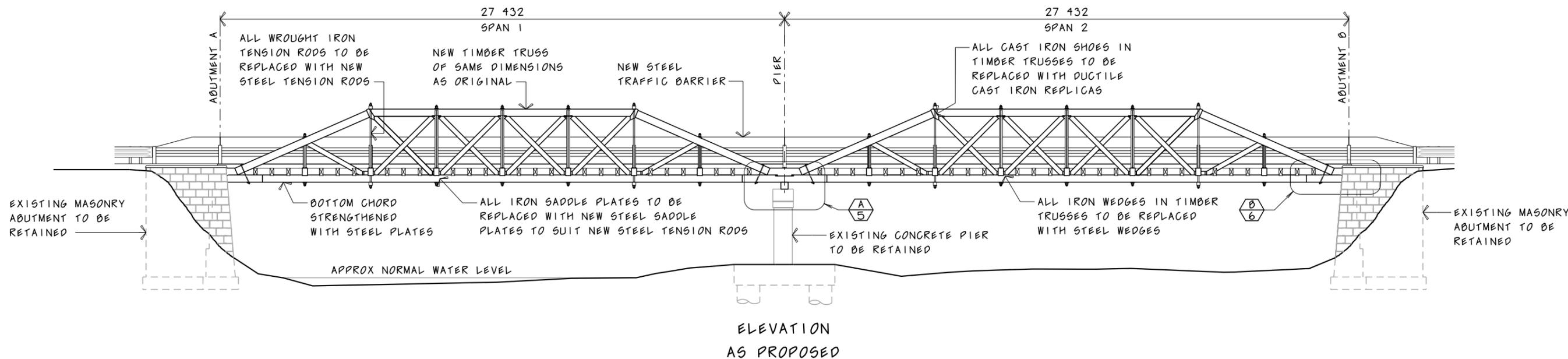
THE BRIDGE SITE IS APPROXIMATELY 131KM BY ROAD FROM SYDNEY

GENERAL NOTES



DIMENSIONS ARE IN MILLIMETRES.
 ALL EXISTING DIMENSIONS ARE BASED ON ORIGINAL DRAWINGS.
 NUMBER OF PLAN 000 258 BC 0127.
 TYP DENOTES ALL SUCH COMPONENTS IN ALL LOCATIONS.
 UC DENOTES UNIVERSAL COLUMN.
 SHS DENOTES SQUARE HOLLOW SECTION.
 SLT DENOTES STRESS LAMINATED TIMBER.

ISSUE	DATE	REVISION	PREP	CHECK	AUTH
LOCAL ROAD					CITY OF LITHGOW
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT					
GENERAL ARRANGEMENT - SHEET A					
			PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
TRANSPORT Roads & Maritime Services			CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No			
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS			
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302		
S DESHPANDE BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW		
		SHEET No	1 OF 8	ISSUE	A



GENERAL NOTES

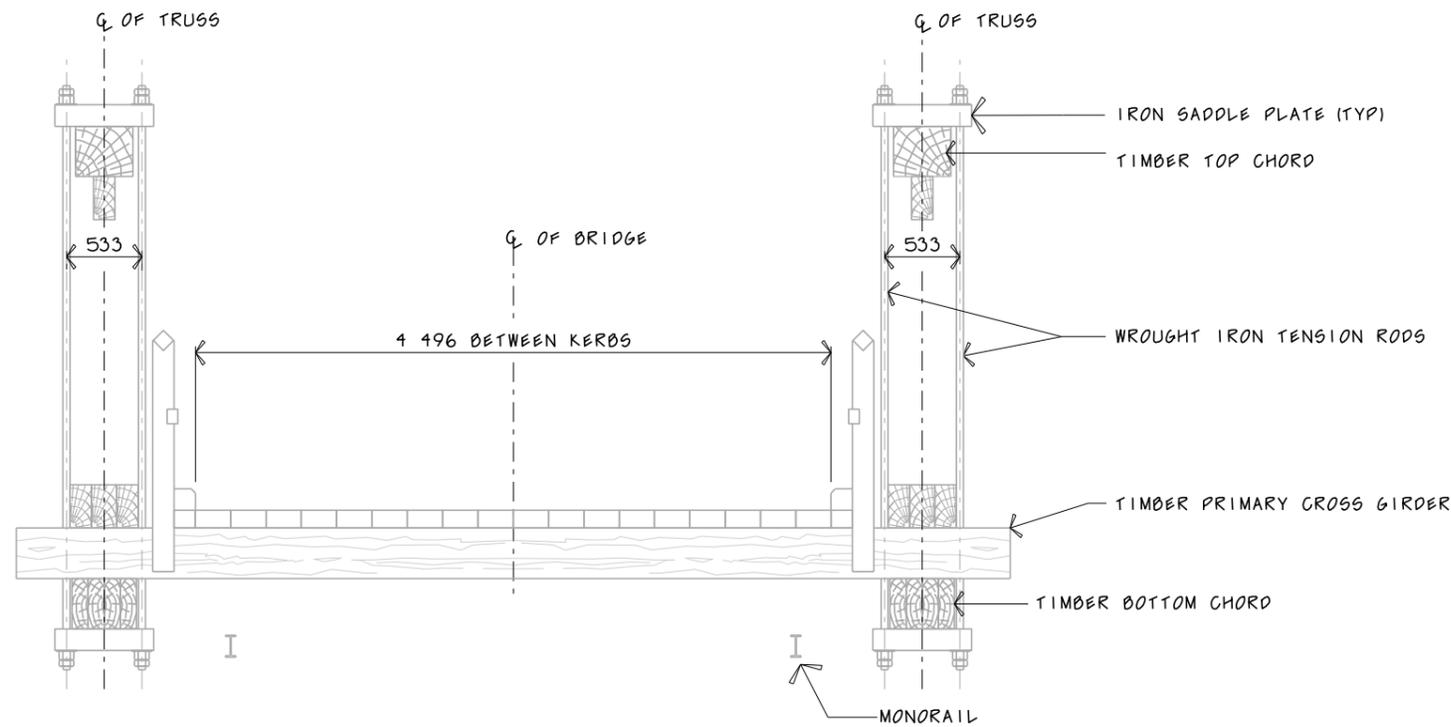


FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

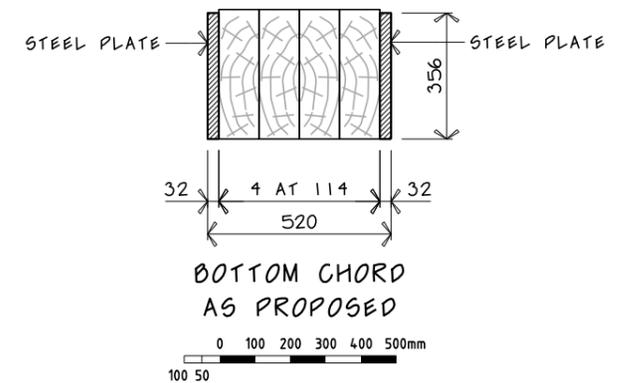
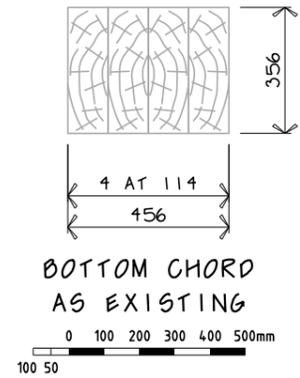
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BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT GENERAL ARRANGEMENT - SHEET B				
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023 CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
DESIGN A NICHOLAS	S SUN	KA872HCS		
DRAWING JK	A NICHOLAS	BRIDGE NUMBER	B1302	
S DESHPANDE BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW	
		SHEET No	2 OF 8	ISSUE
				B

UPSTREAM

DOWNSTREAM

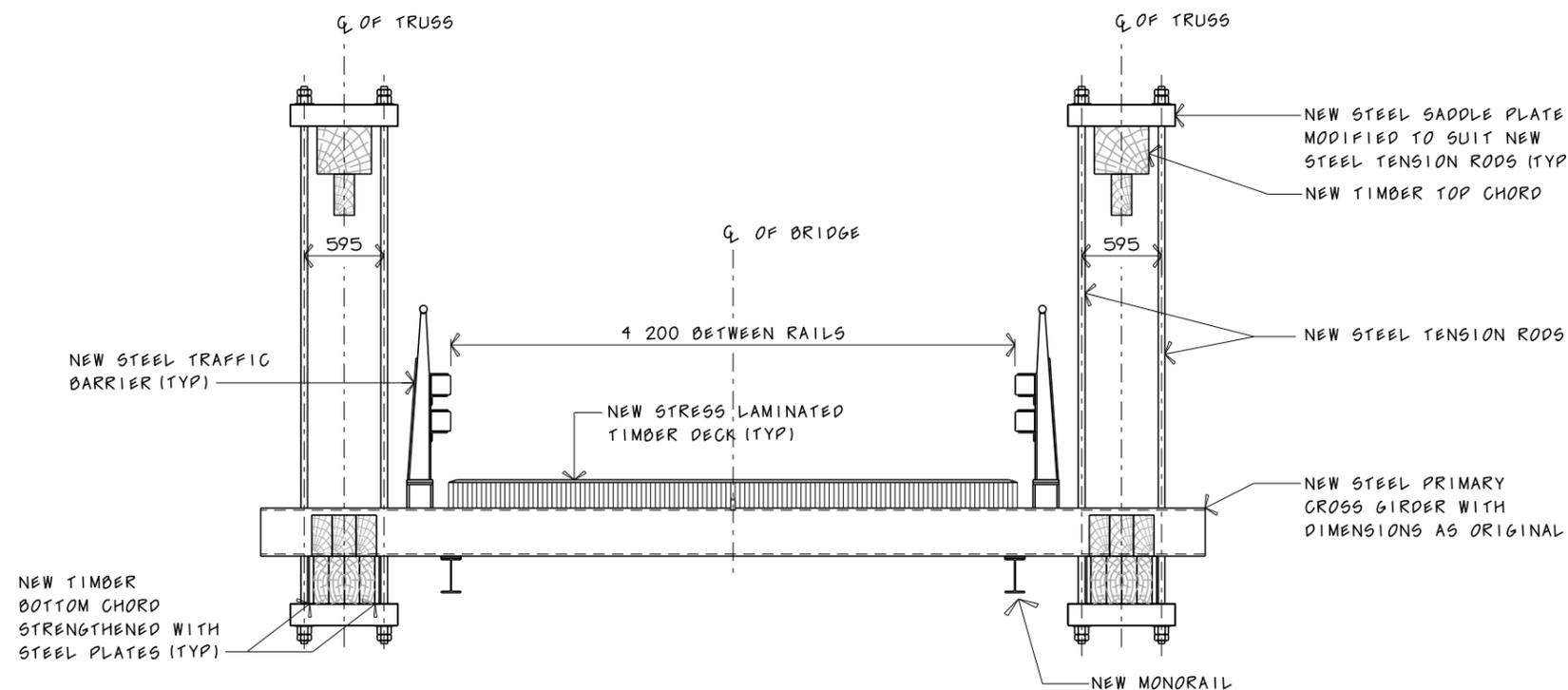


SECTION 1
AS EXISTING



UPSTREAM

DOWNSTREAM



SECTION 2
AS PROPOSED

GENERAL NOTES

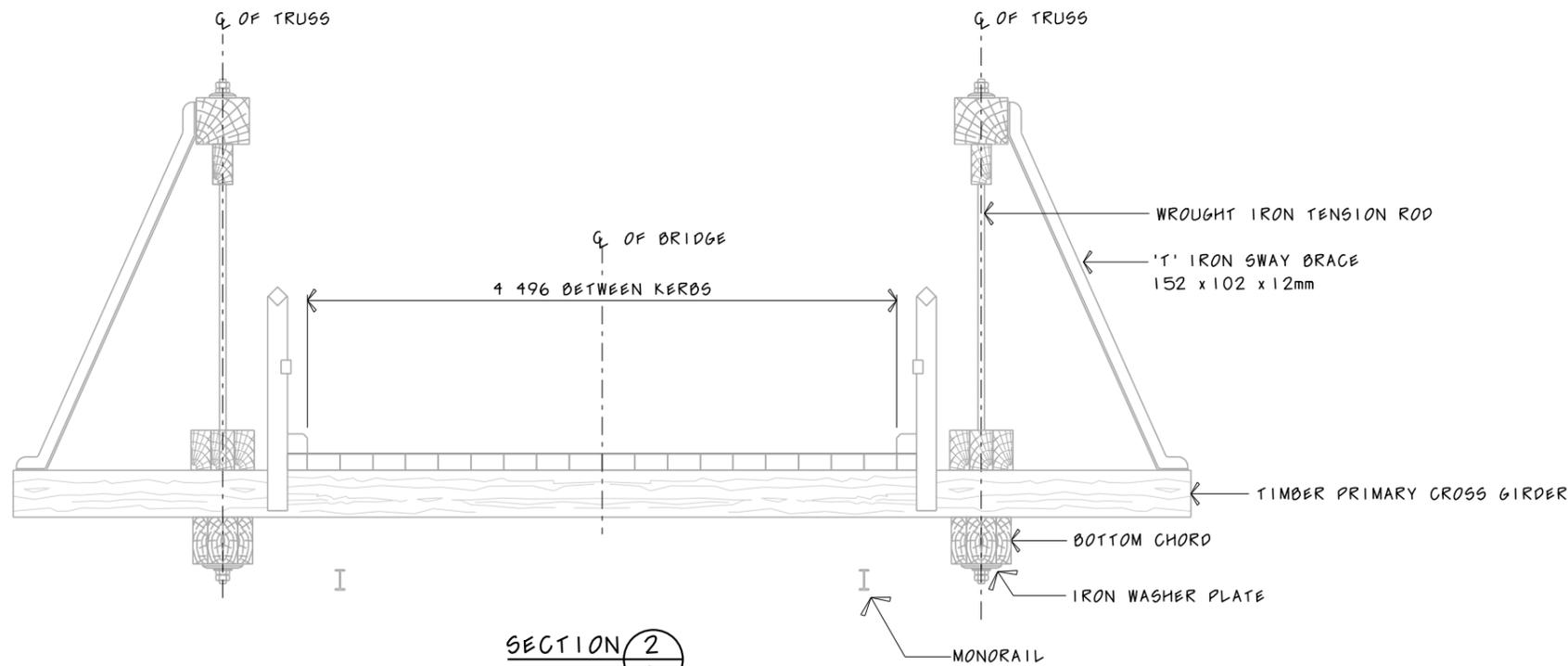
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FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

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ISSUE	DATE	REVISION	PREP [CHECK] AUTH
LOCAL ROAD		CITY OF LITHGOW	
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT			
TRUSS DETAIL - SHEET A			
	PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
	CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No	
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS	
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302
<u>S DESHPANDE</u> BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW
		SHEET No	3 OF 8 ISSUE
			B

UPSTREAM

DOWNSTREAM

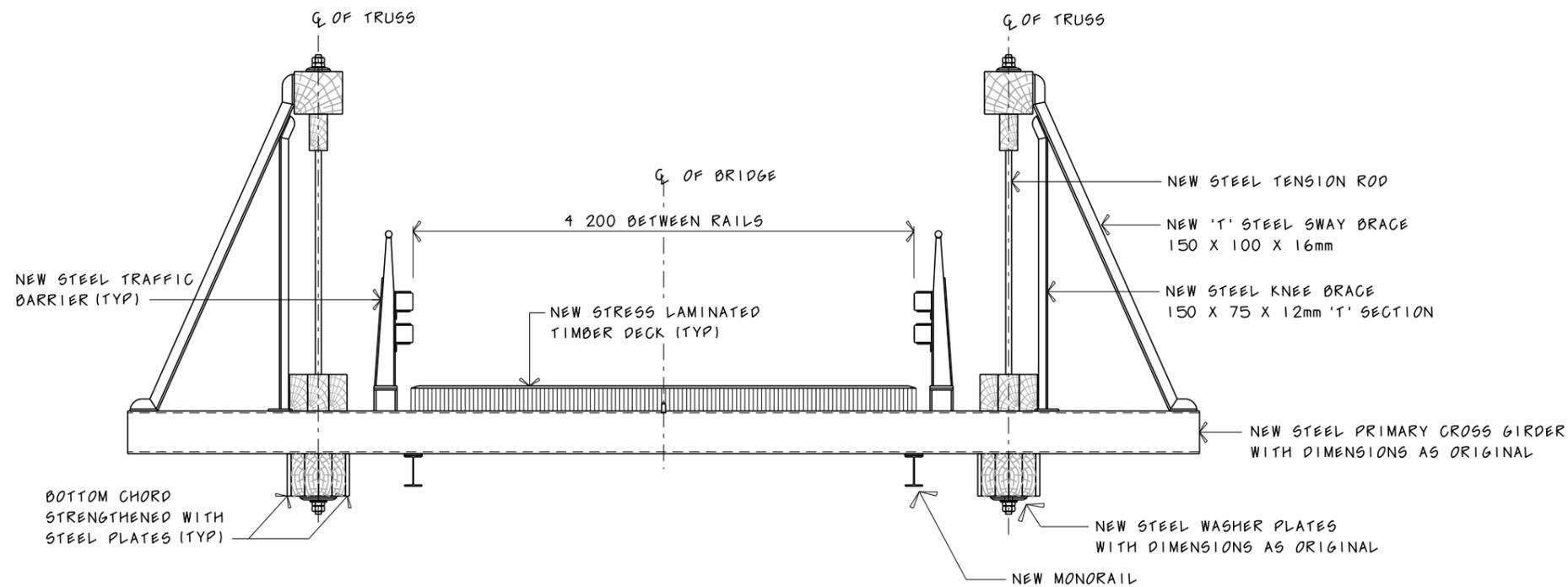


SECTION 2
1

AS EXISTING

UPSTREAM

DOWNSTREAM



SECTION 2
2

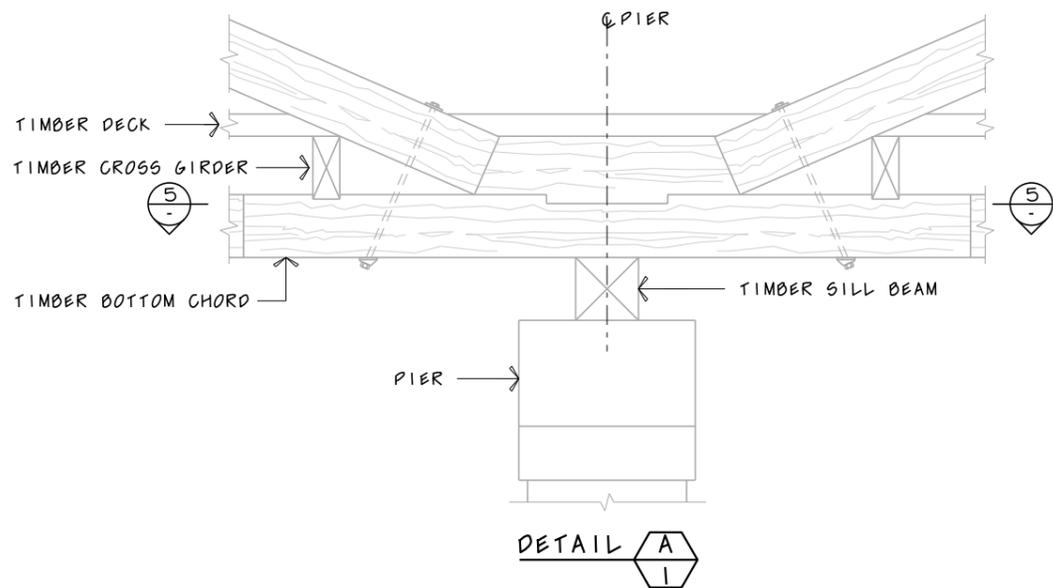
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GENERAL NOTES

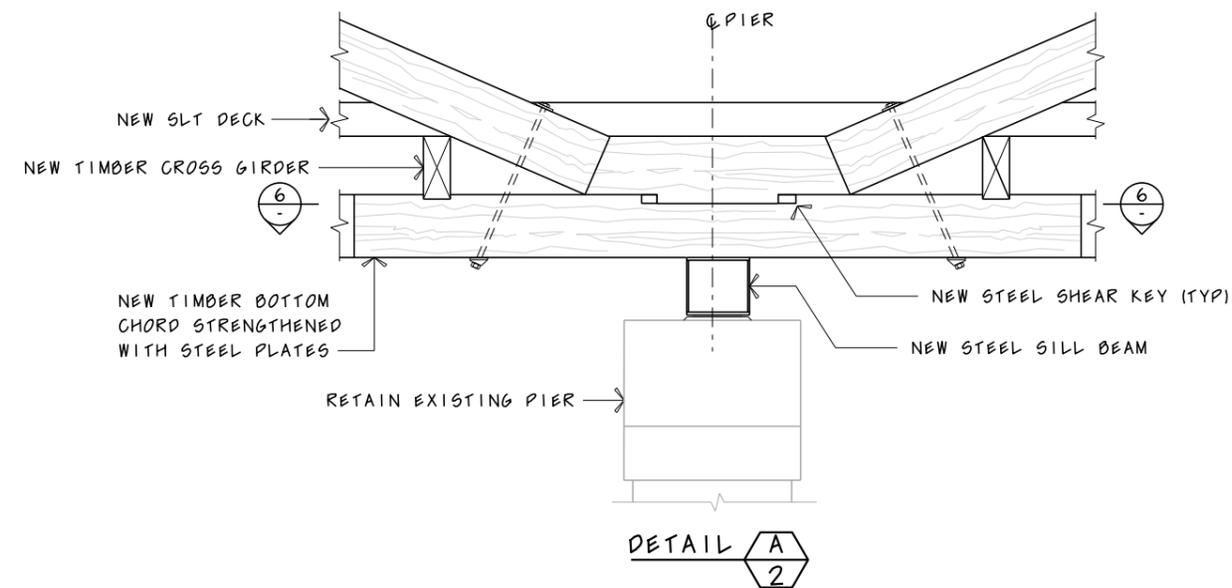
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FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

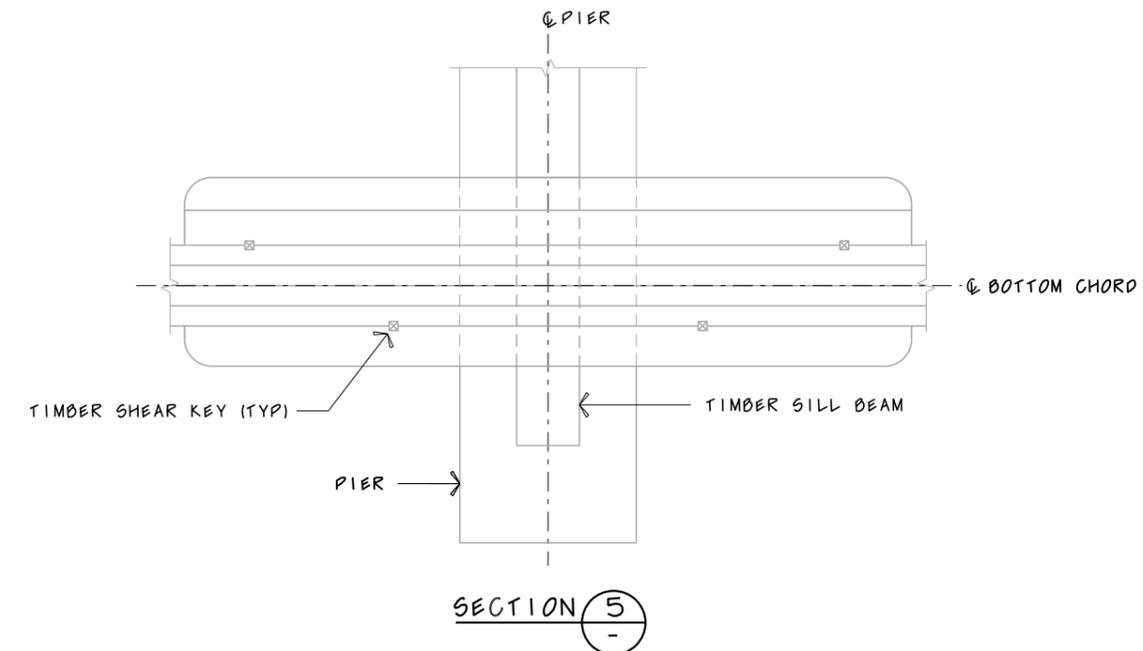
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ISSUE	DATE	REVISION	PREP	CHECK AUTH
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BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT				
TRUSS DETAILS - SHEET B				
		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
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DRAWING JK	A NICHOLAS	BRIDGE NUMBER	B1302	
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		SHEET No 4 OF 8	ISSUE	B



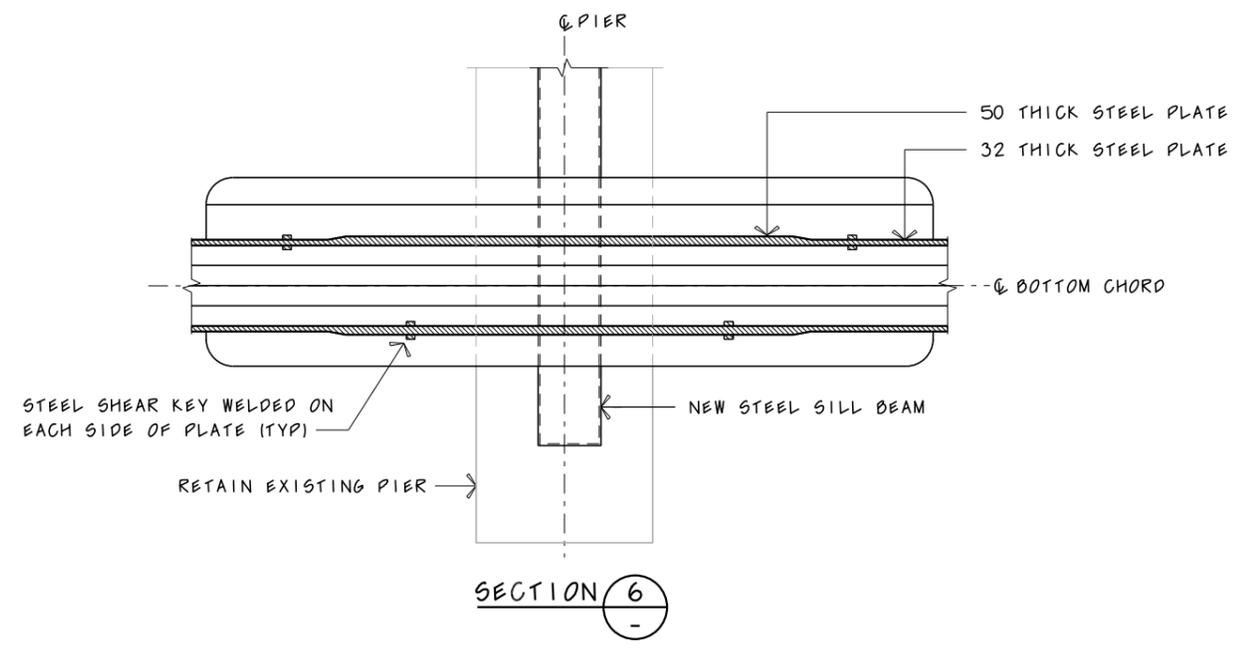
EXISTING CONNECTIONS AT PIER



PROPOSED CONNECTIONS AT PIER



SECTION 5



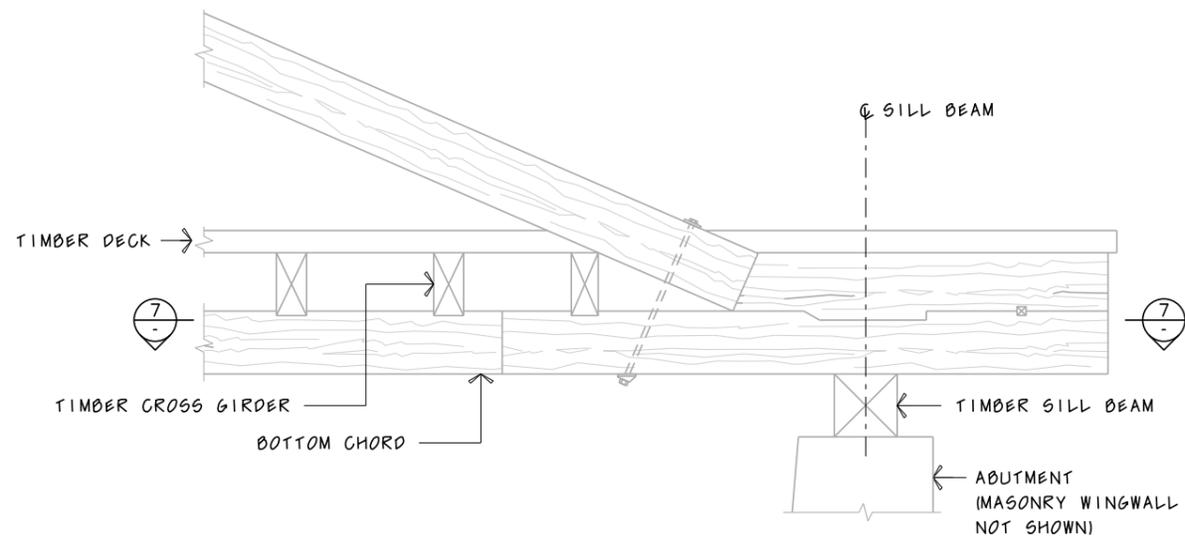
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GENERAL NOTES



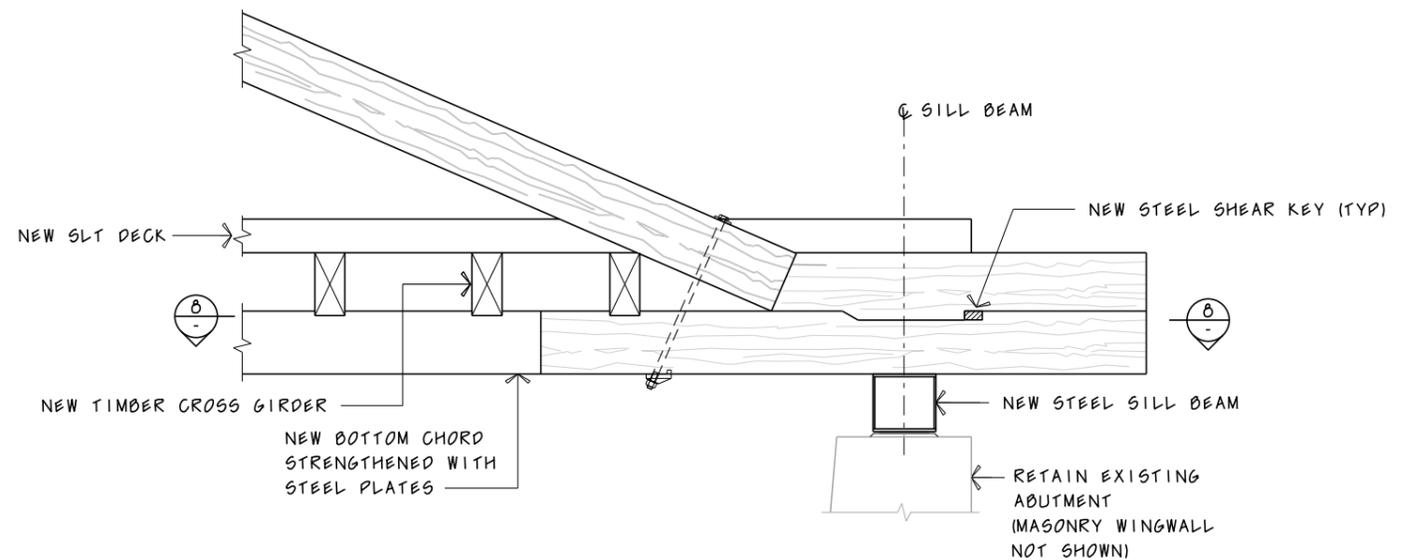
FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

ISSUE	DATE	REVISION	PREP	CHECK	AUTH
LOCAL ROAD					CITY OF LITHGOW
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT					
TRUSS DETAILS - SHEET C					
 Transport Roads & Maritime Services			PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023 CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No			
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS			
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302		
<u>S DESHPANDE</u> BRIDGE ENGINEER (REHABILITATION DESIGN)		ISSUE STATUS:	HERITAGE REVIEW		
		SHEET No	5 OF 8	ISSUE	A



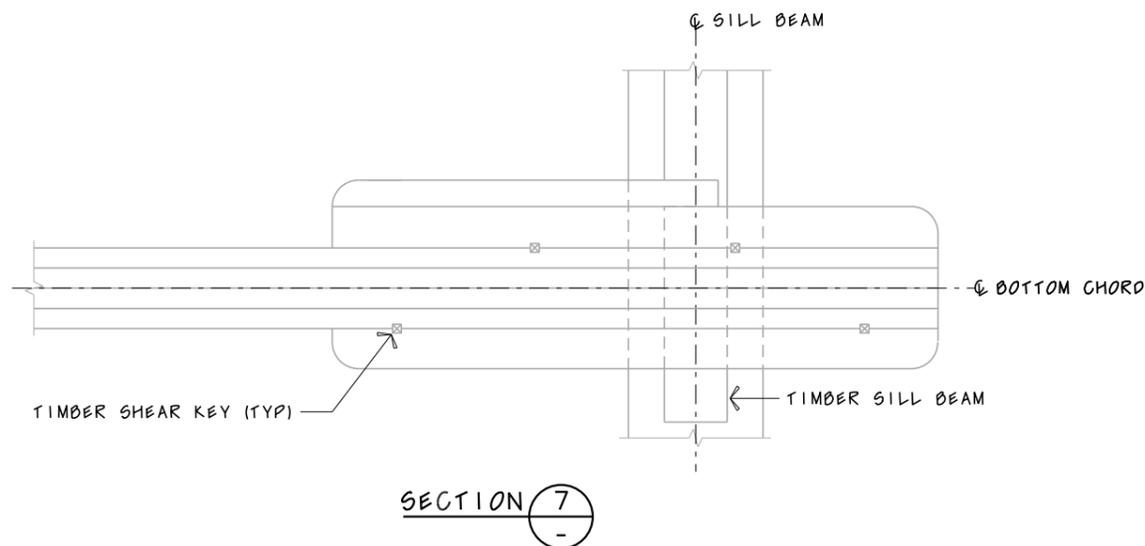
DETAIL B
1

EXISTING CONNECTION OF PRINCIPAL TO
BOTTOM CHORD AT ABUTMENTS

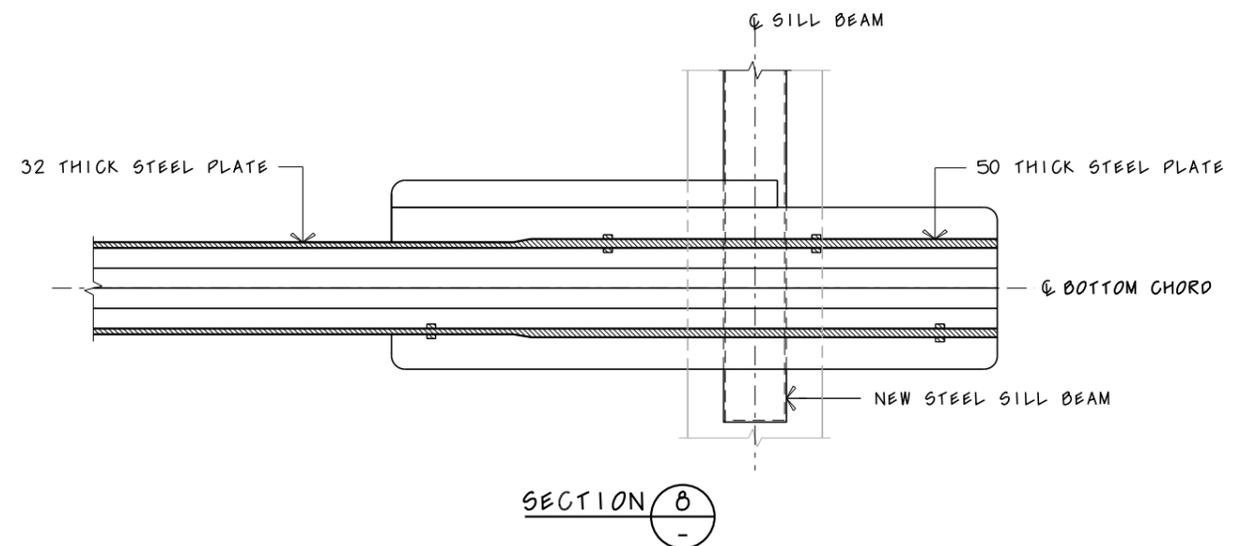


DETAIL B
2

PROPOSED CONNECTION OF PRINCIPAL TO
BOTTOM CHORD AT ABUTMENTS



SECTION 7



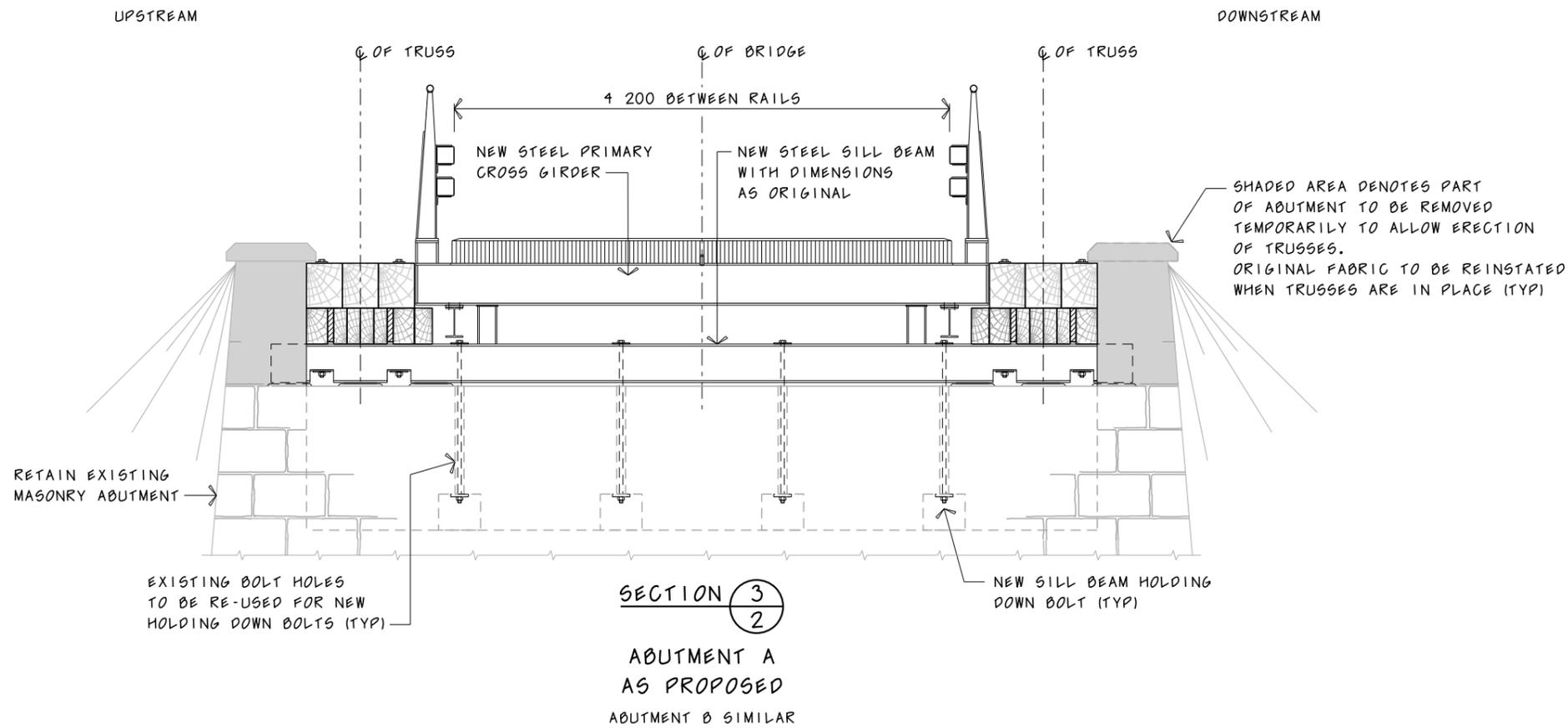
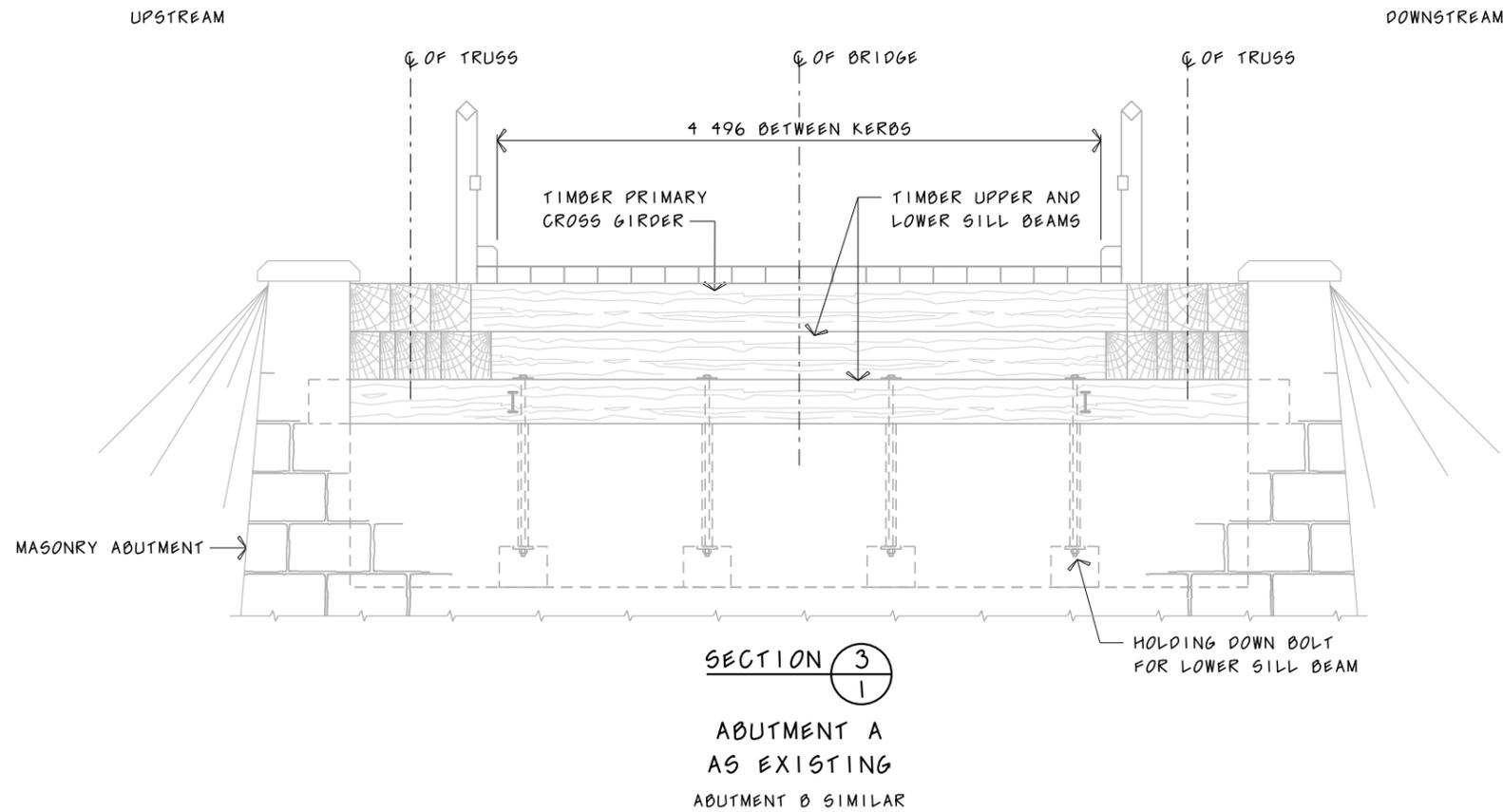
SECTION 8

GENERAL NOTES

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FOR OTHER GENERAL NOTES RELATING TO THIS SHEET,
SEE SHEET NO 1.

B	30.11.2016	BOLT ADDED AT DETAIL B (PROPOSED).	JP	
ISSUE	DATE	REVISION	PREP	CHECK/AUTH
LOCAL ROAD			CITY OF LITHGOW	
BRIDGE OVER COX'S RIVER AT 7km SOUTH OF BOWENFELS (McKANES FALLS BRIDGE) CAPACITY UPGRADE - HERITAGE CONCEPT				
TRUSS DETAILS - SHEET D				
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS		
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302	
<u>S DESHPANDE</u>		ISSUE STATUS: HERITAGE REVIEW		
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No 6 OF 8	ISSUE	B



GENERAL NOTES

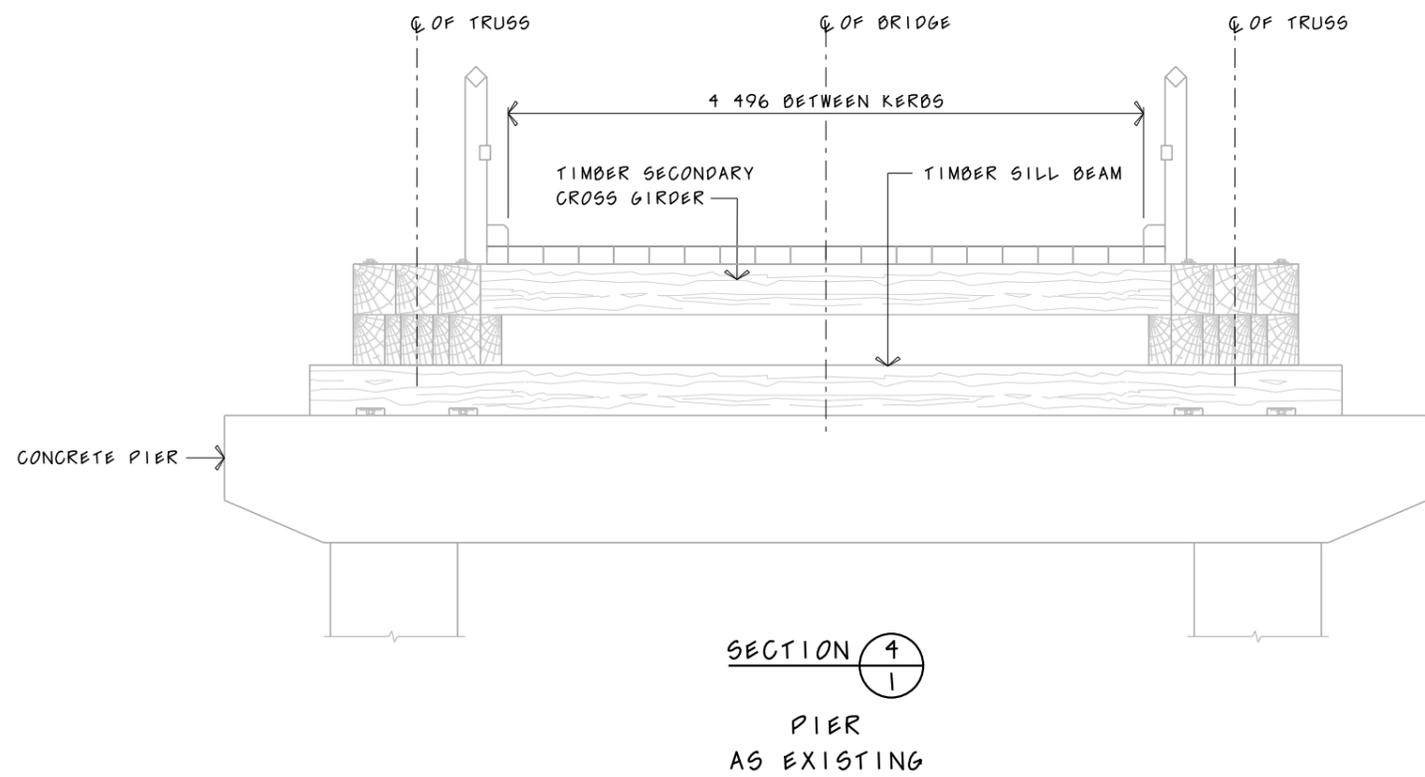


FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

B	30.11.2016	TRAFFIC BARRIERS REVISED	JP
ISSUE	DATE	REVISION	PREP [CHECK] AUTH
LOCAL ROAD		CITY OF LITHGOW	
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ABUTMENTS			
Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023	
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PREPARED	CHECKED	SKETCH No	
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS	
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302
<u>S DESHPANDE</u>		ISSUE STATUS:	HERITAGE REVIEW
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No 7 OF 8	ISSUE B

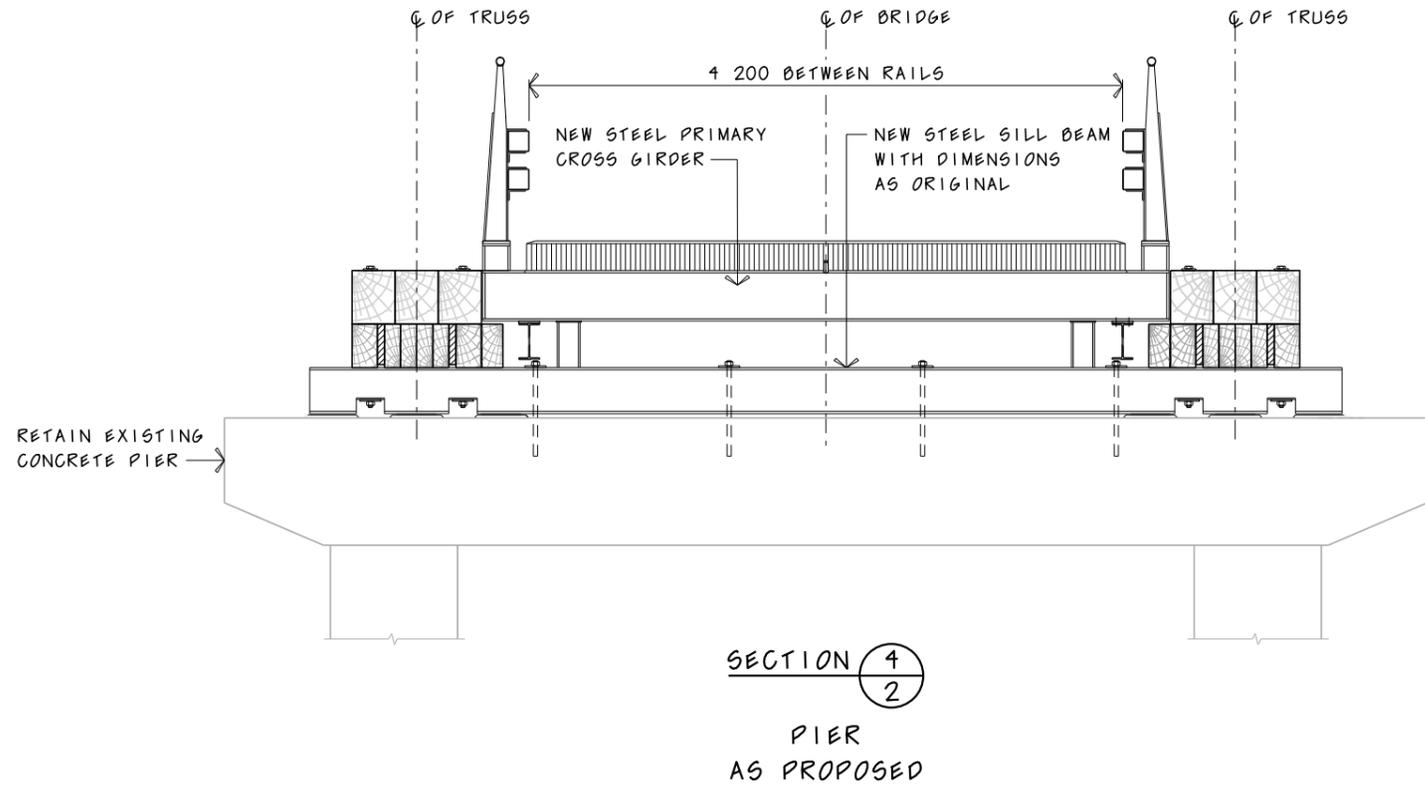
UPSTREAM

DOWNSTREAM



UPSTREAM

DOWNSTREAM



GENERAL NOTES



FOR OTHER GENERAL NOTES RELATING TO THIS SHEET, SEE SHEET NO 1.

B	30.11.2016	TRAFFIC BARRIERS REVISED	JP	
ISSUE	DATE	REVISION	PREP	CHECK AUTH
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Transport Roads & Maritime Services		PREPARED BY BRIDGE AND STRUCTURAL ENGINEERING BRANCH 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8837-0832 FACSIMILE (02) 8837-0023		
		CLIENT: WESTERN REGIONAL OFFICE 51-55 CURRAJONG STREET PARKES PHONE (02) 6861-1444 FACSIMILE (02) 6861-1414		
PREPARED	CHECKED	SKETCH No		
DESIGN <u>A NICHOLAS</u>	<u>S SUN</u>	KA872HCS		
DRAWING <u>JK</u>	<u>A NICHOLAS</u>	BRIDGE NUMBER	B1302	
<u>S DESHPANDE</u>		ISSUE STATUS: HERITAGE REVIEW		
BRIDGE ENGINEER (REHABILITATION DESIGN)		SHEET No	8 OF 8	ISSUE
		B		

Focus Bridge Engineering Pty Ltd

Link Business Hub, 271 Brunner Road, Adamstown, NSW 2289
E: mail@focusbridges.com W: www.focusbridges.com



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Job number: 220102

Rev No.	Authors	Reviewed		Authorised		
		Name	Signature	Name	Signature	Date
0	C Everett M Tilley	C Everett		M Tilley		06/06/18
C	C Everett M Tilley	C Everett, D Weber, Gunn, A Nicholas	<i>On file</i>	M Tilley	<i>On file</i>	21/05/18
B	C Everett M Tilley	C Everett, D Weber, Gunn, A Nicholas	<i>On file</i>	M Tilley	<i>On file</i>	27/04/18
A	C Everett M Tilley	C Everett	<i>On file</i>	M Tilley	<i>On file</i>	08/04/18

www.focusbridges.com



Appendix G

Stage 1 PACHCI Clearance Letter

13/12/2018

Tim Stone
Project Manager, Western Bridges.

Dear Tim

Preliminary assessment results for McKanes Bridge Inspection. Based on Stage 1 of the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI).

The project, as described in the Project REF Brief was assessed as being unlikely to have an impact on Aboriginal cultural heritage. Onsite inspection conducted 12/12/2018, including Compound sites and Side tracks

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 and places within the study area
- The study area does 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 Roads and Maritime Services' procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance. (Previous Farming, Bridge construction and continuous Bridge maintenance activities)

Safe Guards: The works is to be restricted to the Conditions stated in the Project REF Brief. Please be vigilant for further potential Aboriginal objects when construction 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 course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' **Unexpected Heritage Item Procedure**.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely



Aboriginal Cultural Heritage Advisor – Western Region

Roads and Maritime Services

Appendix H

Consultation Letters and Agency Responses



24/05/2019

14.2166.0523-0450

Project Officer
Aquatic Environmental Branch/Fisheries
Department of Primary Industries
4 Marsden Park Road
Calala NSW 2340

Dear Sir/Madam

Consultation regarding proposed B1302 – McKanes Bridge Capacity Upgrade

Roads and Maritime Services (Roads and Maritime) is proposing to undertake works to upgrade the capacity of the McKanes Bridge Upgrade (the proposal).

A Review of Environmental Factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime invites DPI – Fisheries to provide comment and advice regarding any interests, concerns or statutory requirements relating to the project. Comments received will be considered in preparing the REF, which will be displayed for stakeholder and community feedback in mid-2019.

Outline of the project

Roads and Maritime proposes to undertake a capacity upgrade of the existing B1302 McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels. McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway.

The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users. A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs and safety of the road network. The key features of the proposal are shown on the attached figures and would include:

- Relocation of the high voltage overhead powerlines that cross McKanes Bridge
- A temporary construction compound site and laydown area on both land sides of McKanes Bridge
- Transfer of the existing bridge deadload to a supporting structure and piecemeal dismantling of the existing bridge superstructure
- Systematic construction of the new bridge superstructure, including:

Roads and Maritime Services

- Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.432m long each (for a total bridge length of 54.864m)
- Retention of the existing road geometry
- Reduction in carriageway width to 4.2m between kerbs
- Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck
- Provision of new steel traffic barriers
- Provision of new maintenance monorail system
- Temporary light and heavy vehicle detour via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal.

The proposal has an expected duration of 12 months, not including any delays subject to weather.

How will this affect DPI – Fisheries?

Under the *Fisheries Management Act 1994*, Roads and Maritime would like to consult with Department of Primary Industries – Fisheries (DPI).

McKanes Bridge is located on a section of waterway shown as Key Fisheries Habitat by the DPI. During construction it is anticipated that a suspended access scaffold would be used. There may also be a need for temporary scaffolding adjoining the bridge abutments and central bridge pier which may require works to be undertaken in the waterway. The specific construction methodology would be confirmed during the detailed design. The proposal would not result in any temporary or permanent barriers to fish movement within the river. The proposed upgrade is of the superstructure and no changes to the foundations are proposed.

Mitigation measures would be identified in the REF and implemented to avoid or minimise environmental impacts during construction and operation of the project.

It would be appreciated if you could provide any comments about this proposal by 14/06/2019. To assist in your response please find attached details of the proposal and concept drawings of the proposed bridge upgrade.

Roads and Maritime Services would be pleased to provide further information if required. In this regard Tim Stone may be contacted on 02 6393 5438 or by email Tim.STONE@rms.nsw.gov.au.

Yours faithfully

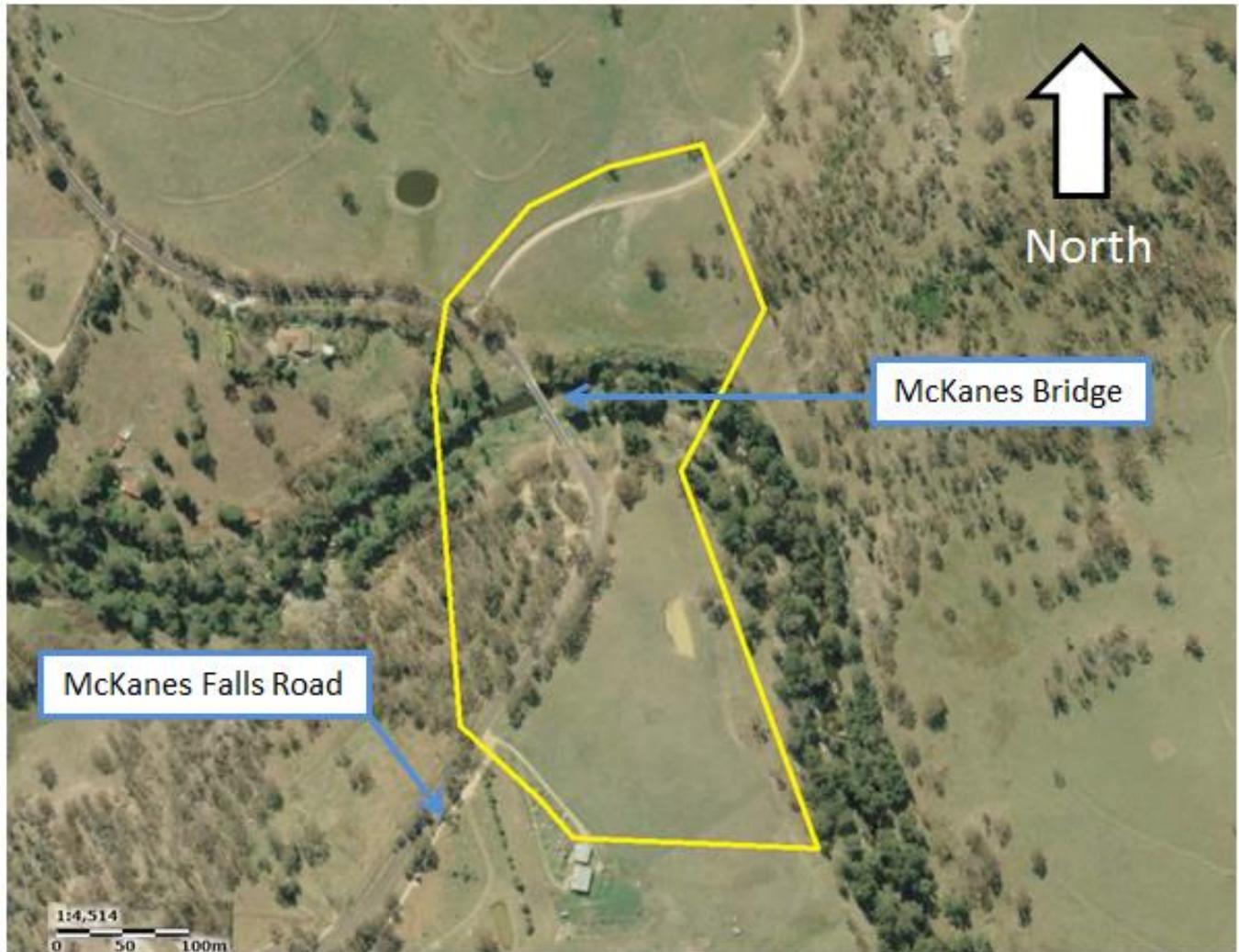
Zoe Cox
Graduate Environmental Scientist – AECOM



Care of Tim Stone
Project Manager, Western Bridges

Attachment A

The anticipated footprint of the proposal area including the bridge, proposed site compound and access tracks to be utilised is shown in yellow below.





Department of Primary Industries

FE19/496

C19/336

Your ref: 14.2166.0523-0450

5 June 2019

Tim Stone
Transport Roads & Maritime Services
Locked Bag 928
NORTH SYDNEY NSW 2059

Dear Tim,

Re: Consultation regarding proposed B1302 –McKanes Bridge Capacity Upgrade

Thank you for providing DPI Fisheries the opportunity to provide input into the REF. DPI Fisheries are responsible for ensuring that fish stocks are conserved and that there is “no net loss” of key fish habitats upon which they depend. To achieve this, the Department ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act respectively) and the associated *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (2013)* at <http://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs>.

In relation to required approvals/permits, the Minister for Fisheries must be notified of any proposed dredging and reclamation works associated with the proposed works by RMS in accordance with section 199 of the *Fisheries Management Act 1994* (the Act). Such works may include, but are not limited to, construction of temporary crossings/sidetracks, bridges, creek diversions, excavating or reclaiming the bed or banks of any waterways. The REF should describe the type and extent of such proposed works.

A permit may be required to temporarily or permanently block fish passage under section 219 of the Act. Such works may include the bunding of waterways during bridge or sidetrack construction, use of silt fences across waterways and other similar works. The REF should describe the type, extent and duration of such works for each timber bridge replacement.

Specifically, DPI Fisheries requests that the following issues are addressed in the REF for the proposed works;

- 1. Blockages to fish Passage** - DPI Fisheries requests that the REF needs to consider whether the works may result in any blockage of fish passage. If so, details on proposed design and construction methods, likely duration of installation or removal methods should be outlined within the REF. The publication *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (2013)* on the website outlines important considerations when designing or constructing waterway crossings.

2. **Maintenance or Improvement to the Cross-sectional Area of a Waterway** – The REF should describe the proposed works in relation to the cross-sectional area of the waterway, A description of the need for the proposed works, and the likely construction methods should be provided. DPI Fisheries requests that constriction of waterways or the use of scour protection within the bed of waterways be avoided where possible, as such works are likely to have a detrimental impact on floodwater velocities which can have significant impacts on fish and fish habitat.

3. **Damage to Riparian Vegetation** - DPI Fisheries seeks information on any damage to riparian vegetation that may occur, noting that *Degradation of Riparian Vegetation along Watercourses* is listed as a Key Threatening Process under the FM Act.

4. **Bank Stabilisation and Rehabilitation** – DPI Fisheries seeks information on any destabilisation of the banks with heavy machinery or damage to the bed or banks. DPI Fisheries requests that any bed and bank rehabilitation works be completed immediately after the completion of works. Proposals to ensure replacement of aquatic and riparian vegetation with native/endemic species are encouraged.

5. **Removal, realignment of snags** - DPI Fisheries requests information on any proposal to remove, realign or relocate snags (large woody debris) during bridge replacement. Proposed works should be outlined within the REF. Snags should not be removed, realigned or relocated without first contacting DPI Fisheries. Note: that the *removal of large woody debris* is listed as a Key Threatening Process under the FM Act.

If you have any queries do not hesitate to call me on 6763 1255 or 0429 908 856.

Yours sincerely



David Ward
Fisheries Manager (Tamworth)



24/05/2019

14.2166.0523-0450

Lithgow City Council

General Manager

PO BOX 19

Lithgow NSW 2790

Dear Sir/Madam

Invitation to comment

Consultation regarding proposed B1302 – McKanes Bridge Capacity Upgrade

Roads and Maritime Services (Roads and Maritime) is proposing to undertake works to upgrade the capacity of the McKanes Bridge Upgrade (the proposal).

A Review of Environmental Factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime invites Lithgow City Council to provide comment and advice regarding any interests, concerns or statutory requirements relating to the project. Comments received will be considered in preparing the REF, which will be displayed for stakeholder and community feedback in mid-2019.

Outline of the project

Roads and Maritime proposes to undertake a capacity upgrade of the existing B1302 McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels. McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway.

The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users. A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs and safety of the road network. The key features of the proposal are shown on the attached figures and would include:

- Relocation of the high voltage overhead powerlines that cross McKanes Bridge
- A temporary construction compound site and laydown area on both land sides of McKanes Bridge

Roads and Maritime Services

- Transfer of the existing bridge deadload to a supporting structure and piecemeal dismantling of the existing bridge superstructure
- Systematic construction of the new bridge superstructure, including:
 - Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.432m long each (for a total bridge length of 54.864m)
 - Retention of the existing road geometry
 - Reduction in carriageway width to 4.2m between kerbs
 - Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck
 - Provision of new steel traffic barriers
 - Provision of new maintenance monorail system
- Temporary light and heavy vehicle detour via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal.

The proposal has an expected duration of 12 months, not including any delays subject to weather.

How will this affect Lithgow Council?

Under the *State Environmental Planning Policy (Infrastructure) 2007*, Roads and Maritime is required to consult with Lithgow Council under clause 13, 14 and 15, due to the potential impacts to Council infrastructure or services (including local roads), locally listed heritage items and the flood plains within the area. These issues are discussed further below.

Clause 13 – development with impacts on council-related infrastructure or services:

No council related services or infrastructure are expected to be impacted by the proposal.

Clause 14 – development with impacts on local heritage:

The Lithgow Local Environmental Plan 2014 identifies McKanes Bridge to be a State heritage item.. McKanes Creek Bridge is also listed under the Roads and Maritime Section 170 Heritage Register. Roads and Maritime have prepared a Statement of Heritage Impact (SoHI) which assessed potential heritage impacts to the bridge that may occur as a result of the proposal. The SoHI identified that the proposal can proceed subject to the implementation of certain management measures As McKanes Bridge is listed in the LEP we welcome comment from Lithgow City Council on the heritage significance of this item

Clause 15 – development with impacts on flood liable lands:

McKanes Bridge crosses over Coxs River. During construction it is anticipated that a suspended access scaffold would be used, and the construction activities would not result in any barriers within the river. The proposed upgrade is on the same alignment as the existing structure and retention of the existing road geometry. Therefore, during construction and operation the upgraded bridge is unlikely to contribute to a change in flooding patterns.

It would be appreciated if you could provide any comments about this proposal by 14/06/2019.

Roads and Maritime Services would be pleased to provide further information if required. In this regard Tim Stone may be contacted on 02 6393 5438 or by email Tim.STONE@rms.nsw.gov.au.

Yours faithfully

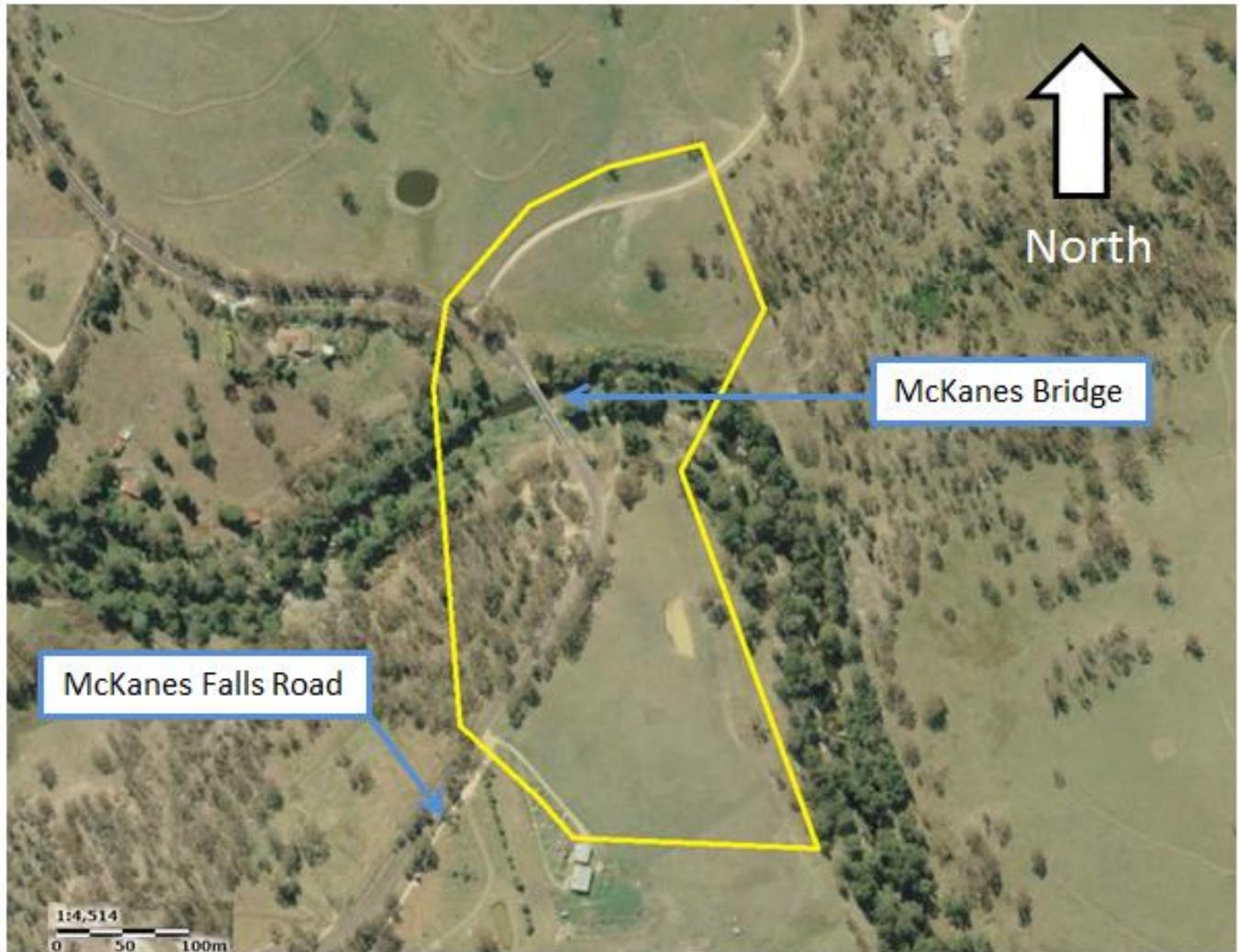
Zoe Cox
Graduate Environmental Scientist – AECOM

A handwritten signature in blue ink that reads "Z. Cox".

Care of Tim Stone
Project Manager, Western Bridges

Attachment A

The anticipated footprint of the proposal area including the bridge, proposed site compound and access tracks to be utilised is shown in yellow below.





24/05/2019

14.2166.0523-0450

NSW Police Force
Lithgow Police
244-270 Mort Street
LITHGOW 2790

Dear Sir/Madam

Invitation to comment

Consultation regarding proposed B1302 – McKanes Bridge Capacity Upgrade

Roads and Maritime Services (Roads and Maritime) is proposing to undertake works to upgrade the capacity of the McKanes Bridge Upgrade (the proposal).

A review of environmental factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime invites NSW Police Force to provide comment and advice regarding any interests, concerns or statutory requirements relating to the project. Comments received will be considered in preparing the REF, which will be displayed for stakeholder and community feedback in mid-2019.

Outline of the project

Roads and Maritime proposes to undertake a capacity upgrade of the existing B1302 McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels. McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway.

The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users. A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs and safety of the road network. The key features of the proposal would include:

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- Systematic construction of the new bridge superstructure, including:

Roads and Maritime Services

Attachment A

- Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.432m long each (for a total bridge length of 54.864m)
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- Provision of new steel traffic barriers
- Provision of new maintenance monorail system
- Temporary light and heavy vehicle detour via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal.

The proposal has an expected duration of 12 months, not including any delays subject to weather.

How will this affect NSW Police Force?

During construction the proposal will require closure of McKanes Falls Road to all vehicle traffic at the bridge. The proposal has an expected duration of 12 months, not including significant delays subject to weather. There would be a detour via Jenolan Caves Road and the Great Western Highway at Hartley, which would add about four minutes travel time. An outline of the detour is attached to this letter.

It would be appreciated if you could provide any comments about this proposal by 14/06/2019.

Roads and Maritime Services would be pleased to provide further information if required. In this regard Tim Stone may be contacted on 02 6393 5438 or by email Tim.STONE@rms.nsw.gov.au.

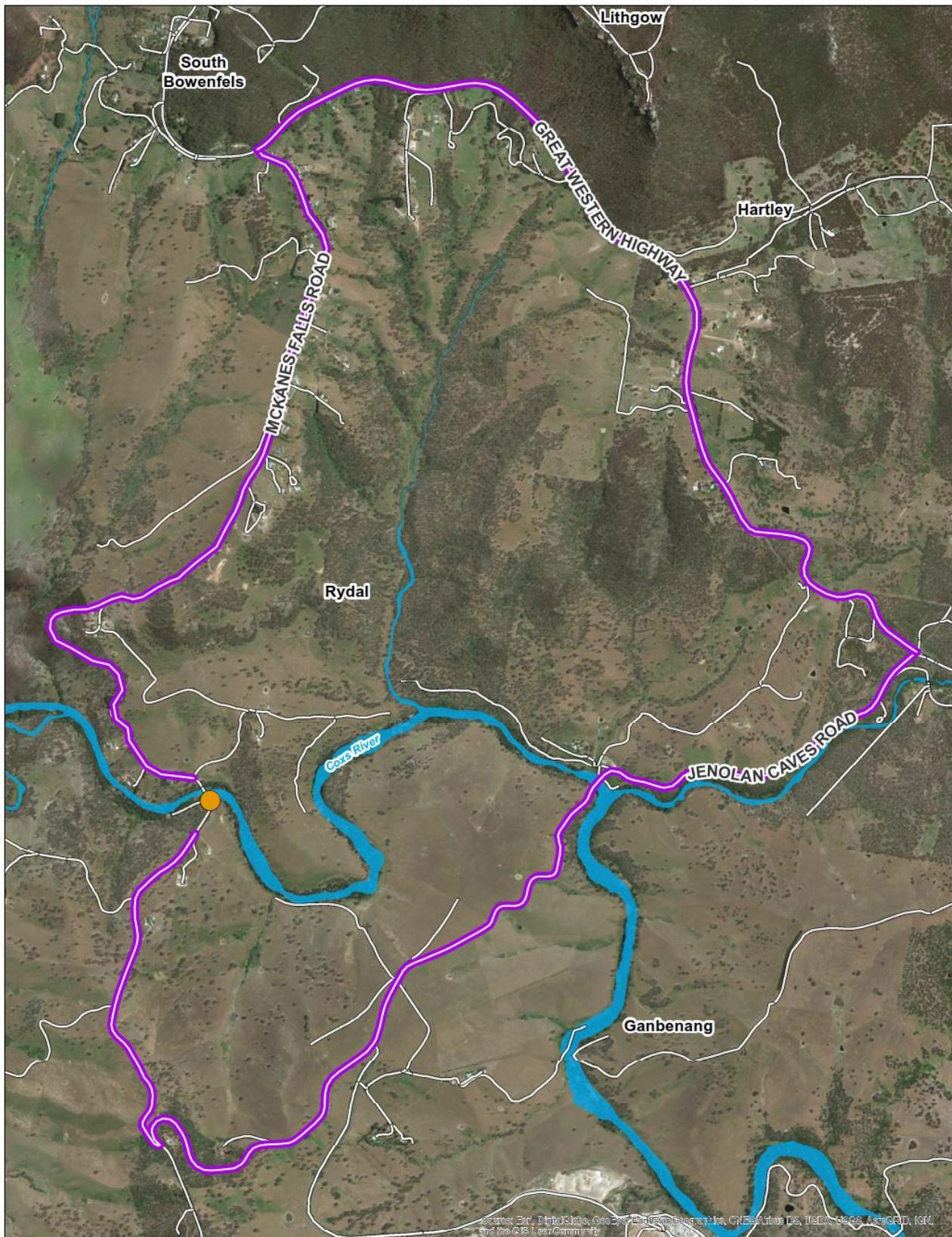
Yours faithfully

Zoe Cox
Graduate Environmental Scientist – AECOM



Care of Tim Stone
Project Manager, Western Bridges

Attachment A



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community

- | Proposal features | Other features |
|-------------------------|----------------|
| Proposal location | Watercourse |
| Traffic diversion route | Roads |

Proposed traffic diversion route
B1302 McKanes Bridge Capacity Upgrade

21/05/2019
60598715





24/05/2019

14.2166.0523-0450

NSW SES

PO Box 6126

Wollongong NSW 2500

Dear Sir/Madam

Invitation to comment

Consultation regarding proposed B1302 – McKanes Bridge Capacity Upgrade

Roads and Maritime Services (Roads and Maritime) is proposing to undertake works to upgrade the capacity of the McKanes Bridge Upgrade (the proposal).

A Review of Environmental Factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime invites NSW SES to provide comment and advice regarding any interests, concerns or statutory requirements relating to the project. Comments received will be considered in preparing the REF, which will be displayed for stakeholder and community feedback in mid-2019.

Outline of the project

Roads and Maritime proposes to undertake a capacity upgrade of the existing B1302 McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels. McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western.

The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users. A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs and safety of the road network. The key features of the proposal are shown on the attached figures and would include:

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Roads and Maritime Services

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- Temporary light and heavy vehicle detour via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal.

The proposal has an expected duration of 12 months, not including any delays subject to weather.

How will this affect SES?

Under the State Environmental Planning Policy (Infrastructure) 2007, Roads and Maritime Services is required to consult with State Emergency Service (SES) under clause 15AA due to the potential impacts on flood liable lands.

Clause 15AA – development with impacts on flood liable lands:

McKanes Bridge crosses over Coxs River which is subject to flooding. During construction it is anticipated that a suspended access scaffold would be used, and the construction activities would not result in any barriers within the river. The proposed upgrade is on the same alignment as the existing structure and retention of the existing road geometry. Therefore, during construction and operation the upgraded bridge is unlikely to contribute to a change in flooding patterns.

Appropriate mitigation measures would be identified in the REF and implements to avoid or minimise environmental impacts during construction and operation of the project.

It would be appreciated if you could provide any comments about this proposal by 14/06/2019. To assist in your response, please find the attached location map and outline of the proposal.

Roads and Maritime Services would be pleased to provide further information if required. In this regard Tim Stone may be contacted on 02 6393 5438 or by email Tim.STONE@rms.nsw.gov.au.

Yours faithfully

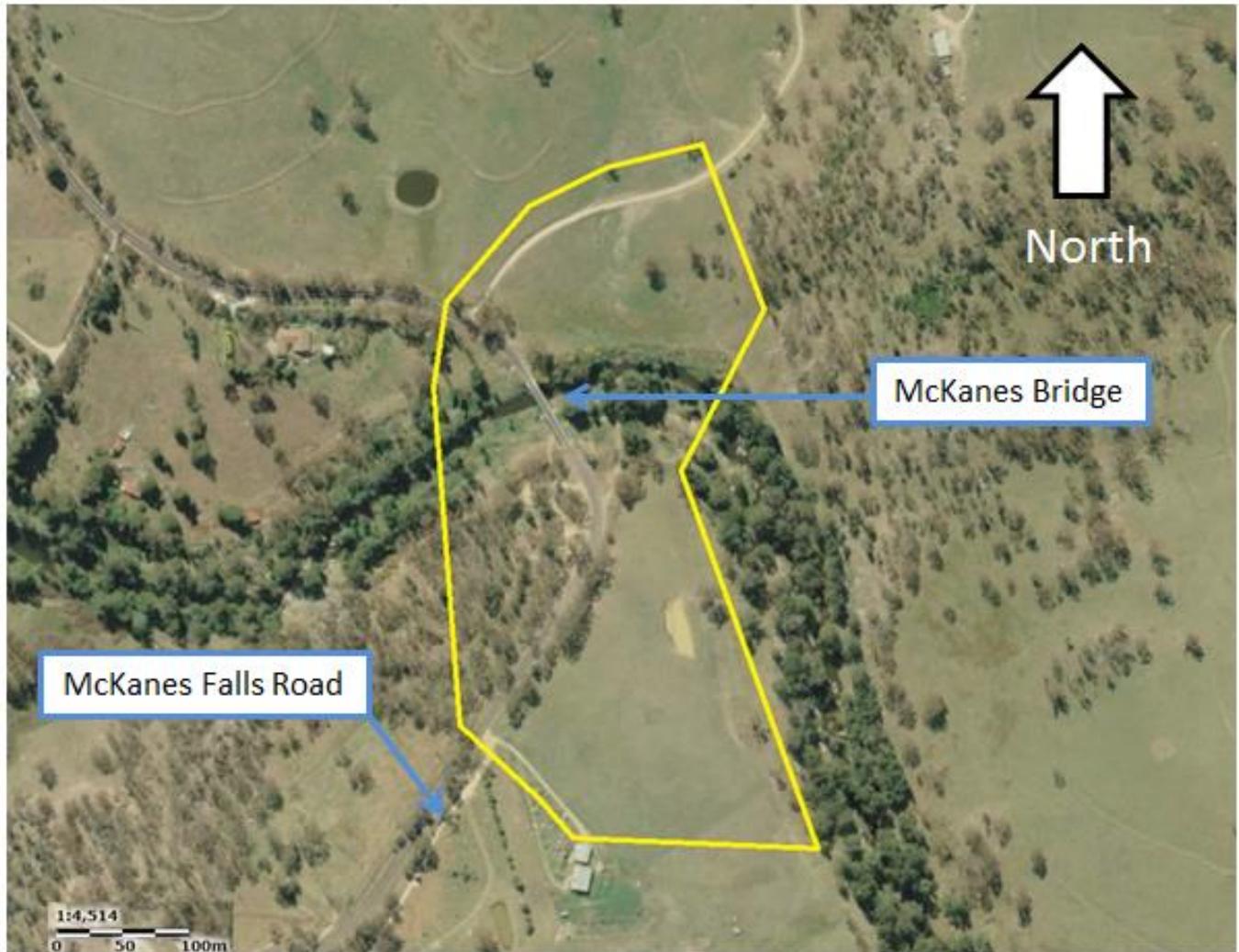
Zoe Cox
Graduate Environmental Scientist – AECOM



Care of Tim Stone
Project Manager, Western Bridges

Attachment A

The anticipated footprint of the proposal area including the bridge, proposed site compound and access tracks to be utilised is shown in yellow below.





04/06/2019

14.2166.0523-0450

Water NSW

PO Box 1018
Dubbo NSW 2830

Dear Sir/Madam

Invitation to comment

Consultation regarding proposed B1302 – McKanes Bridge Capacity Upgrade

Roads and Maritime Services (Roads and Maritime) is proposing to undertake works to upgrade the capacity of the McKanes Bridge Upgrade (the proposal).

A Review of Environmental Factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime invites Water NSW to provide comment and advice regarding any interests, concerns or statutory requirements relating to the project. Comments received will be considered in preparing the REF, which will be displayed for stakeholder and community feedback in mid-2019.

Outline of the project

Roads and Maritime proposes to undertake a capacity upgrade of the existing B1302 McKanes Bridge on McKanes Falls Road in the suburb of South Bowenfels. McKanes Falls Road provides a north-south connection between Jenolan Caves Road and the Great Western Highway.

The bridge is considered to be in poor condition due to the deterioration of the timber elements. The bridge is currently load limited to 15 tonnes and has substandard timber side rails which pose a safety hazard to road users. A capacity upgrade of the bridge superstructure is required to ensure the bridge can meet the current and future operational needs and safety of the road network. The key features of the proposal are shown on the attached figures and would include:

- Relocation of the high voltage overhead powerlines that cross McKanes Bridge
- A temporary construction compound site and laydown area on both land sides of McKanes Bridge
- Transfer of the existing bridge deadload to a supporting structure and piecemeal dismantling of the existing bridge superstructure
- Systematic construction of the new bridge superstructure, including:

Roads and Maritime Services

- Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.432m long each (for a total bridge length of 54.864m)
 - Retention of the existing road geometry
 - Reduction in carriageway width to 4.2m between kerbs
 - Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck
 - Provision of new steel traffic barriers
 - Provision of new maintenance monorail system
- Temporary light and heavy vehicle detour via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal.

The proposal has an expected duration of 12 months, not including any delays subject to weather.

How will this affect Water NSW?

The proposal is located within the Sydney drinking water catchment as defined by State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011. In accordance with Clause 12 of the SEPP, Roads and Maritime is required to consider whether the proposal would have a neutral or beneficial effect on water quality before carrying out the proposal.

A neutral or beneficial effect on water quality assessment was carried out as part of the REF (currently being prepared) which indicated that the proposal is expected to have a neutral effect on water quality.

Appropriate mitigation measures would be identified in the REF and implemented to avoid or minimise environmental impacts during construction and operation of the project.

It would be appreciated if you could provide any comments about this proposal by 25/06/2019. To assist in your response, please find the attached location map and outline of the proposal.

Roads and Maritime Services would be pleased to provide further information if required. In this regard Tim Stone may be contacted on 02 6393 5438 or by email Tim.STONE@rms.nsw.gov.au.

Yours faithfully

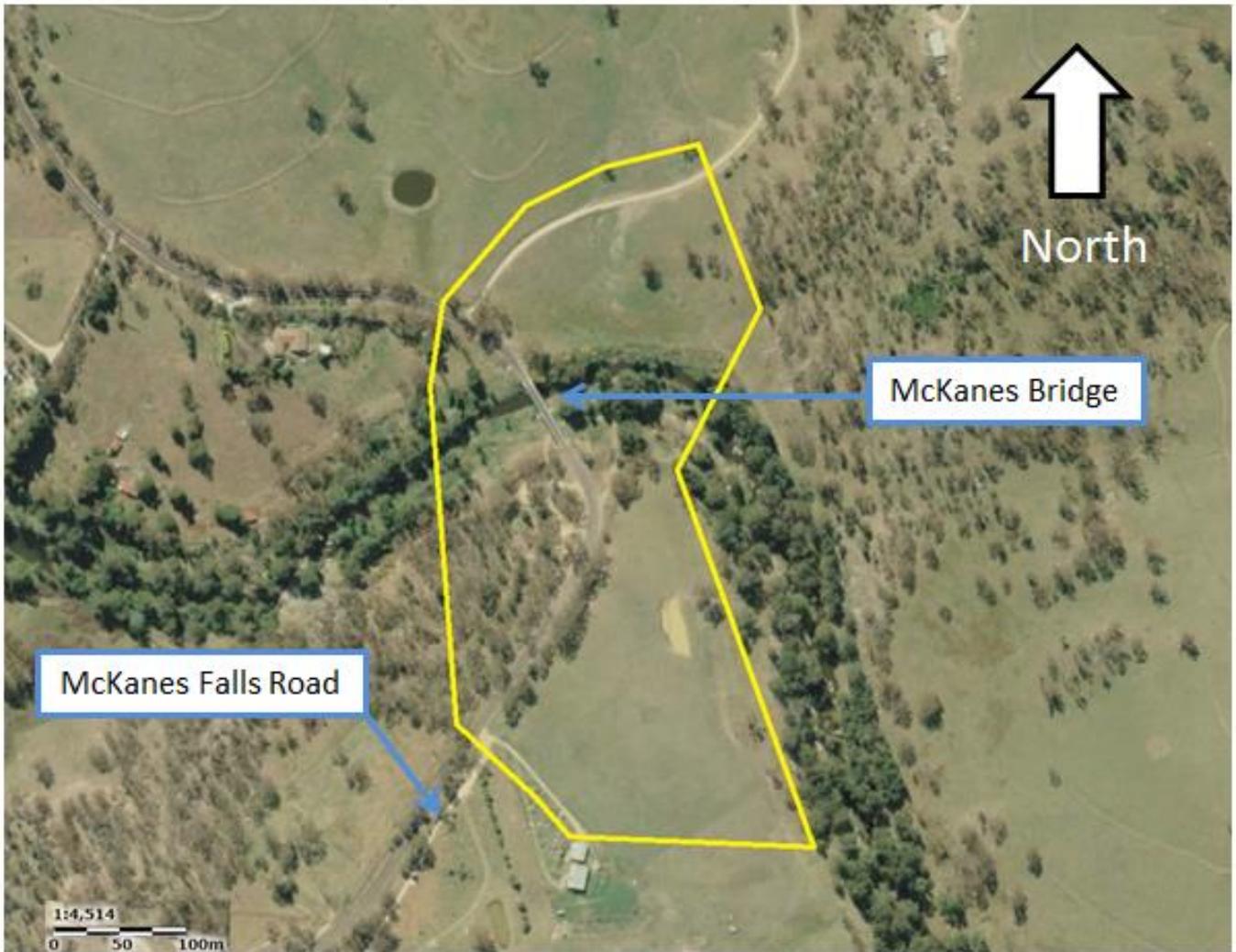
Zoe Cox
Graduate Environmental Scientist – AECOM



Care of Tim Stone
Project Manager, Western Bridges

Attachment A

The anticipated footprint of the proposal area including the bridge, proposed site compound and access tracks to be utilised is shown in yellow below.



20 June 2019

Contact: *Justine Clarke*

Telephone: *02 9865 2402*

Our ref: *D2019/61120*

Tim Stone
Project Manager, Western Bridges
Roads and Maritime Services
Locked Bag 928
NORTH SYDNEY NSW 2059

ATTN: Zoe Cox

Dear Mr Stone

McKanes Bridge Capacity Upgrade (B1302)

Thank you for letter dated 4 June 2019 requesting WaterNSW comments to inform the preparation of the Review of Environmental Factors (REF) for the McKanes Bridge capacity upgrade project.

WaterNSW understands that the bridge crosses the Coxs River on McKanes Falls Road, South Bowenfels and is considered to be in poor condition due to deterioration of the timber elements. The project involves the replacement of bridge spans and associated works.

WaterNSW makes the following comments regarding the proposal:

- The site is located in the Sydney drinking water catchment and is therefore subject to the requirements of the *State Environment Planning Policy (Sydney Drinking Water Catchment) 2011*. As such, RMS are required to consider whether the activity will have a neutral or beneficial effect on water quality. WaterNSW acknowledges the REF will consider this requirement and expects the proposal to have a neutral effect on water quality.
- Section 9 of the SEPP details that any development or activity proposed to be carried out on land which the policy applies should incorporate WaterNSW's current recommended practices (CRPs) and standards. CRPs endorsed by WaterNSW are on our website. Of particular relevance to your project may be those listed in the construction earthworks, roads, water quality and stormwater categories.
- The site is located within close proximity to WaterNSW water quality monitoring sites on the Coxs River. Appropriate mitigation measures to limit any impacts on the environment during construction and operation should be incorporated into the project REF.

WaterNSW understands that the Roads and Maritime Services (RMS) is the determining authority. However due to the location of the project, the REF (including any construction environmental management plan) should be made available for WaterNSW to assess before it is approved and construction commences.

WaterNSW requests that RMS continue to consult with us for any development that may have any impacts on our assets, infrastructure or land, using the email address Environmental.Assessments@watnsw.com.au.

If you have any questions regarding this letter, please contact Justine Clarke at justine.clarke@watnsw.com.au.

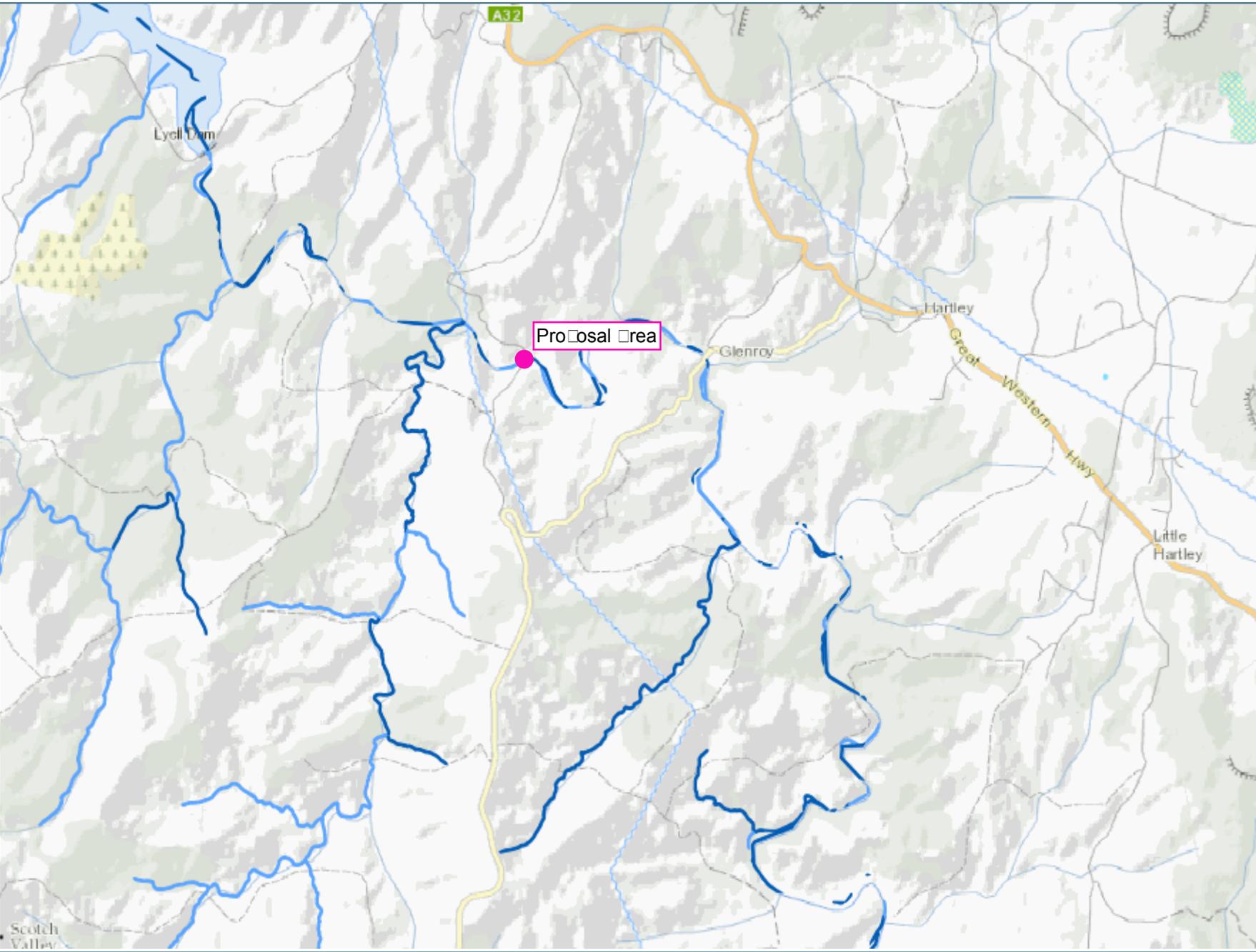
Yours sincerely

A handwritten signature in black ink that reads "Clay Preshaw".

CLAY PRESHAW
Manager Catchment Protection

Appendix I

Surface and Groundwater search results



Aquatic GDE

- Known GDE (regional study)
- High potential GDE (regional study)
- Moderate potential GDE (regional study)
- Low potential GDE (regional study)
- Unclassified potential GDE (regional study)
- High potential GDE (national assessment)
- Moderate potential GDE (national assessment)
- Low potential GDE (national assessment)
- Unclassified potential GDE (national assessment)

N

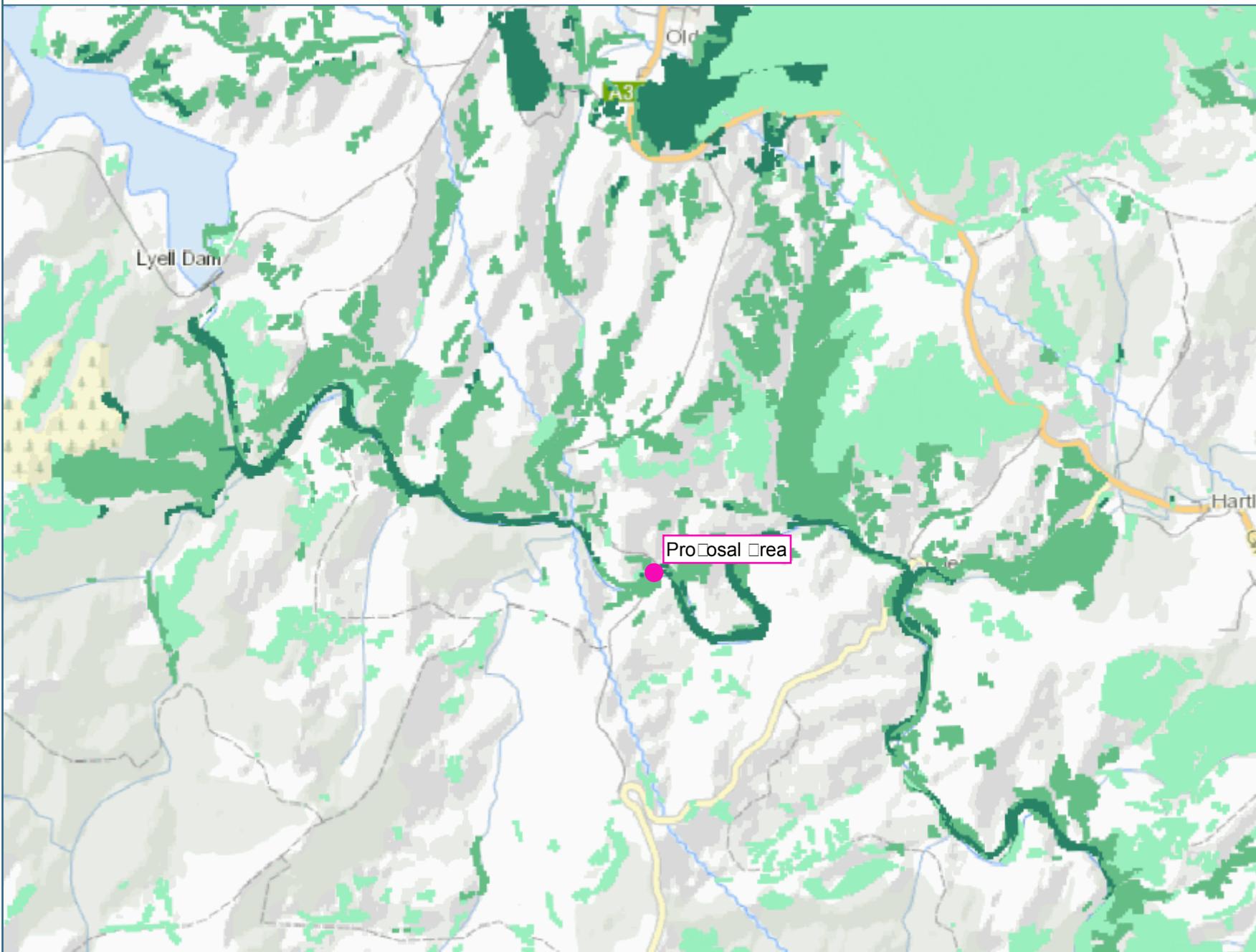
1:78,752

Kilometres 2

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: [Click here](#)

Australian Albers GDA94





Terrestrial GDE (no data)

No ecosystems analysed

Terrestrial GDE

- Known GDE (regional study)
- High potential GDE (regional study)
- Moderate potential GDE (regional study)
- Low potential GDE (regional study)
- Unclassified potential GDE (regional study)
- High potential GDE (national assessment)
- Moderate potential GDE (national assessment)
- Low potential GDE (national assessment)
- Unclassified potential GDE (national assessment)

N

1:56,571

Kilometres 1 2

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: [Click here](#)

Australian Albers GDA94



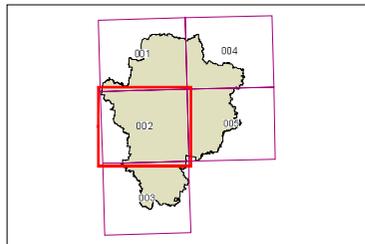


Lithgow Local Environmental Plan 2014

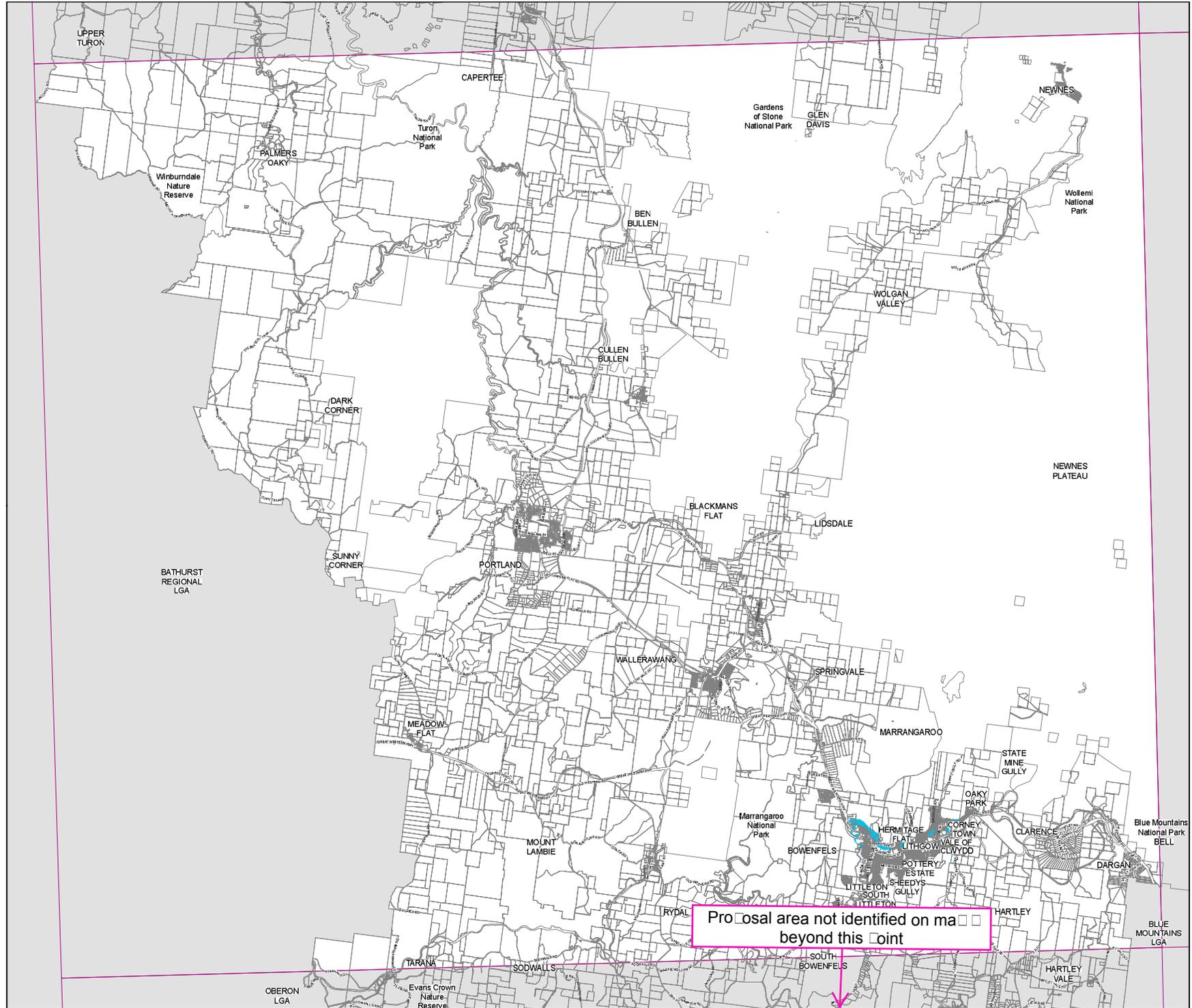
Flood Planning Map - Sheet FLD_002

Flood Planning Land
Flood Planning Area

Cadastral
Cadastral 16/04/2013 © Land and Property Information (LPI)



Projection: GDA 1994
MGA Zone 56
Scale: 1:160,000 @ A3
Map identification number: 4870_C0M_FLD_002_160_20140430



Proposed area not identified on map beyond this point

Appendix J

Scour Depth Memorandum – McKanes Bridge over Coxs River, Roads and Maritime 2014

To: Sanjivan Deshpande **Fax:**
CC:
From: Phanta Khamphounvong **Date:** 26 Nov 2014
Ref: **Pages:** 1 of 1
File no:
Subject: Scour Depth - McKane's Bridge over Cox's River



Transport
Roads & Maritime
Services

MEMO

Comments

HYDROLOGICAL INFORMATION

The catchment area for McKane's Bridge over Cox's River site is found to be 464km². The (t_c), time of concentration is about 7.8 hours. The peak flow, Q (m³/s), in the model was determined using the Statistical Rational Method in Section 1.4.1 of Australian Rainfall and Runoff 2001, and summarised in **Table 3**.

Peak flow estimates from 2 to 100 year ARI events were calculated.

STANDARD DESIGN RAINFALL INFORMATION

The rainfall data was obtained from the Bureau of Meteorology website using the co-ordinates for McKane's Bridge over Cox's River. The design Intensity-Frequency-Duration (IFD) parameters obtained for the catchment (centred on Latitude 33.550 S, Longitude 150.125 E) and from volume 2 of the Australian Rainfall and Runoff 1987 are presented in **Table 1** below.

	Parameter
2-Years ARI 1-hour Intensity	24.50
2-Years ARI 12-hours Intensity	5.70
2-Years ARI 72-hours Intensity	1.85
50-Years ARI 1-hour Intensity	45.40
50-Years ARI 12-hours Intensity	11.00
50-Years ARI 72-hours Intensity	3.25
C ₁₀	0.28
G, Skew Factor	0.12
F ₂	4.31
F ₅₀	15.75

Table 1: IFD Parameters

Estimated design storm rainfall intensities (mm/hr) for the full range of storm events and durations are presented in **Table 2**

DURATION	1 Year ARI	2 Year ARI	5 Year ARI	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI
5 mins	62.0	80.9	107	123	144	172	194
6 mins	58.2	75.8	99.8	115	134	161	181
10 mins	47.4	61.6	80.6	92.3	108	129	145
20 mins	34.3	44.4	57.4	65.3	75.8	89.9	101
30 mins	27.8	35.9	46.1	52.2	60.4	71.4	79.9
1 hour	18.8	24.2	30.9	34.8	40.2	47.3	52.8
2 hours	12.3	15.9	20.2	22.8	26.3	31.0	34.6
3 hours	9.53	12.3	15.7	17.8	20.5	24.2	27.1
6 hours	6.13	7.93	10.2	11.6	13.4	15.9	17.8
12 hours	4.02	5.20	6.71	7.63	8.85	10.5	11.7
24 hours	2.71	3.49	4.46	5.04	5.82	6.86	7.67
48 hours	1.84	2.35	2.93	3.28	3.76	4.39	4.87
72 hours	1.41	1.80	2.23	2.49	2.84	3.30	3.66

Table 2: Design Rainfall Intensities (mm/hour)

From the rainfall intensities and the IFD parameters, the calculated flows for 2 to 100 year ARI is summarised in **Table 3** below.

Existing	2 year	5 year	10 year	20 year	50 year	100 year
Flow (m ³ /s)	180	280	360	490	665	850

Table 3: Peak Flow Rates

HYDRAULIC MODELLING

Survey of the bridge site including the floodplain and river was completed. Three cross sections were surveyed, which are NS20, NS21 and NS22.

Due to site accessibility, the downstream cross sections in the model adopted cross section NS22.

The surveyed cross sections are summarised in Table 5.

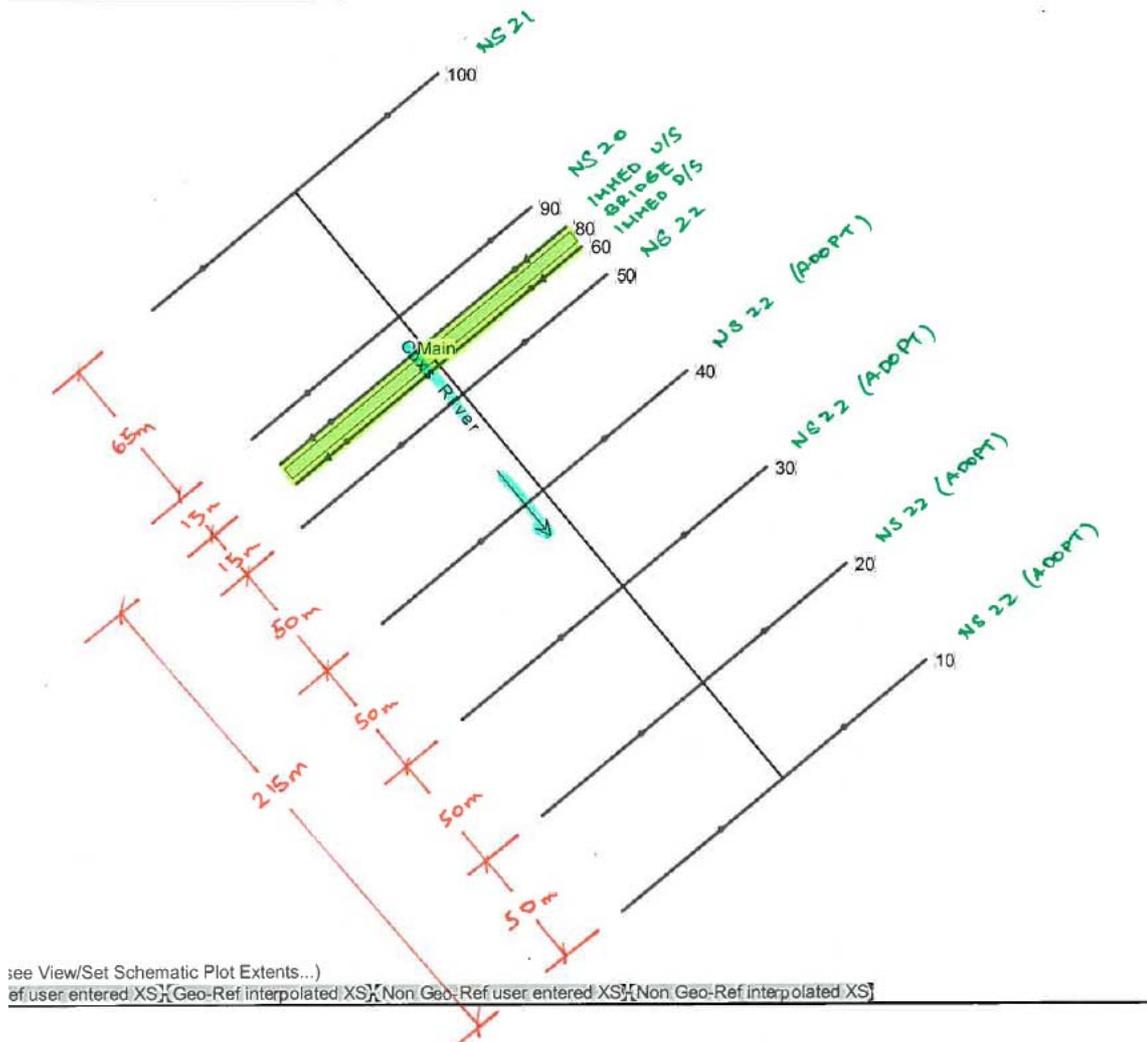


Figure 1: Hydraulic Model Cross Sections

Station	XS Location	Surveyed XS
100	80 upstream of bridge	NS21
90	15 m upstream of bridge	NS20
80	Immediately upstream of Bridge	Adopt Road Centreline XS
70	Bridge	Road Centreline XS
60	Immediately downstream of Bridge	Adopt Road Centreline XS
50	15 downstream of bridge	NS22
40	65 downstream of bridge	Adopt XS NS22
30	115 downstream of bridge	Adopt XS NS22
20	165 downstream of bridge	Adopt XS NS22
10	215 downstream of bridge	Adopt XS NS22

Table 5: Surveyed Cross Sections

Additional cross sections were interpolated between stations 100 and 60. Due to the limited surveyed cross sections, these sections provide stability to the hydraulic model.

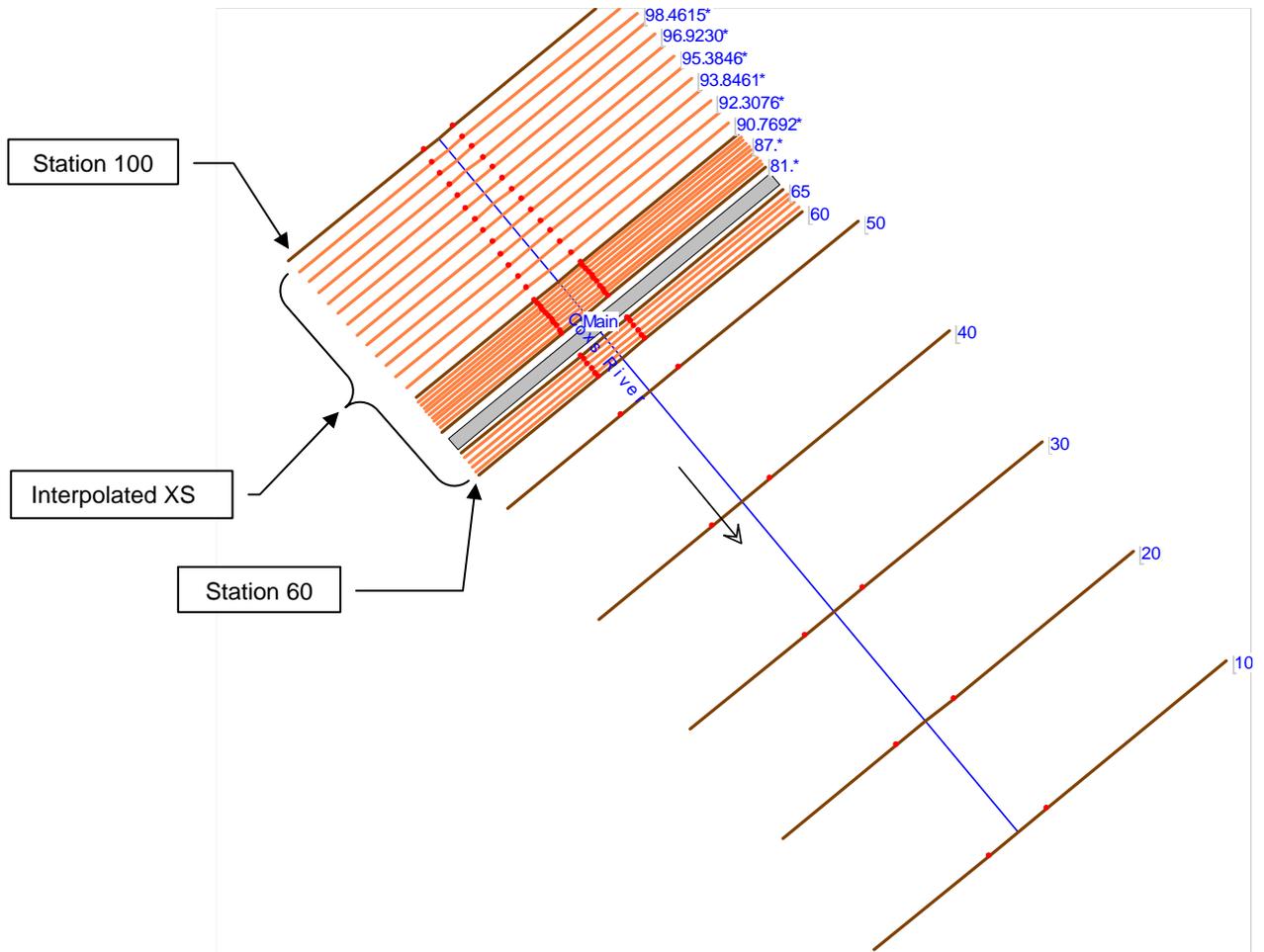


Figure 2: Hydraulic Model Cross Sections with interpolated cross sections

EXISTING

	Existing	Proposed (No Change)
Catchment Area	464.2 km ²	No Change
Bridge Length	55m	
Deck Level	716.265	
Soffit Level	715.765	
Abutment Type	Vertical	
No. Spans	2	
No. Piers	1	
Pier Width	1m	
Pier Shape	Square	
Depth of Superstructure	0.50m	
Cox's River bed slope	0.26%	

Table 4: Existing and Proposed McKane's Bridge Data

The proposed rehabilitation works would not change the bridge dimensions. There are no changes in proposed flow, flood level and velocity values. It is assumed the surrounding catchment area remains unchanged.

A numerical model was established including the proposed bridge and embankments in order to compute flood levels and to assess the hydraulic capacity of the proposed structure. The steady state backwater computer program HEC-RAS was used for this purpose.

The HEC-RAS model uses Manning's 'n' values to represent hydraulic resistance (notionally channel and floodplain roughness). In the absence of sufficient calibration data for the hydraulic model, Manning's 'n' values were selected based on typical published values (Chow 1959).

The HEC-RAS model extends to about 215m downstream and 65m upstream of the existing McKane's Bridge.

Mannings 'n', the hydraulic roughness coefficients were defined for various land uses and surface cover types based on aerial photography and from observations of the site.

Review of the photos of the existing bridge and aerial photography of the creek shows that the main channel is with grass lining/light vegetation.

The riverbanks and floodplains are typically heavily vegetated and overbank areas are typically cleared pastureland consisting of long grass, scattered trees on short grass

The adopted Manning's 'n' values are given in **Table 6**

Location	Adopted Manning's 'n' Values
River Channel	0.035
Floodplain Area	0.045

Table 6: Adopted Manning's 'n' Values

Based on the land and bed slope of the river, a flood slope of 0.0026 has been adopted in the hydraulic model.

The calculated flow discharge for McKane's Bridge generated the following modelled flood levels and velocities through the bridge opening.

Existing	2 year	5 year	10 year	20 year	50 year	100 year
Flow (m ³ /s)	180	280	360	490	665	850
Flood Level (m)	713.15	713.63	713.96	714.47	714.97	715.39
Velocity (m/s)	2.16	2.55	2.82	3.16	3.65	4.15

Table 7: Peak Flow Rates, Flood Levels and Flow Velocity

The diagram below shows the modelled 100 year ARI flood level (approx RL 715.390). The deck level is 716.270. This represents a 330mm overtopping of the bridge deck for the 1 in 100 year ARI.

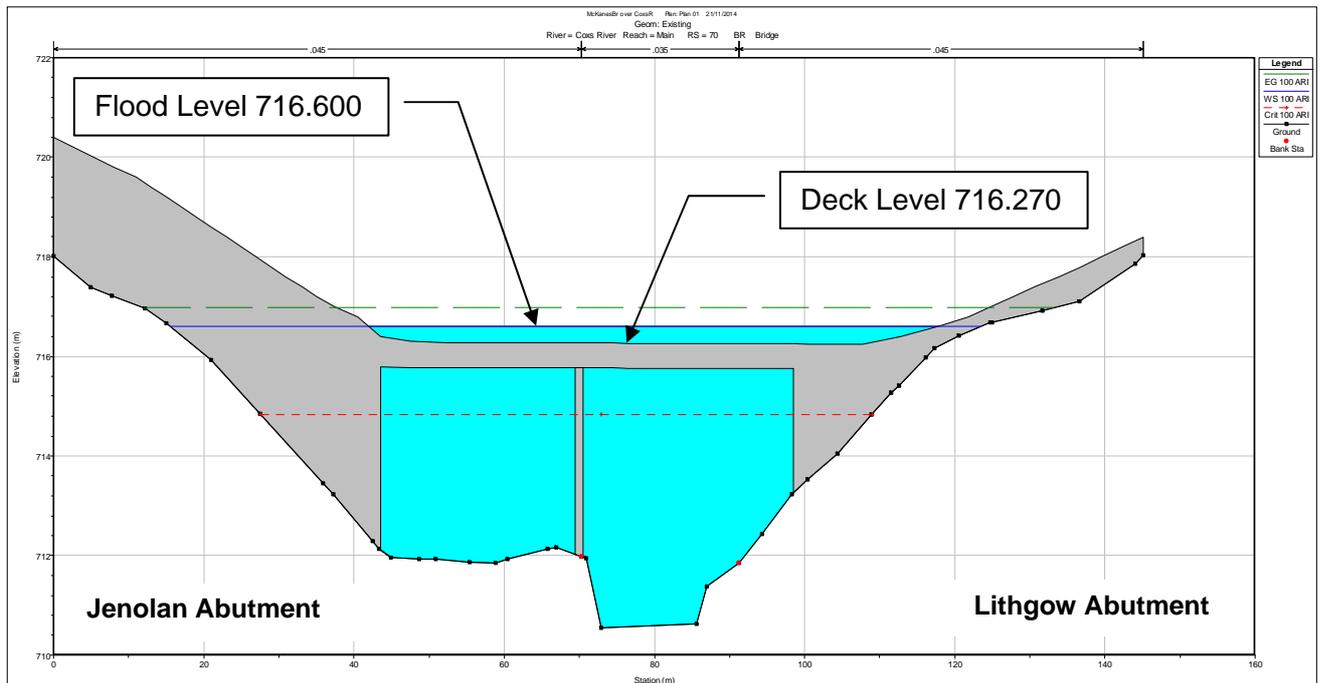


Figure 3: 100 ARI Flood Level

SCOUR AT ABUTMENTS

The Jenolan side abutment does not require scour protection. The Lithgow side abutment is subject to scour. There are several methods to determine the depth of scour for abutments.

Four methods of calculating scour depths were performed and summarised below:

Scour Calculation Method	Depth of Scour (m) (Lithgow Abutment)
Hec-Ras	6.95
Laursen (1962)	10.60
Froelich (1989)	11.60
Melville (1997)	15.34

Table 8: Scour Depth Values

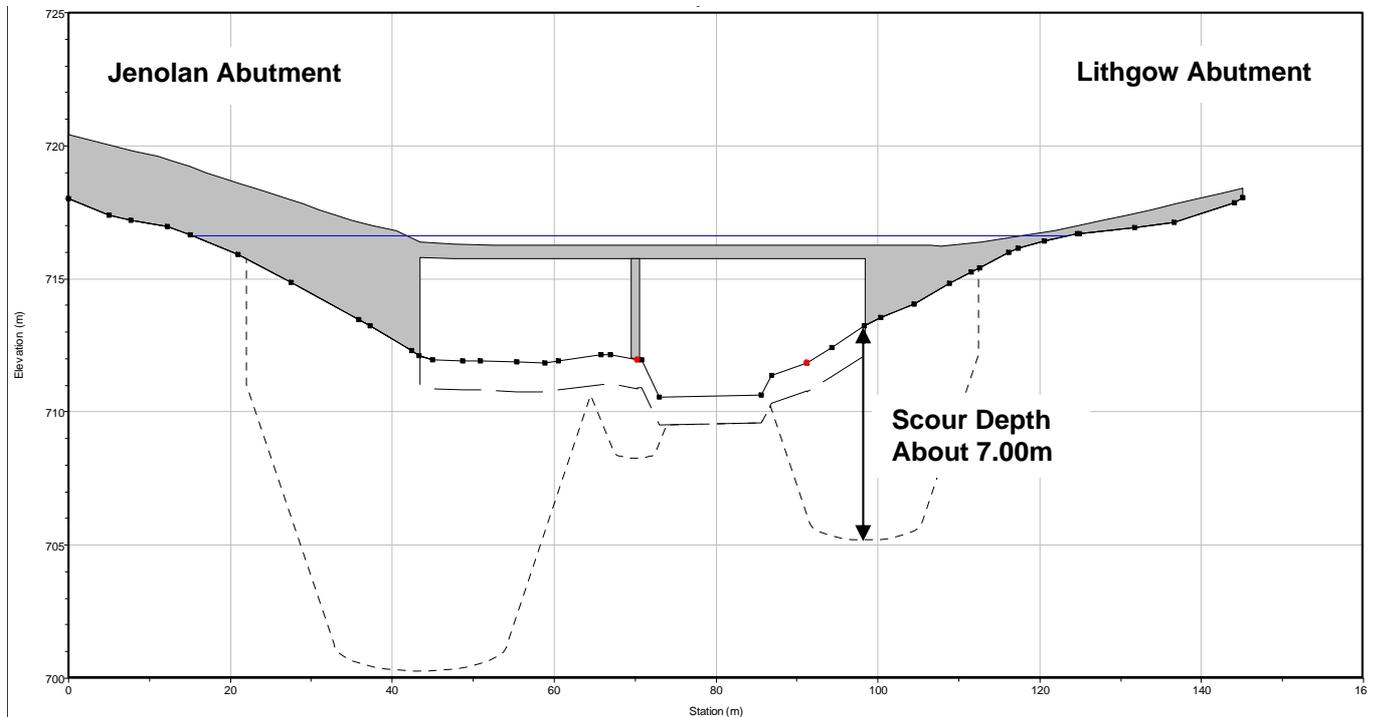


Figure 4: Scour Depth for 1 in 100 year ARI using HEC-RAS

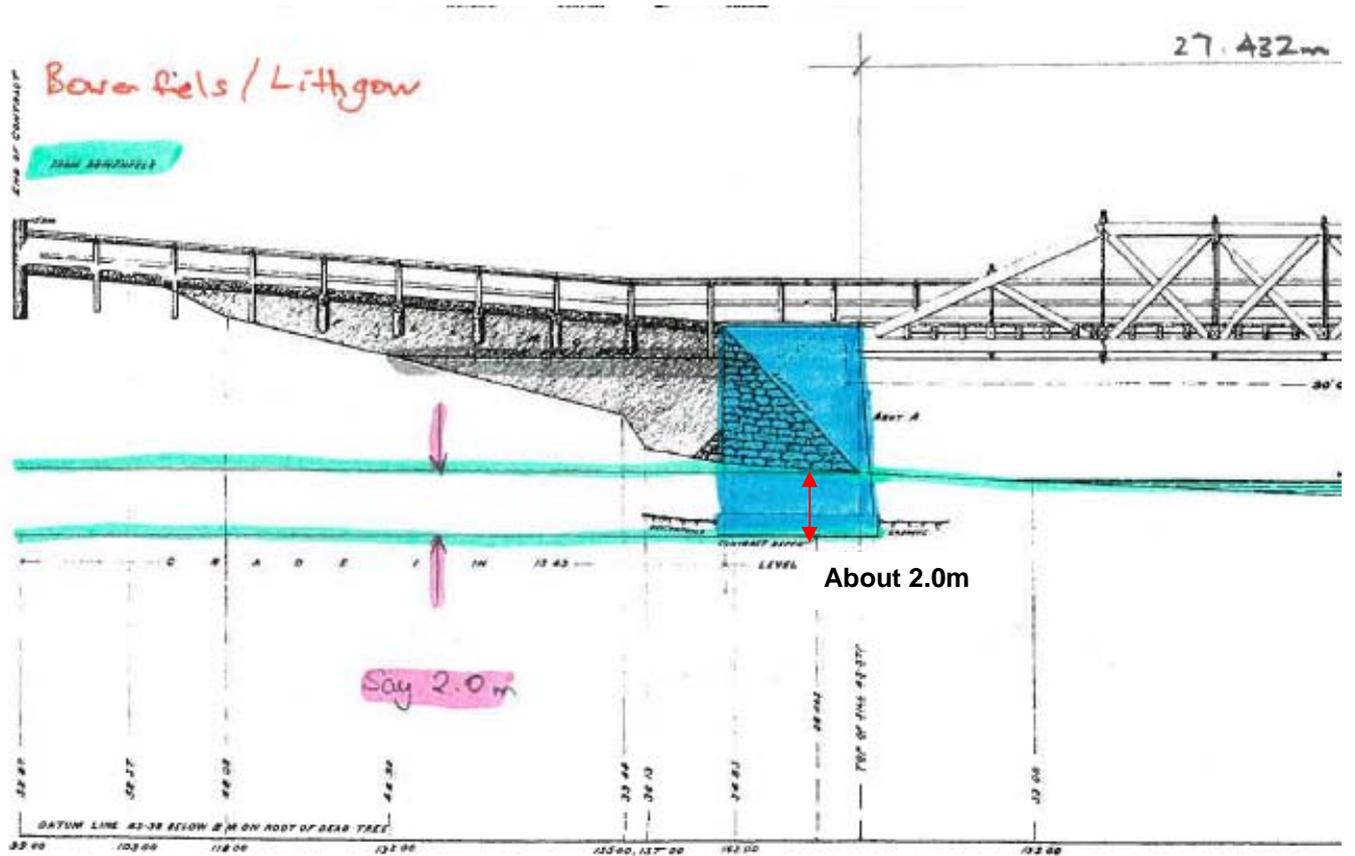


Figure 5: Lithgow Abutment

RECOMMENDATION

Geotechnical assessment is currently being carried out. The assessment report is expected to be completed by December 2014.

The geotechnical information and the scour depth calculations would be used together to provide a recommendation of the scour depth.

Appendix K

Noise and Vibration Assessment

26 August 2019

Construction noise assessment

McKanes Bridge Capacity Upgrade Review of Environmental Factors

1.0 Introduction

Roads and Maritime Services NSW (Roads and Maritime) proposes to restore and upgrade the capacity of McKanes Bridge on McKanes Falls Road, South Bowenfels to ensure the bridge can meet the current and future safe operational needs of the road network. The proposed work involves a replacement of the existing bridge on the same alignment, with a stronger, safer and more reliable bridge which still has the appearance of the original. To facilitate the replacement of the bridge, it is proposed to close McKanes Falls Road to all traffic for an estimated 12-month period, with a detour in place via Jenolan Caves Road and the Great Western Highway. This proposed detour would add approximately five minutes to travel time.

A construction noise assessment is required to identify the potential noise impacts to nearby receivers.

2.0 The proposal

The key features of the proposal would include:

- Removal of regrowth vegetation including several mature trees for the relocation of overhead power lines that cross Coxs River directly above McKanes Bridge
- Installation of a temporary secure compound at both ends of the bridge, including a suitable area for:
 - Construction plant and materials
 - Activities such as shaping new bridge elements
 - Construction office and amenities
 - Stockpiles.
- Provision of a temporary detour for all traffic via Jenolan Caves Road and the Great Western Highway at Hartley during the construction of the proposal (adding about five minutes to travel time)
- Transfer of the existing bridge self-weight to a supporting structure and systematic dismantling of the bridge superstructure
- Systematic construction of the new bridge superstructure, including:
 - Replacement of the two existing truss spans with two new strengthened truss spans of the same lengths, being 27.43 metres long each (for a total bridge length of 54.86 metres)
 - Retention of the existing road geometry
 - Reduction in carriageway width to 4.2 metres between kerbs
 - Provision of a new stress-laminated timber (SLT) deck to replace the existing timber deck
 - Provision of new steel traffic barriers
 - Reconstruction of the concrete backing walls to both stone abutments
 - Application of rock armouring scour protection to the northern abutment of the bridge
 - Provision of a new maintenance monorail system.
- Preservation of the State heritage significance of the bridge
- Improvement of safety and access for road users.

3.0 Construction noise assessment

The proposal has the potential to affect the community due to noise and vibration during construction. The following methodology has been implemented to assess the impacts.

For construction noise impacts from the proposed activity, the Roads and Maritime construction noise estimator tool was used. The following key tasks were completed during assessment:

- Identification of appropriate background noise levels;
- Identification of the noise management level (NML);
- Identification of type of sensitive receivers;
- Identification of the noise and vibration impacts; and
- Identification of feasible and reasonable additional mitigation measures.

The construction noise estimator was used to identify an appropriate background noise level and NML for each time period of proposed works. Common receivers were grouped into noise catchment areas (NCA) for the construction noise assessment. NCA combines the receivers affected by the same works to assist with assessment, consultation or notification. NCAs are the areas that are affected by the same works and located at similar distances from the noise generating activity. The output of the assessment can be found in the sections below and in Attachment A.

Based on the selected noise area category, the construction noise estimator tool produced representative background noise levels (L_{90}) together with the NMLs. These values are recorded in the section below (or Table 1).

The noise assessment considers only the impacts during the day period. This assessment conservatively considers the worst-case scenario in order to capture all appropriate mitigation measures necessary to manage risk of impact.

4.0 Duration of works and construction hours

The proposed work would take about 12 months to complete and would be carried out within Roads and Maritime standard constructions hours. Standard construction work hours are as follows:

- Monday to Friday: 7am – 6pm
- Saturday: 7am – 1pm
- Sunday and Public Holidays: No work.

5.0 Proposed activities and equipment

The proposed construction methodology is as follows:

- Install a temporary supporting structure that would take the weight of the current bridge
- Dismantle the current bridge
- Build the replacement bridge
- Remove the temporary supporting structure.

After a review of the above construction methodology, it was identified that the noisiest plant to be used as part of the proposal would be the 'Chainsaw' which would be required for the dismantling of the existing bridge superstructure.

6.0 Calculator input data

6.1.1 Nearby sensitive receivers

The proposal corridor is located along McKanes Falls Road within the Lithgow local government area (LGA). The proposal corridor is around eight kilometres south of the township of Lithgow and there are eight rural residential properties surrounding the proposal with the closest being about 150 metres to the west.

6.1.2 Noise category

The noise area category that has been selected for the proposal is R0. The proposal corridor carries around 600-700 Annual Average Daily Traffic (AADT) and has a posted speed limit of 80km/h.

6.1.3 Scenario used

The plant-based (scenario) assessment was used incorporating the ‘Chainsaw’. The distance-based (scenario) assessment was also used incorporating ‘Compound site establishment’ and ‘Compound operation’.

6.1.4 Background noise levels and line of sight

Table 1 below provides the background noise levels and noise management levels for an R0 noise area category. All residential receivers were identified to have a line of sight to the proposal. As the work would be carried out as day work during Roads and Maritime standard construction hours, the appropriate RBL is 30dB(A) and the NML is 40dB(A).

Table 1 Background noise levels and noise management levels

Noise area category		R0
RBL or LA90 Background level (dB(A))	Day	30
	Evening	30
	Night	30
LAeq(15minute) Noise Mangement Level (dB(A))	Day	40
	Day (OOHW)	35
	Evening	35
	Night	35

6.1.5 Noise Management Levels

During construction, the NML are set as per RMS CNVG (August 2016) to be 10 dB(A) above the background levels during standard hours and 5 dB(A) above the background level for out of hours.

As such based on the existing background noise levels provided in Table 1, the following NMLs would apply to the proposal:

- Day (standard hours): $30 + 10 = 40$ dB(A)
- Day (outside standard hours): $30 + 5 = 35$ dB(A)
- Evening (outside standard hours): $30 + 5 = 35$ dB(A)
- Night (outside standard hours): $30 + 5 = 35$ dB(A)

7.0 Calculator output

7.1.1 Predicted noise levels

During construction the noisiest plant is anticipated to be the chainsaw used in the dismantling of the current bridge superstructure. Using the noisiest plant-based scenario for ‘Chainsaw’, the noise estimator tool produced predicted noise levels at different locations for various receivers. The NCA affected distances (or the distances up to which noise levels are expected to exceed the NML) are recorded in Table 2 together with the predicted noise levels.

The most appropriate residential receiver category was considered to be ‘Undeveloped green fields, rural areas with isolated dwellings’.

Table 2 Construction period NMLs

Residential receiver	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (25m) – in line of sight	40	75	N, PC, RO
	NCA2 (120m) – in line of sight	40	60	N
	NCA3 (250m) – in line of sight	40	50	N

Using the distance-based scenario for ‘Compound site establishment’ and ‘Compound operation’, the noise estimator tool was used to assess impacts of the compound site on residential receivers. The NCA affected distances (or the distances up to which noise levels are expected to exceed the NML) are recorded in Table 3 and Table 4 together with the predicted noise levels.

Table 3 Construction period NMLs for the site compound establishment

Residential receiver	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (35m) – in line of sight	40	75	N, PC, RO
	NCA2 (170m) – in line of sight	40	60	N
	NCA3 (360m) – in line of sight	40	50	N

Table 4 Construction period NMLs for the site compound operation

Residential receiver	Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
Undeveloped green fields, rural areas with isolated dwellings	NCA1 (20m) – in line of sight	40	75	N, PC, RO
	NCA2 (115m) – in line of sight	40	60	N
	NCA3 (250m) – in line of sight	40	50	N

8.0 Predicted noise impacts

Following a review of the catchment distances, it is evident that no residential receivers are located within NCA1 or NCA2. One residential receiver (R4) is located within NCA3 (see Figure 1 in Attachment A). These are maximum predicted noise levels which are only anticipated to be during the dismantling of the existing bridge superstructure. These are maximum predicted noise levels which are only anticipated to be during the dismantling of the existing bridge superstructure.

For the ‘Compound site establishment’ scenario, no residential receivers are located within NCA1. Two residential receivers (R4 and R6) are located within NCA2 and three residential receivers (R3, R5 and R7) are located within NCA3 (see Figure 2 in Attachment A).

No residential receivers are located within NCA1 or NCA2 for the ‘Compound operation’ scenario. Two residential receivers (R4 and R6) are within NCA3 and two residential receivers (R3 and R5) are partially within NCA3 (see Figure 3 in Attachment A).

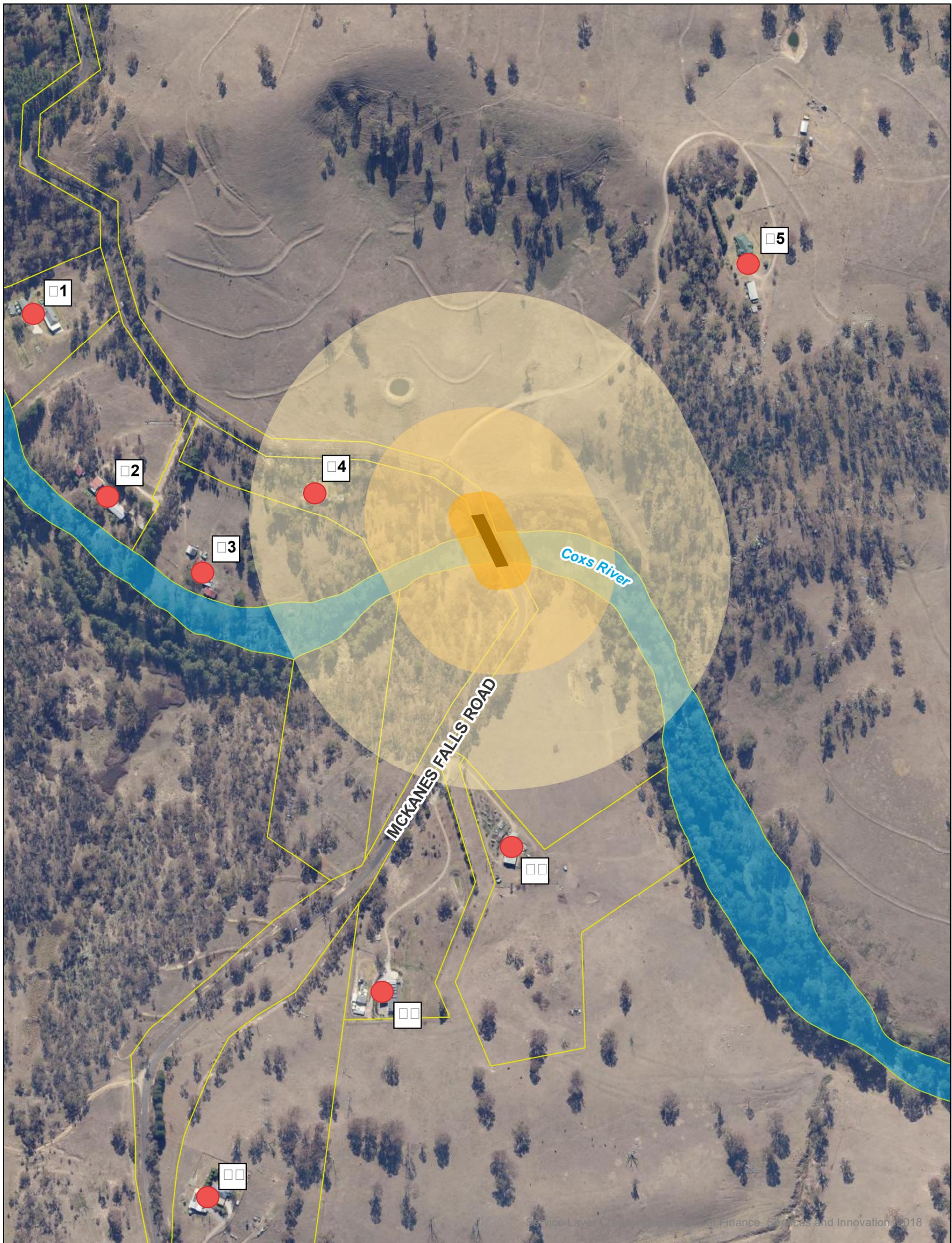
9.0 Conclusion

The above three tables identify recommended additional mitigation measures as provided by the Roads and Maritime Construction Noise Estimator Tool. A review of recommended additional mitigation measures was carried out to identify reasonable and feasible mitigation measures to apply to affected receivers.

Noise impacts to the residential receivers would be mitigated through implementing standard mitigation measures and the additional mitigation measure of a N Notification (or equivalent). To ensure consistent communication with affected receivers, it is recommended to notify receivers R1 to R8 as identified within Attachment A of the proposed work, at least seven calendar days before work commences.

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Service Layer Credits Department of Finance, Services and Innovation 2018

- | | | |
|--------------------------|-----------------------|---------------------------------|
| Proposal features | NCA2 60dB(A) 120 | Approximate property boundaries |
| McKanes Bridge | NCA3 50dB(A) 250 | |
| Noise Assessment | Other features | |
| NCA1 75dB(A) 25m | Watercourse | |

Noise Assessment - Chainsaw
B1302 McKanes Bridge Capacity Upgrade

26/08/2019
60598715

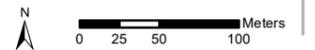
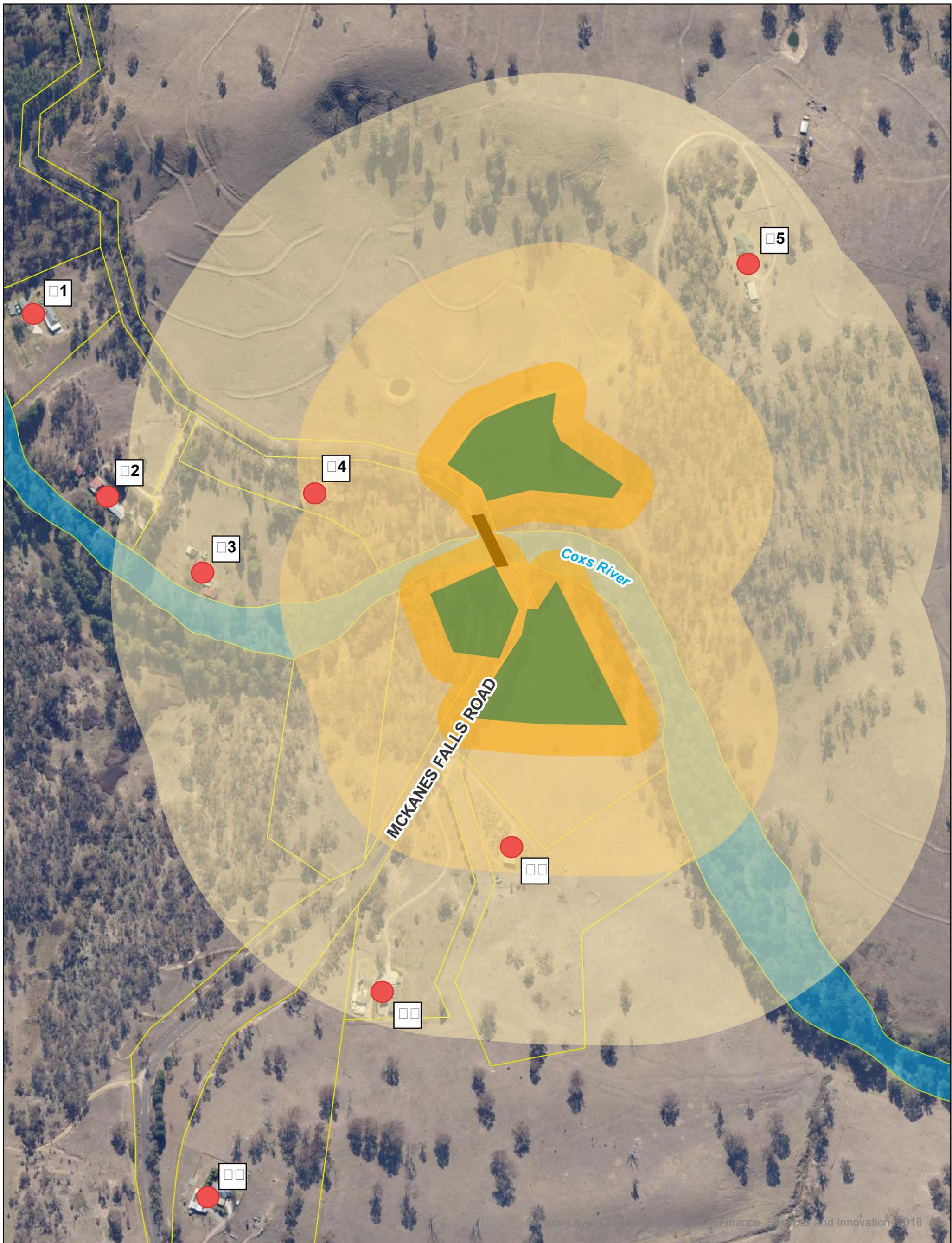


Fig. 1



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Proposal features

McKanes Bridge

Proposed compound areas

Noise Assessment

NCA1 75dB(A) 35m

NCA2 60dB(A) 170m

NCA3 50dB(A) 360m

Other features

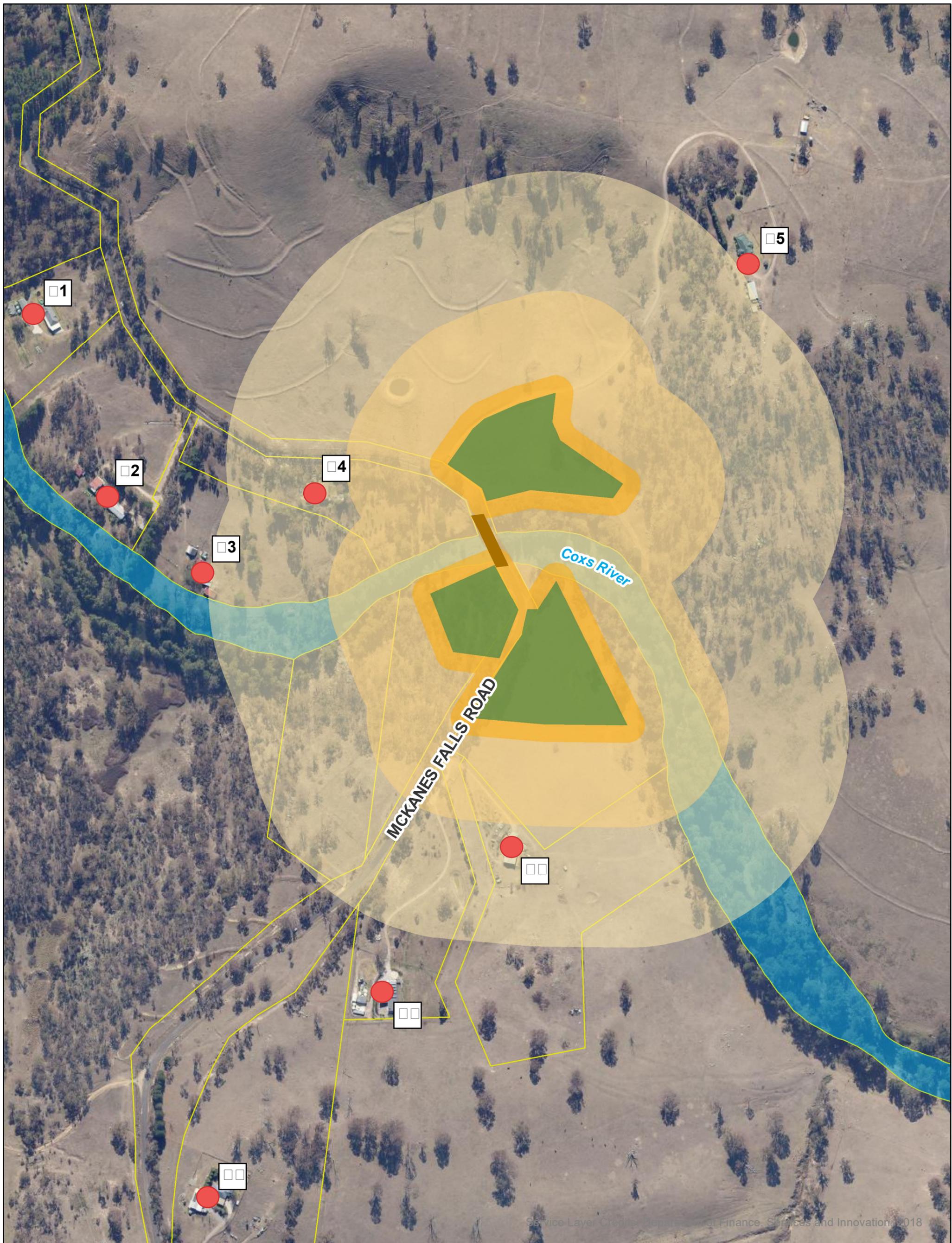
Watercourse

Approximate property boundaries

Noise Assessment - Compound site establishment
B1302 McKanes Bridge Capacity Upgrade

26/08/2019
60598715





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Proposal features

McKanes Bridge

Proposed compound areas

Noise Assessment

NCA1 75dB(A) 20m

NCA2 60dB(A) 115m

NCA3 50dB(A) 250

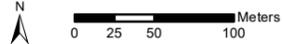
Other features

Watercourse

Approximate property boundaries

Noise Assessment - Compound operation
B1302 McKanes Bridge Capacity Upgrade

26/08/2019
60598715



Distanced Based Assessment (Construction Scenario)

Steps for Screening Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 1pm and implement Standard Measures.
 2. Select the representative noise area category (cell C8). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
 3. Select the scenario (cell C16). 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 (cell C17). Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber hooped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
 5. Determine if there are any receivers within the affected distance (undeveloped or developed areas) for each relevant time period (cells C24 to C25 for residential receiver or cells F40 to F49 for non-residential receivers):
 - (a) If there are **no affected receivers** within the affected distance and the project's impact duration is **less than 3 weeks**: document the background noise levels, noise management levels and the affected distances for the noisiest scenario in an internal memo or letter.
 - (b) If there are **one affected receiver** within the affected distance and the project's impact duration is **greater than 3 weeks**: proceed to use the estimator to predict noise levels at the worst affected receiver, then document background noise levels, noise management levels and the predicted noise levels from the noisiest scenario in an internal memo or letter.
 - (c) If there are **two or more affected receivers** and the project's impact duration is **greater than three and less than six weeks**: proceed to use the estimator to predict noise levels and mitigation measures at all receivers to inform the consultation.
 - (d) Proceed with the following steps if there are **two or more affected receivers** and the project's impact duration is **less than 3 weeks**:
 - (i) undertake a detailed noise assessment if there are **two or more affected receivers** and the project's impact duration is **greater than 6 weeks** or there are **many receivers** and the project's impact duration is **greater than 3 weeks**.
- (Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Steps for Distanced Based Assessment:

6. Identify the affected distance corresponding to the NML (see step #5).
7. Identify and implement standard mitigation measures where feasible and reasonable. Include any shading implemented, as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
8. Identify if there are any receivers that are within the additional mitigation measures or rows 40 to 80 & columns G to R for non residential receiver.
9. Where night works are involved, identify sleep disturbance mitigation measures (cells S27 and S32).
10. Document the outcomes of these steps.

Abbreviation	Measure
N	Notification (letterbox drop or equivalent)
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

Noise area category		RO
RBL or LRA	Day	30
Background level (dB(A))	Evening	30
	Night	30
LAeq(15min) Noise Management Level (dB(A))	Day	40
	Day (OOHW)	35
	Evening	35
Scenario	Compound site establishment	
Is there line of sight to receiver?	Yes	

Residential receiver	Affected distance (m)	LAeq(15min) noise level above background (L _{Aeq})												Sleep disturbance L _{night} 65 dB(A)			
		5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)				Affected distance (m)		
		Noticeable		Mitigation level (dB(A))	Clearly audible		Mitigation level (dB(A))	Moderately intrusive		Mitigation level (dB(A))	Highly intrusive		Mitigation level (dB(A))				
Undeveloped green fields, rural areas with isolated dwellings	Day	755															
	Day (OOHW)	1085															
	Evening	1085															
	Night	1085															
Developed settlements (urban and suburban) or over water	Day	1010															
	Day (OOHW)	1455															
	Evening	1455															
	Night	1455															

Non-residential receiver	Standard hours	LAeq(15min) noise level above NML												
		<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)			
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	
Classroom at schools and other educational institutions	Day	55	250											
	Evening	65	115											
	Day	35	250											
	Night	65	115											

Hospital wards and operating theatres	Standard hours	LAeq(15min) noise level above NML												
		< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)			
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	
Hospital wards and operating theatres	Evening	65	115											
	Night	65	115											
	Evening	55	250											
	Night	55	250											

Non-residential receiver	Standard hours	LAeq(15min) noise level above NML											
		<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)		
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	305										
	Evening	65	130										
	Day	55	305										
	Night	65	130										

Hospital wards and operating theatres	Standard hours	LAeq(15min) noise level above NML											
		< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	130										
	Night	65	130										
	Evening	55	305										
	Night	55	305										

Distanced Based Assessment (Construction Scenario)

Steps for Screening Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 1pm and implement Standard Measures.
 2. Select the representative noise area category (cell C8). The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
 3. Select the scenario (cell C16). If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination. Is there line of sight to receiver? Select the appropriate scenario from the drop down list (cell C17). Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber hooped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
 4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list (cell C17). Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber hooped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier.
 5. Determine if there are any receivers within the affected distance (undeveloped or developed areas) for each relevant time period (cells C24 to C25 for residential receiver or cells F40 to F49 for non-residential receivers):
 - (a) If there are **no affected receivers** within the affected distance and the project's impact duration is **less than 3 weeks**, document the background noise levels, noise management levels and the affected distances for the noisiest scenario in an internal memo or letter.
 - (b) If there are **one affected receiver** within the affected distance and the project's impact duration is **greater than 3 weeks**, proceed to use the estimator to predict noise levels at the worst affected receiver, then document background noise levels, noise management levels and the predicted noise levels from the noisiest scenario in an internal memo or letter.
 - (c) If there are **two or more affected receivers** and the project's impact duration is **greater than three and less than six weeks**, proceed to use the estimator to predict noise levels and mitigation measures at all receivers to inform the consultation.
 - (d) Proceed with the following steps if there are **a few affected receivers** and the project's impact duration is **less than 3 weeks**.
 - (e) Undertake a detailed noise assessment if there are **a few affected receivers** and the project's impact duration is **greater than 6 weeks** or there are **many receivers** and the project's impact duration is **greater than 3 weeks**.
- (Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Steps for Distanced Based Assessment:

6. Identify the affected distance corresponding to the NML (see step #5).
7. Identify and implement standard mitigation measures where feasible and reasonable. Include any shading implemented, as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list.
8. Identify if there are any receivers that are within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver (rows 24 to 33 & columns D to columns G for residential receiver or rows 40 to 49 & columns G to R for non-residential receiver).
9. Where night works are involved, identify sleep disturbance mitigation measures (cells S27 and S32).
10. Document the outcomes of these steps.

Abbreviation	Measure
SN	Notification (letterbox drop or equivalent)
PC	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

Noise area category		RO
RBL or LRA	Day	30
Background level (dB(A))	Evening	30
	Night	30
LAeq(15min) Noise Management Level (dB(A))	Day	40
	Day (OOHW)	35
	Evening	35
Scenario	Compound operation	
Is there line of sight to receiver?	Yes	

Residential receiver	Affected distance (m)	LAeq(15min) noise level above background (LRA)												Sleep disturbance Level 65 dB(A)			
		5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)				Affected distance (m)		
		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	525															
	Day (OOHW)	755															
	Evening	755															
	Night	755															
Developed settlements (urban and suburban) or over water	Day	685															
	Day (OOHW)	1010															
	Evening	1010															
	Night	1010															

Non-residential receiver	Standard hours	Period	NML	Affected distance (m)	LAeq(15min) noise level above NML													
					<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)				
					Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets	Day	55	170									
							Day	65	65									
							Day	35	170									
							Day	65	65									

Non-residential receiver	Standard hours	Period	NML	Affected distance (m)	LAeq(15min) noise level above NML												
					< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)			
					Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	
Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets	Evening	65	65									
						Evening	65	65									
						Evening	55	170									
						Evening	65	65									

Non-residential receiver	Standard hours	Period	NML	Affected distance (m)	LAeq(15min) noise level above NML												
					<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)			
					Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	
Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets	Day	55	200								
							Day	65	75								
							Day	55	200								
							Day	65	75								

Non-residential receiver	Standard hours	Period	NML	Affected distance (m)	LAeq(15min) noise level above NML											
					< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
					Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets	Evening	65	75								
						Evening	65	75								
						Evening	55	200								
						Evening	65	75								

Appendix L

Non-Aboriginal Heritage search result



Search criteria
LGA: Lithgow
Roads and Maritime
s170 register

[Home](#) > [Topics](#) > [Heritage places and items](#) > [Search for heritage](#)

Search for NSW heritage

[Return to search page where you can refine/broaden your search.](#)

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search did not return any matching results.

Section 2. Items listed under the NSW Heritage Act.

Your search returned 1 record.

Item name	Address	Suburb	LGA	SHR
<u>McKanes Falls Bridge</u>	Jenolan Caves Road	Lithgow	Lithgow	01473

Section 3. Items listed by Local Government and State Agencies.

Your search returned 4 records.

Item name	Address	Suburb	LGA	Information source
<u>Marrangaroo Creek Bridge</u>	Great Western Highway/Mudgee Road	7.72 km north-north-west of Lithgow	Lithgow	SGOV
<u>Masonry Culvert & Retaining Wall, Old Bowenfels</u>	Great Western Highway	Old Bowenfels	Lithgow	SGOV
<u>McKanes Falls Bridge over Cox River</u>	Lithgow to Oberon Road, McKanes Fall	Lithgow	Lithgow	SGOV
<u>Victoria Pass</u>	Great Western Highway	Mount Victoria	Lithgow	SGOV

There was a total of 5 records matching your search criteria.

Key:

LGA = Local Government Area

GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study,
LGOV = Local Government, SGOV = State Government Agency.

Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.



Search criteria
Lithgow LGA

[Home](#) > [Topics](#) > [Heritage places and items](#) > [Search for heritage](#)

Search for NSW heritage

[Return to search page where you can refine/broaden your search.](#)

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
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- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search returned 1 record.

Aboriginal place name	Local government area	Local Aboriginal Land Council	Latitude	Longitude	Gazettal date and page numbers	Comments
Blackfellows Hand	Lithgow	Bathurst	-33.3213837186	150.118394381	07/18/2008 p. 7252	

Section 2. Items listed under the NSW Heritage Act.

Your search returned 33 records.

Item name	Address	Suburb	LGA	SHR
Ben Bullen Railway Station group	Wallerawang-Gwabegar railway	Ben Bullen	Lithgow	01082
Bowenfels National School Site	70 Mudgee Street	Old Bowenfels	Lithgow	00761
Bowenfels Rail Viaducts	Main Western railway 159.156 km	Bowenfels	Lithgow	01028
Bowenfels Railway Station and Stationmaster's House	Main Western railway	Bowenfels	Lithgow	00475
Collits' Inn	Hartley Vale Road	Hartley Vale	Lithgow	00455
Coerwull Railway footbridge	Top Points Zig Zag Railway	Lithgow	Lithgow	01115
Cox's Road and Early Deviations - Hartley, Clarence Hilly Range / Mount Blaxland Precinct	The Old Bathurst Road	Hartley	Lithgow	01957

<u>Cox's Road and Early Deviations - Mount York, Cox's Pass Precinct</u>	Mount York Road (off)	Mount Victoria	Blue Mountains	01956
<u>Cox's Road and Early Deviations - Sodwalls, Fish River Descent Precinct</u>	Cuthill Road (off)	Sodwalls	Lithgow	01958
<u>Eskbank House and Moveable Collections</u>	70 Inch Street	Lithgow	Lithgow	02008
<u>Eskbank Railway Station group</u>	Main Western railway	Lithgow	Lithgow	01138
<u>Fernhill</u>	Great Western Highway	Bowenfels	Lithgow	00225
<u>Great Zig Zag Railway and Reserves</u>	Brewery Lane	Lithgow	Lithgow	00542
<u>Great Zig Zag Railway deviation tunnels</u>	Main Western Railway	Lithgow	Lithgow	01037
<u>Hartley Historic Site</u>	Great Western Highway	Hartley Historic Site	Lithgow	00992
<u>Lithgow (James St) Underbridge</u>	Railway location, Main West Line 156.334km James St	Lithgow	Lithgow	01831
<u>Lithgow Blast Furnace</u>	Inch Street	Lithgow	Lithgow	00548
<u>Lithgow Coal Stage Signal Box</u>	Gas Works Lane	Lithgow	Lithgow	01832
<u>Lithgow Heavy Anti Aircraft Gun Stations and Dummy Station</u>	Kirkley Street (via)	Bowenfels	Lithgow	01862
<u>Lithgow Railway Station Group and Residence</u>	Railway Parade	Lithgow	Lithgow	01833
<u>Lithgow Valley Colliery & Pottery Site</u>	Bent Street	Lithgow	Lithgow	00078
<u>Marrangaroo railway viaduct</u>	Main Western railway	Marrangaroo	Lithgow	01046
<u>McKanes Falls Bridge</u>	Jenolan Caves Road	Lithgow	Lithgow	01473
<u>Military Station Archaeological Site and Burial at Glenroy</u>	200 Jenolan Caves Road	Hartley	Lithgow	01840
<u>Portland Cement Works Precinct</u>	Williwa Street	Portland	Lithgow	01739
<u>Raffan's Mill and Brick Bottle Kilns Precinct</u>	Carlton Road	Portland	Lithgow	01738
<u>Rydal rail underbridges</u>	Main Western railway	Rydal	Lithgow	01053
<u>Rydal Railway Station group</u>	Main Western railway	Rydal	Lithgow	01239

<u>St. John the Evangelist Church</u>	Main Street	Wallerawang	Lithgow	01702
<u>Tarana Railway Station and yard group</u>	Main Western railway	Tarana	Lithgow	01263
<u>Wallerawang rail bridges over Cox's River</u>	Main Western Railway	Wallerawang	Lithgow	01064
<u>Wallerawang Railway Station and yard group</u>	Main Western railway	Wallerawang	Lithgow	01282
<u>Wambool old-rail truss overbridges</u>	Main Western Railway	Wambool	Lithgow	01065

Section 3. Items listed by Local Government and State Agencies.

Your search returned 149 records.

Item name	Address	Suburb	LGA	Information source
<u>Airdrie</u>	Kirkley Street	South Bowenfels	Lithgow	LGOV
<u>Ambermere</u>	Great Western Highway	Little Hartley	Lithgow	LGOV
<u>Andrew Brown's Private Cemetery</u>	Coerwull Road (off)	Lithgow	Lithgow	LGOV
<u>Anglican Church</u>	Cartwright Street	Rydal	Lithgow	LGOV
<u>ANZ Bank</u>	30 Main Street (cnr)	Lithgow	Lithgow	LGOV
<u>Bank</u>	156 Main Street	Lithgow	Lithgow	LGOV
<u>Barton Park Cemetery</u>		Wallerawang	Lithgow	SGOV
<u>Bell To Zig Zag Ten Tunnel Railway Deviation & Zig Zag Rail Corridor</u>	Clarence Station To Zig Zag Bottom Points, and Rail Corridor From Zig Zag To Bells Rd/Brewery Lane	Bell	Lithgow	SGOV
<u>Ben Avon</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Ben Bullen Railway Station</u>	Sydney Road	Ben Bullen	Lithgow	SGOV
<u>Blackman and Merrick family cemetery</u>	Gap Road	Hartley Vale	Lithgow	LGOV
<u>Blast Furnace Site</u>	Inch Street	Lithgow	Lithgow	LGOV
<u>Bowenfels (George Coates St) Underbridge</u>	George Coates Street	Bowenfels	Lithgow	SGOV

<u>Bowenfels Presbyterian cemetery</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Bowenfels Railway Station Group</u>	Main Western Line	Bowenfels	Lithgow	LGOV
<u>Bowenfels Railway Station Group and Residence</u>	1-31 Coerwull Road	Bowenfels	Lithgow	SGOV
<u>Bowenfels, Farmers Creek Viaducts</u>	159.156km, Main Western Line	Bowenfels	Lithgow	SGOV
<u>Braemar House</u>	50 Tweed Road	Bowenfels	Lithgow	LGOV
<u>Caddies Restaurant</u>	1 Coerwull Road	Bowenfels	Lithgow	LGOV
<u>Capertee Police Station</u>	Mudgee Road	Capertee	Lithgow	SGOV
<u>Capertee Railway Station</u>		Capertee	Lithgow	SGOV
<u>Cemetery</u>	Mead Street	Meadow Flat	Lithgow	LGOV
<u>Collits Inn</u>	Hartley Vale Road	Hartley Vale	Lithgow	LGOV
<u>Collitt's / Mt.York burial ground</u>	Hartley Vale Road	Hartley Vale	Lithgow	LGOV
<u>Coerwull House</u>	Great Western Highway	Bowenfels	Lithgow	LGOV
<u>Coerwull Presbyterian Church</u>	Great Western Highway	Lithgow	Lithgow	LGOV
<u>Cottage (duplex)</u>	16 and 18 Lithgow Street	Lithgow	Lithgow	LGOV
<u>Cox's River Convict Stockade</u>		Lake Lyell, Lithgow	Lithgow	SGOV
<u>Eliza Rodd Grave</u>	Jenolan Caves Road (off)	Hartley	Lithgow	LGOV
<u>Emoh</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Eskbank House</u>	Bennett Street	Lithgow	Lithgow	LGOV
<u>Eskbank Railway Precinct</u>	Inch Street	Eskbank	Lithgow	SGOV
<u>Fernhill</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Forty Bends</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Forty Bends Cemetery</u>	Old Forty Bends Road	South Bowenfels	Lithgow	LGOV

<u>Forty Bends Cottage</u>	Old Forty Bends Road	South Bowenfels	Lithgow	LGOV
<u>General Cemetery</u>	Capertee Road	Dark Corner	Lithgow	LGOV
<u>General Store (former)</u>	Bathurst Street (0.5km N of town)	Rydal	Lithgow	LGOV
<u>Glen Alice Cemetery</u>	Glen Alice Road	Glen Alice	Lithgow	LGOV
<u>Glen Alice Church</u>	Glen Alice Road	Glen Alice	Lithgow	LGOV
<u>Great Zig Zag</u>	Lithgow Valley Reserve	Lithgow	Lithgow	LGOV
<u>Gymnasium</u>	Railway Parade	Lithgow	Lithgow	LGOV
<u>Harp of Erin</u>	Great Western Highway	Little Hartley	Lithgow	LGOV
<u>Hartley Court House</u>	Old Bathurst Road	Hartley	Lithgow	LGOV
<u>Hermitage Colliery Managers Cottage</u>	8 Coalbrook Street	Lithgow	Lithgow	LGOV
<u>Hoskins Memorial Presbyterian Church</u>	Bridge Street	Lithgow	Lithgow	LGOV
<u>Hospital Cottage</u>	Lithgow Road	Wallerawang	Lithgow	SGOV
<u>Hospital Farm Barn</u>	Lithgow Road	Wallerawang	Lithgow	SGOV
<u>House</u>	22-24 Lithgow Street	Lithgow	Lithgow	LGOV
<u>House</u>	20 Lithgow Street	Lithgow	Lithgow	LGOV
<u>House group</u>	1-13 and 2-12 Brisbane Street	Lithgow	Lithgow	LGOV
<u>Kirkconnell Correctional Centre</u>	Sunny Corner Road	Kirkconnell	Lithgow	SGOV
<u>Kirkconnell Correctional Centre - Education & Silk Screen</u>	Sunny Corner Road	Kirkconnell	Lithgow	SGOV
<u>Kirkconnell Correctional Centre - House & outbuildings</u>	Sunny Corner Road	Kirkconnell	Lithgow	SGOV
<u>Kirkconnell Correctional Centre - Pottery & Generator Room</u>	Sunny Corner Road	Kirkconnell	Lithgow	SGOV
<u>Kirkconnell Correctional Centre - Reception Office & Main S/B</u>	Sunny Corner Road	Kirkconnell	Lithgow	SGOV

<u>La Salle Academy South Bowenfels</u>	Rabaul Street (off)	Lithgow	Lithgow	LGOV
<u>Lidsdale House Gardens</u>	Mudgee Road	Lidsdale	Lithgow	LGOV
<u>Lithgow (James St) Underbridge</u>	Railway location, Main West Line 156.334km James Street	Lithgow	Lithgow	SGOV
<u>Lithgow Coal Stage Signal Box</u>	Gas Works Ln	Lithgow	Lithgow	SGOV
<u>Lithgow Correctional Centre - Sandstone Garage</u>		Lithgow	Lithgow	SGOV
<u>Lithgow Correctional Centre - Staff Training Centre</u>		Lithgow	Lithgow	SGOV
<u>Lithgow Court House</u>	Bridge Street	Lithgow	Lithgow	LGOV
<u>Lithgow Courthouse</u>	Bridge Street and Mort Street	Lithgow	Lithgow	SGOV
<u>Lithgow Fire Station</u>	58 Cook Street	Lithgow	Lithgow	SGOV
<u>Lithgow general cemetery</u>	Great Western Highway	Lithgow	Lithgow	LGOV
<u>Lithgow No. 2 Dam</u>	Farmers Creek	Lithgow	Lithgow	LGOV
<u>Lithgow Patrol Office , Former</u>	156 Mort Street	Lithgow	Lithgow	SGOV
<u>Lithgow Police Station , Former</u>	Bridge Street	Lithgow	Lithgow	SGOV
<u>Lithgow Primary School Residence</u>	Mort Street	Lithgow	Lithgow	LGOV
<u>Lithgow Railway Station Group and Residence</u>	Railway Parade	Lithgow	Lithgow	SGOV
<u>Lithgow Valley Colliery and Pottery Office Building</u>	69 Bent Street	Lithgow	Lithgow	LGOV
<u>Lockyers Pass</u>	Hartley Vale Road	Hartley Vale	Lithgow	LGOV
<u>Lowther Park</u>	Jenolan Caves Road	Lowther	Lithgow	LGOV
<u>Lowther Park and Cemetery</u>	Jenolan Caves Road	Lowther	Lithgow	LGOV
<u>Marrangaroo Creek Bridge</u>	Great Western Highway/Mudgee Road	7.72 km north-north-west of Lithgow	Lithgow	SGOV

<u>Marrangaroo Prayer Chapel</u>	Great Western Highway	Marrangaroo	Lithgow	LGOV
<u>Marrangaroo, Middle River Brick Viaduct</u>	163.334km, Main Western Railway	Marrangaroo	Lithgow	SGOV
<u>Marrangaroo, Middle River Stone Viaduct</u>	163.334km, Main Western Railway	Marrangaroo	Lithgow	SGOV
<u>Masonry Culvert & Retaining Wall, Old Bowenfels</u>	Great Western Highway	Old Bowenfels	Lithgow	SGOV
<u>McKanes Falls Bridge over Cox River</u>	Lithgow to Oberon Road, McKanes Fall	Lithgow	Lithgow	SGOV
<u>Meades Farm</u>	Great Western Highway	Little Hartley	Lithgow	LGOV
<u>Methven</u>	1 Evans Place	Bowenfels	Lithgow	LGOV
<u>Moyn</u>	Coxs River Road	Kanimbla	Lithgow	LGOV
<u>Moyn Farm and Cemetery</u>	Coxs River Road (off)	Little Hartley	Lithgow	LGOV
<u>National School Group (former)</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Newnes</u>		Wolgan Valley	Lithgow	LGOV
<u>Newnes Junction Signal Box</u>		Newnes Junction	Lithgow	SGOV
<u>Oakey Park (Ida Falls Creek) Railway Culvert</u>	Ida Falls Creek Off Bell Road	Oakey Park	Lithgow	SGOV
<u>Office</u>	31 Main Street	Lithgow	Lithgow	LGOV
<u>Oil Shale Works and Refinery</u>		Glen Davis	Lithgow	LGOV
<u>Old Roman Catholic Cemetery</u>	Great Western Highway	Hartley	Lithgow	LGOV
<u>Portland Cement Group</u>	Williwa Street	Portland	Lithgow	LGOV
<u>Presbyterian Church and Sessions Hall</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Railway Cottage</u>	Portland Road	Pipers Flat	Lithgow	LGOV
<u>Railway Items Newnes Junction - Sodwalls</u>	Main West Line	Sodwalls	Lithgow	LGOV
<u>Railway Items Newnes Junction - Sodwalls</u>	Main West Line	Newnes Junction	Lithgow	LGOV

<u>Railway Items Newnes Junction - Sodwalls</u>	Main West Line	Marrangaroo	Lithgow	LGOV
<u>Railway Items Newnes Junction - Sodwalls</u>	Main West Line	Rydal	Lithgow	LGOV
<u>Railway Items Newnes Junction - Sodwalls</u>	Main West Line	Clarence	Lithgow	LGOV
<u>Railway Items Newnes Junction - Sodwalls</u>	Main Street	Wallerawang	Lithgow	LGOV
<u>Recco Store</u>	Railway Parade	Lithgow	Lithgow	LGOV
<u>Rosedale</u>	Great Western Highway	Little Hartley	Lithgow	LGOV
<u>Royal Hotel</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Royal Hotel (former)</u>	Old Bathurst Road	Hartley Historic Site	Lithgow	LGOV
<u>Rydal General Cemetery</u>		Rydal	Lithgow	LGOV
<u>Rydal Railway Station</u>	Bathurst Street	Rydal	Lithgow	LGOV
<u>Rydal Railway Station</u>	Bathurst Street	Rydal	Lithgow	SGOV
<u>Rydal Railway Station</u>	Bathurst St	Rydal	Lithgow	SGOV
<u>School and Residence</u>	Main Street	Wallerawang	Lithgow	LGOV
<u>School Residence</u>	Rydal Road	Tarana	Lithgow	LGOV
<u>Shale Mining and Works Remains</u>	Hartley Vale Road	Hartley Vale	Lithgow	LGOV
<u>Six Foot Track</u>		Megalong Valley	Lithgow	LGOV
<u>Sodwalls Inn</u>	Sodwalls Road	Sodwalls	Lithgow	LGOV
<u>Sodwalls, Antonia Creek Underbridge</u>	186.651km Main Western Railway	Sodwalls	Lithgow	SGOV
<u>Sodwalls, Solitary Creek No 1 & 2 Underbridges</u>	183.777 & 183.967 Main Western Line	Sodwalls	Lithgow	SGOV
<u>Sodwalls, Solitary Creek Nos 3 & 4 Underbridges</u>	188.025 & 188.316, Main Western Railway	Sodwalls	Lithgow	SGOV
<u>Sodwalls, Solitary Creek Nos 5 to 12 Underbridges</u>	8 locations Main Western Line	Sodwalls To Tarana	Lithgow	SGOV
<u>Somerset House</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV

<u>St. Bernard's Roman Catholic Church Group</u>	Old Bathurst Road	Hartley Historic Site	Lithgow	LGOV
<u>St. John the Evangelist Church</u>	Main Street	Wallerawang	Lithgow	LGOV
<u>St. John the Evangelist's Anglican Church</u>	Great Western Highway	Hartley	Lithgow	LGOV
<u>St. Thomas Anglican Church</u>	Wicketty War Road	Hampton	Lithgow	LGOV
<u>Staff Cottages for Small Arms Factory</u>	1,2,3 Commonwealth Avenue	Lithgow	Lithgow	LGOV
<u>State Mine Site</u>	State Mine Gully	Lithgow	Lithgow	LGOV
<u>Sunny Corner General Cemetery</u>	Dark Corner Road	Sunny Corner	Lithgow	LGOV
<u>Sunny Corner Smelter Ruins</u>	Sunny Corner PO 1km North/East	Sunny Corner	Lithgow	LGOV
<u>Sweet Briars</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Tam 902 - Main-line Sleeping Car (Destroyed By Fire In 2001)</u>		Not Listed	Unknown	SGOV
<u>Tarana Railway Precinct</u>	Tarana Road	Tarana	Lithgow	SGOV
<u>Tarana Railway Precinct</u>	Tarana Road	Tarana	Lithgow	SGOV
<u>Terrace</u>	8,10,12,14 Lithgow Street	Lithgow	Lithgow	LGOV
<u>Thompson's Creek Sites and Graves</u>	Thompson's Creek	Portland	Lithgow	SGOV
<u>Timber slab cottage</u>	Mid Hartley Road	Hartley Vale	Lithgow	LGOV
<u>Umera</u>	Great Western Highway	South Bowenfels	Lithgow	LGOV
<u>Union Theatre / Outbuilding</u>	65 Bridge Street	Lithgow	Lithgow	LGOV
<u>Victoria Pass</u>	Great Western Highway	Mount Victoria	Lithgow	SGOV
<u>Victoria Pass</u>	Great Western Highway	Mount Victoria	Lithgow	LGOV
<u>Walker-Barton private cemetery</u>		Wallerawang	Lithgow	LGOV
<u>Wallerawang A and B Power</u>	Main Steet	Wallerawang	Lithgow	SGOV

<u>Stations chimney stack</u>				
<u>Wallerawang Police Station and Official Residence</u>	17 Tweedie Street	Wallerawang	Lithgow	SGOV
<u>Wallerawang Railway Precinct</u>	Main Street	Wallerawang	Lithgow	SGOV
<u>Wallerawang Schoolhouse</u>		Wallerawang	Lithgow	SGOV
<u>Wallerawang, Cox's River Underbridge</u>	169.593km, Main Western Railway Line	Wallerawang	Lithgow	SGOV
<u>West Fund: King's Chinese Restaurant</u>	Railway Parade	Lithgow	Lithgow	LGOV
<u>Willowvale</u>	Portland Road	Wallerawang	Lithgow	LGOV
<u>Wolgan Valley Railway</u>	Main West Line	Newnes Junction	Lithgow	LGOV
<u>Wolgan Valley Station</u>	Wolgan Road	Wallerawang	Lithgow	LGOV
<u>Zig Zag Brewery (former)</u>	Brewery Lane	Lithgow	Lithgow	LGOV

There was a total of 183 records matching your search criteria.

Key:

LGA = Local Government Area

GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study,

LGOV = Local Government, SGOV = State Government Agency.

Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

Lithgow LEP 2014 search

Locality	Item name	Address	Property Description	Significance	Item no
Lithgow - South Bowenfels	MckKanes Falls Bridge	McKanes Falls Road	NA	State	A077
Lithgow - South Bowenfels	Gonna- Do	29 McKanes Falls Road and Lithgow Road	Lot 1, DP 87543	Local	I050

Search Results

Search criteria
Lithgow LGA

No results found.

Enter at least one search criterion.

[Search Hints](#)

<input type="button" value="Search"/> <input type="button" value="Reset form"/>	
Place name	<input type="text"/>
Street name	<input type="text"/>
Town or suburb	State --All-- ▾
Country	<input type="text"/>

Advanced search options

List	Commonwealth Heritage List ▾	
<i>Different lists will provide different status and class options</i>		
Local Government Area	Lithgow	Place ID number <input type="text"/>
Legal status	--All-- ▾	Class --All-- ▾
Keyword Search	<input type="text"/>	
<input checked="" type="checkbox"/> Description	<input checked="" type="checkbox"/> Statement of Significance	<input checked="" type="checkbox"/> Place history
Latitude/Longitude		
N Latitude 1 Longitude 1 <input type="text"/> S Longitude 2 W <input type="text"/> E Latitude 2 <input type="text"/> E E <input type="text"/> S S		
<input type="radio"/> Wholly within region <input checked="" type="radio"/> Wholly or partially within region		
<i>Longitude coordinates should be entered as ddd.mm.ss</i>		
<i>Latitude coordinates should be entered as dd.mm.ss</i>		
Map Ref No	<input type="text"/>	
<i>1:100,000 eg 2357</i> <i>1:250,000 eg SF-50-01</i>		

Search Hints

- Not all fields need to be filled in. The fewer you fill in the more results you will get.
- If you cannot find a place, check spelling and try alternative names. Reduce the number of words that you include and use fewer fields.
- The Local Government field used on its own will provide a comprehensive list of places in an area.

Report Produced: Thu Jun 6 11:53:26 2019

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Search Results

Search criteria
Lithgow LGA

2 results found.

Former Commonwealth Small Arms Factory Lithgow Methven St	Lithgow, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
The Greater Blue Mountains Area - Additional Values Great Western Hwy	Katoomba, NSW, Australia	(Nominated place) National Heritage List

Report Produced: Tue May 21 15:44:13 2019



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Customer feedback
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October 2019