BRUXNER HIGHWAY AT TABULAM

Building of new bridge over the Clarence River and removal of existing timber truss bridge

Review of environmental factors

FEBRUARY 2015

RMS 15.049
ISBN: 978-1-925217-45-2

Prepared by GHD Pty Ltd (GHD)

This report: has been prepared by GHD for Roads and Maritime Services and *may only be used and relied on by Roads and Maritime Services for the purpose agreed between GHD and the Roads and Maritime Services as set out in section 1.2 of this report.*

GHD otherwise disclaims responsibility to any person other than Roads and Maritime Services arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD 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.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Executive summary

The proposal

Roads and Maritime proposes to replace the Tabulam Bridge situated on the Bruxner Highway between Tenterfield and Casino in the Northern Rivers region of NSW (the proposal). Located on the Clarence River, its position in the northern catchment of one of Australia's largest rivers affords it geographical and environmental significance.

The proposal involves the construction of a new bridge over the Clarence River and the removal of the existing bridge. The removal of the existing heritage listed timber truss bridge is consistent with the Roads and Maritime Timber Truss Bridge Conservation Strategy, endorsed by the Heritage Council in 2012. The new bridge would extend from the most western overflow structure, west of the Clarence River, before crossing the river approximately 50 metres at the widest point downstream and on a slight angle to the existing bridge, converging and re-joining the highway at the Clarence Street intersection. The proposal includes:

- Construction of a new concrete super-T girder bridge over the Clarence River approximately 288 metres long, 13 metres wide and provision of a 2.5 metre wide shared path for pedestrians and cyclists.
- Construction of an additional 45 metre long bridge to the south of the existing Clarence River Overflow Bridge No.1.
- Alterations to the alignment of the road approaches to the east and west to link with the new bridge.
- Creation of a new intersection with Clarence River Road adjacent to the Western approach.
- Reconstruction of the highway intersections with Clarence Street and Tabulam Road to the east of the Clarence River.

Both existing overflow bridges would be retained on the western approach, one remaining in use on the Bruxner Highway and the second retained for bat habitat.

Project objectives

The objectives of the proposal are to:

- Enhance road safety for all road users over the length of the proposal including improving safety for pedestrians and cyclists.
- Investigate and determine the appropriate treatment for pedestrians and cyclists on the new structure.
- Remove the existing bridge.
- Improve traffic efficiency.
- Improve road transport productivity and reliability.
- Support regional and local economic development including improved opportunity for economic and tourism development for Tabulam.
- Minimise impacts on the natural, social and built environment.
- Coordinate construction traffic to minimise its impact and damage to the existing structure and to make allowance for potential maintenance works that may need to be conducted during the course of this proposal.
- Consider constructability impacts.
- Consider work health and safety impacts of the proposal.

Need for the proposal

The existing bridge over the Clarence River at Tabulam, built in 1903, is costly to maintain and is a major capacity constraint on the Bruxner Highway. The length and width of the bridge allows only a single lane of traffic and thus requires traffic to stop and give way to oncoming vehicles. Additionally the bridge does not have any dedicated pedestrian or cyclist facilities forcing vulnerable road users to share the road with heavy vehicles.

The annual average maintenance expenditure for the bridge over the last 10 years is about $700,000. Future maintenance costs would increase significantly as the existing critical timber elements, such as trestles, approach the end of their life.

Options considered

Options considered for the proposal included the 'do nothing' option, upgrading of the existing bridge and a number of variations for a new bridge. Consideration of options included assessment of social, environmental and economic factors as well as stakeholder input. The proposal described in this REF is the preferred option to meet project objectives and deliver an upgraded road network for NSW.

Statutory and planning framework

Clause 94 of *State Environmental Planning Policy (Infrastructure) 2007* (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 of Local Government.

As the proposal is for the purpose of a road and is to be carried out by Roads and Maritime, development consent under Part 4 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) is not required. The proposal will instead be assessed under Part 5 of the EP&A Act. This review of environmental factors (REF) has been prepared as part of that assessment process.

Following public exhibition of this REF and consideration of community comments, Roads and Maritime will make a determination as to whether to proceed in compliance with the environmental management measures identified in this REF and any additional management measures that may be identified following consideration of community comment.

As the existing bridge is listed on the NSW State Heritage Register, no action in respect of the physical removal of the existing bridge will be made until the bridge has been removed from the State Heritage Register in accordance with the *Heritage Act* 1977 and the Roads and Maritime Timber Truss Bridge Conservation Strategy which has been endorsed by the NSW Heritage Council. This strategy is available on the Roads and Maritime website.

Community and stakeholder consultation

Consultation with potentially affected property owners, relevant government agencies and other stakeholders has been carried out since August 2013 and is ongoing. Information about the proposal has also been placed on the Roads and Maritime website.

Roads and Maritime has extensively consulted with Kyogle and Tenterfield Shire Councils in accordance with the requirements of ISEPP.

Roads and Maritime will continue to consult with the community and stakeholders throughout development of the proposal.

Environmental impacts

The key potential adverse effects of the proposal, with the exception of the removal of the existing bridge, would generally be short term and localised during the construction period and would include:

- Construction phase traffic impacts, due to bridge restrictions and increased heavy vehicle movements on the existing road network
- Amenity impacts, such as noise, traffic, visual, dust, during construction to properties adjacent to the proposal site
- Removal of the Tabulam Bridge will have a detrimental impact on the heritage significance of the item
- Minor vegetation removal
- Noise, vibration and other amenity impacts for microbats
- Aquatic habitat disturbance and water quality impacts
- Minor changes to the flooding regime.

Adverse environmental effects would be adequately minimised, managed and mitigated through the implementation of the safeguards outlined in this REF. These would include a construction environmental management plan and associated sub-plans.

The loss of heritage due to the removal of the existing bridge would be mitigated by incorporating elements of the existing heritage bridge and its location on the eastern bank into the design of the new bridge. This includes reusing elements of the existing timber trusses and marking the alignment of the existing heritage bridge.

The beneficial effects of the proposal would include:

- Reduced travel times and congestion
- Improved road safety for all road users
- Improved provision of pedestrian and cyclist facilities
- Improved transport efficiency
- Savings in bridge maintenance expenditure.

Justification and conclusion

The proposed new bridge at Tabulam is considered to be consistent with national, state and local strategies and plans as it would lead to improved efficiency and safety of the local road network.

While there would be some environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects are considered to outweigh the adverse impacts and risks associated with the proposal.

The proposal is subject to assessment under Part 5 of the EP&A Act. This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be published and approval to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The proposal is unlikely to significantly affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation* Act 1995 or Fisheries Management Act 1994 and therefore a species impact statement is not required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance. Therefore a referral to the Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999* is not required.

Display of the review of environmental factors

This REF is on display for comment and you can access the documents in the following ways:

Internet

The documents will be available as pdf files on the Roads and Maritime website at www.rms.nsw.gov.au/projects/northern-nsw/tabulam-bridge/.

Display

The REF documents can be viewed at the following locations:

- Tabulam Post Office
- Tenterfield Shire Council
- Kyogle Council
- Motor Registries at Tenterfield and Casino
- Roads and Maritime website.

The REF documents are available in hard copy by contacting the project team on 1800 810 680.

How can I make a submission?

To make a submission on the proposal, please send your written comments to:

New Tabulam Bridge Project Team

GHD, Reply Paid 85012, Sydney NSW 2000

Or email community.input@ghd.com

Submissions must be received by Friday 27 March 2015.

Privacy information

All information included in submissions is collected for the sole purpose of assisting in the assessment of this proposal. The information may be used during the environmental impact assessment process by relevant Roads and Maritime staff and its contractors.

Where the respondent indicates at the time of supply of information that their submission should be kept confidential, Roads and Maritime will attempt to keep it confidential. However there may be legislative or legal justification for the release of the information, for example under the *Government Information (Public Access) Act 2009* or under subpoena or statutory instrument.

The supply of this information is voluntary. Each respondent has free access at all times to the information provided by that respondent but not to any identifying information provided by other respondents if a respondent has indicated that the representation should be kept confidential.

Any respondent may make a correction to the information that they have provided by writing to the same address the submission was sent.

The information will be held by the Roads and Maritime Services, Northern Region Office, 76 Victoria Street, Grafton NSW 2460.

What happens next?

Following the submissions period, Roads and Maritime will collate submissions. Acknowledgement letters will be sent to each respondent. The details of submission authors will be retained and authors will be subsequently advised when proposal information is released.

After consideration of community comments, Roads and Maritime will determine whether the proposal should proceed as proposed, or whether any alterations to the proposal are necessary. The community will be kept informed regarding this Roads and Maritime determination.

Roads and Maritime will then proceed with final design and call for tenders for construction of the proposal.

If you have any queries about the proposal, please contact the project team on 1800 810 680.

Contents

Appendices

1. Introduction

1.1 Proposal identification

Roads and Maritime propose to replace the existing bridge over the Clarence River at Tabulam (Tabulam bridge) on the Bruxner Highway.

1.1.1 Proposal location

Originally occupied by the Bundjalung people, Tabulam and the surrounding land was first settled by Europeans in 1839. A postal service from Grafton was established in 1848 and eventually a courthouse and post office opened in 1849. The river crossing remained a problem with many sheep-droving teams stranded when the river flooded. The existing bridge was built in 1903, though a punt had aided river crossings as early as 1863. As such, the heritage of the town is an important consideration when planning for a new bridge over the Clarence River.

The proposal location is shown in Figure 1-1.

1.2 Proposal overview

Roads and Maritime proposes to replace the Tabulam bridge situated on the Bruxner Highway between Tenterfield and Casino in the Northern Rivers region of NSW (the proposal). Located on the Clarence River, its position in the northern catchment of one of Australia's largest rivers affords it geographical and environmental significance.

The proposal involves the construction of a new bridge over the Clarence River and the removal of the existing bridge. The removal of the existing heritage listed timber truss bridge is consistent with the Roads and Maritime Timber Truss Bridge Conservation Strategy, endorsed by the Heritage Council in 2012. The new bridge would extend from the most western overflow structure, west of the Clarence River, before crossing the river approximately 50 metres at the widest point downstream and on a slight angle to the existing bridge, converging and re-joining the highway at the Clarence Street intersection. The proposal includes:

- Construction of a new concrete super-T girder bridge over the Clarence River approximately 288 metres long, 13 metres wide and provision of a 2.5 metre wide shared path for pedestrians and cyclists
- Construction of an additional 45 metre long bridge to the south of the existing Clarence River Overflow Bridge No.1
- Alterations to the alignment of the road approaches to the east and west to link with the new bridge
- Creation of a new intersection with Clarence River Road adjacent to the Western approach
- Reconstruction of the highway intersections with Clarence Street and Tabulam Road to the east of the Clarence River.

Both existing overflow bridges would be retained on the western approach, one remaining in use on the Bruxner Highway and the second retained for bat habitat.

Key proposal details are outlined in Table 1-1.

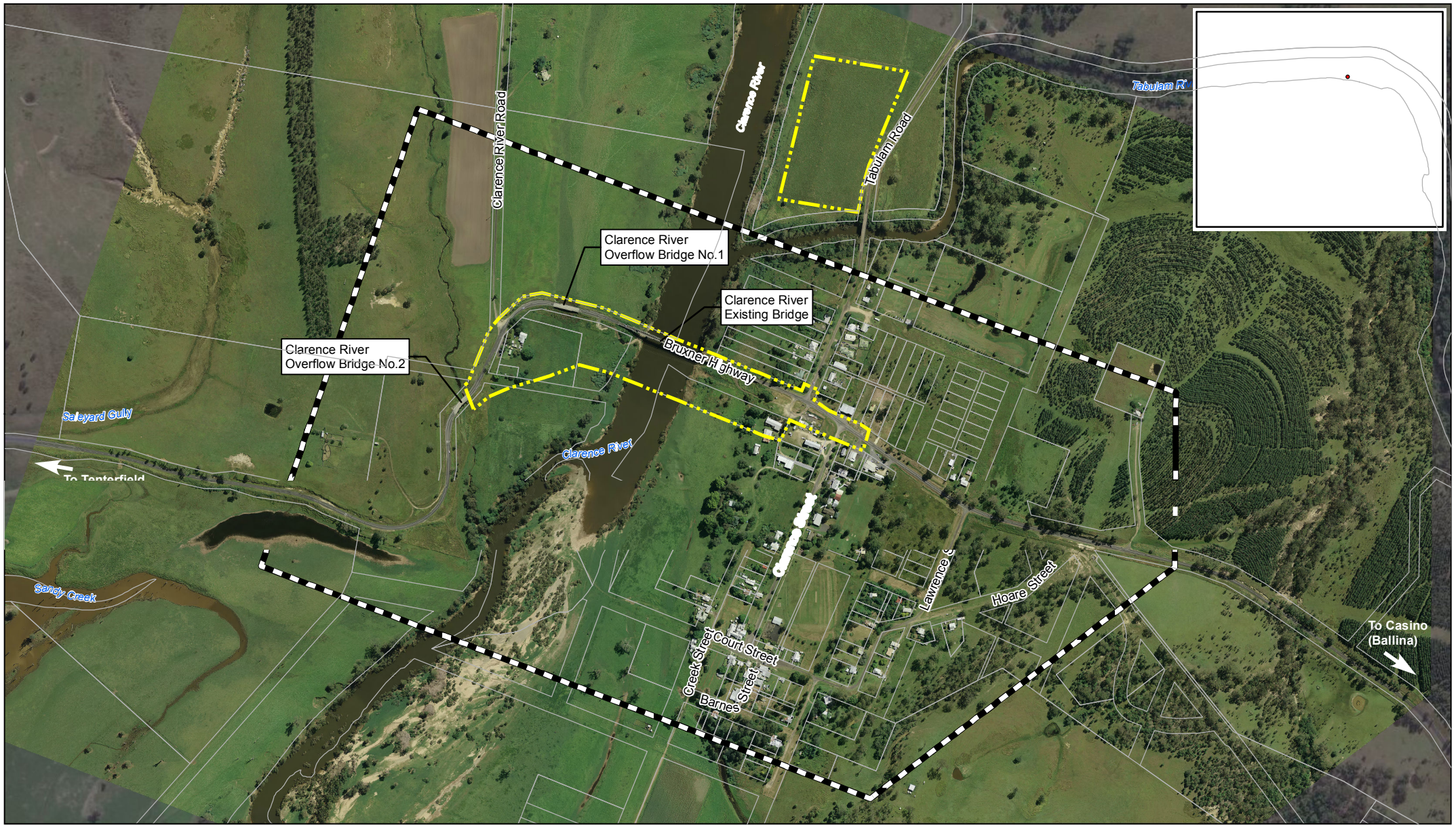
Table 1-1 Project details

Project:	Tabulam new bridge
Region:	Roads and Maritime, Northern Region
Road name/number:	Bruxner Highway, HW16
Project location:	Tabulam NSW
Project length:	820 metres
Council area(s):	Kyogle Council Tenterfield Shire Council
Length of new bridge:	280 metres
Length of new road:	495 metres

The proposal will also involve the removal of a state significant timber truss bridge. As the existing bridge is listed on the NSW State Heritage Register, no action in respect of the physical removal of the existing bridge will be made until the bridge has been removed from the State Heritage Register in accordance with the *Heritage Act* 1977 and the RMS Timber Truss Bridge Strategy which has been endorsed by the NSW Heritage Council. This strategy is available on the RMS website.

Tabulam bridge is primarily a timber structure with an overall length of about 300 metres, comprising 13 timber approach spans and five composite timber/steel De Burgh truss central spans. The overall width between kerbs is 4.6 metres, accommodating single lane traffic only. The main spans are supported by concrete piers located in the river, whilst the approaches are supported by timber trestles.

Extensive maintenance work has been conducted over recent years to ensure the bridge remains safe for legally loaded vehicles. However, the bridge presents significant transport limitations both now and into the future and also requires a disproportionate share of Roads and Maritime bridge maintenance funding.



Paper Size A4

0 35 70 140 210 280

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Study area
- Proposal site
- Cadastre

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Proposal location

Figure 1-1

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF001_ProposalLocation_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay

1.2.1 Study area

For the purposes of this assessment, the following definitions are employed:

- The 'site' refers to the area that would be directly impacted by the proposal.
- The 'study area' encompasses the site and the area that may be indirectly impacted by the proposal. The study area differs for each issue considered and is defined in the relevant specialist reports. For example, the study area is the area surveyed by the ecologists for the flora and fauna assessment. While the study area for the hydraulic assessment is the Clarence River catchment. The study area for the proposal design, announced in August 2013, is shown in Figure 1-1.
- The 'locality' encompasses the village of Tabulam, which is the area surrounding the site.

The proposal site, which is the area subject to this REF, is defined in Figure 1-1 and includes the footprint of the new bridge, the extent of the works required to remove the existing bridge, and all ancillary facilities including the concrete batching plant, compound site and working platforms for cranes and other machinery.

1.3 Purpose of the report

This REF has been prepared by GHD Pty Ltd (GHD) on behalf of Roads and Maritime Northern Region. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the 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 protective measures to be implemented.

The description of the proposed works and associated environmental impacts has been undertaken in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the Threatened Species Conservation Act 1995 (TSC Act), the Fisheries Management Act 1994 (FM Act), and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). In doing so, the REF helps to fulfil the requirements of section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF are to 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 Part 5.1 of the EP&A Act
- The significance of any impact on threatened species, as defined by the TSC Act and/or FM Act, pursuant to section 5A of the EP&A Act and therefore the requirement for a species impact statement
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment 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

2.1 Strategic need for the proposal

The existing bridge over the Clarence River at Tabulam, built in 1903, is costly to maintain and is a major capacity constraint on the Bruxner Highway.

The route on which the Tabulam bridge is located is required to meet emerging regulatory limits well in excess of the T44 Standard, which is the design standard for bridges carrying a 42.5 tonne semi-trailer or equivalent. The bridge cannot be upgraded to achieve the required operational requirements and therefore needs to be replaced with a modern bridge in order to meet capacity requirements.

The length and width of the existing bridge allows only a single lane of traffic and thus requires traffic to stop and give way to oncoming vehicles. Additionally the bridge does not have any dedicated pedestrian or cyclist facilities forcing vulnerable road users to share the road with heavy vehicles.

The annual average maintenance expenditure for the bridge over the last 10 years is about $700,000. Future maintenance costs would increase significantly as the existing critical timber elements, such as trestles, approach the end of their life.

2.2 Strategic transport planning framework

2.2.1 NSW Long Term Transport Master Plan

The Long Term Transport Master Plan was released by Transport for NSW in December 2012. It identifies the key transport challenges for NSW over the next 20 years to support NSW's development and outlines specific actions to address these challenges. Though not addressed specifically, the proposal to replace the Tabulam bridge supports targeted measures to reduce stoppages, better use existing road capacity and improve road safety.

The plan makes reference to the Bridges for the Bush program, which aims to improve regional connectivity and freight efficiency through the replacement of heritage timber truss bridges with modern structures allowing for higher mass limit (HML) vehicles. The plan recognises the replacement of the bridge over the Clarence River at Tabulam as an important activity for realising its objectives. Further detail on the Bridges for the Bush program is outlined in Section 2.2.6.

2.2.2 State Plan - NSW 2021

NSW 2021: A plan to make NSW number one (NSW Government, 2011) is a 10 year plan with goals and targets to rebuild the economy, provide quality services, renovate infrastructure, restore government accountability, and strengthen the local environment and communities. It replaces the State Plan as the NSW Government's strategic business plan, setting priorities for action and guiding resource allocation. NSW 2021 lists a number of actions to achieve these goals and targets including:

- Reduce travel time
- Improve road safety
- Protect our natural environment.

The proposal would assist in achieving the goal of reducing travel times by increasing the capacity of the bridge, thereby improving safety and reducing stoppages. Easing transport congestion and reducing travel times is also one of the priority actions in NSW 2021 for improving the efficiency of the State's road network.

The NSW 2021 strategy includes the Northern Rivers Regional Action Plan (NRRAP) that aims to deliver the growth of a strong and diversified regional economy, which is carefully managed to ensure the protection of the region's natural features. The NSW Government in partnership with the community has a vision for the region that is:

- Sustainably managed, through the protection of natural resources and the local environment, and recognised for biodiversity, tourism and recreation
- Socially inclusive, providing appropriate support for all community members by investing in quality health and community services
- Economically strong, by investing in infrastructure, education and training to drive job growth supporting knowledge-based and clean, green industries.

NRRAP acknowledges the Bridges for the Bush program and the need for the replacement of the bridge over the Clarence River at Tabulam to provide for HML semi-trailers. The proposal to replace the Tabulam bridge is therefore consistent with NSW 2021 strategy.

2.2.3 NSW State Infrastructure Strategy

The *NSW Government State Infrastructure Strategy*, released by the NSW Department of Premier and Cabinet in December 2012, assists in understanding NSW infrastructure needs for the next 20 years, particularly in light of key drivers for infrastructure demand in NSW. The strategy recognises that major arterial roads across the State road network will require improvement and that there is value in addressing regional connectivity and freight efficiency in the short term.

In this regard, the strategy references the Bridges for the Bush program, which aims to improve regional connectivity and freight efficiency through the replacement of heritage timber truss bridges with modern structures allowing for HML vehicles.

Though the proposal is not specifically listed in the strategy, it is consistent with this strategy.

2.2.4 Ballina to Tenterfield Corridor Strategy

The *Ballina to Tenterfield Corridor Strategy* (RTA 2009) provides an overall view of the road transport system from Ballina on the NSW Far North Coast to Tenterfield in the Northern Tablelands. The Bruxner Highway dominates this corridor with the strategy focusing on the 183 kilometre section of this road that carries the majority of traffic, between the Pacific Highway and Tenterfield.

The strategy nominates, whilst recognising its heritage importance, the existing bridge over the Clarence River at Tabulam is a major constraint on the western section of the route and presents very challenging environmental, structural and maintenance issues for Roads and Maritime.

The strategy states that the existing bridge is a physical restriction on access for higher productivity vehicles and acknowledges that managing the heritage of the bridge while catering for any growing and changing traffic demands is a challenge.

Short and long term priorities for the bridge include enhanced road safety, increased freight efficiency, maintenance and improvement of existing road asset and management of the impacts of road traffic in the local environment.

2.2.5 Timber Truss Bridge Conservation Strategy

The *Timber Truss Bridge Conservation Bridge Strategy* was published 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, carried out in consultation with the Heritage Council of NSW, aims to establish a balance between infrastructure provision and heritage conservation.

The strategy explains that timber truss bridges are expensive to maintain in terms of planning, approvals, materials, maintenance frequency and skilled resources. The timber truss bridge stock comprise one per cent of Roads and Maritime's bridge inventory but require around 20 per cent of the bridge maintenance budget. This current level of expenditure for timber truss bridges is compromising bridge maintenance and replacement needs across the remainder of the State's bridge stock.

The strategy also recognises that the road network plays a key role in the efficient transport of freight. Timber truss bridges are a major limitation in allowing for more efficient road freight vehicles such as those carrying HML. Furthermore, there is a risk of damage to these bridges due to their intrinsic design that features a structural support frame above the bridge deck. They are generally narrow single lane bridges making their trusses even more vulnerable to damage from trucks.

The bridge over the Clarence River at Tabulam was assessed as part of the strategy. The strategy found that the existing bridge is on a major State highway and cannot be upgraded to meet future operational requirements, such as providing for HML vehicles. The existing structure is currently the only impediment to opening the Bruxner Highway to HML semi-trailers between Casino and Tenterfield.

The strategy also found that any form of retention of the bridge would present continuing conservation, operational and financial challenges. The report noted that its conservation would not substantially strengthen the representative sample of timber bridges in NSW and would come at a high cost to government.

The strategy, states that specific commitments require an application to remove to be accompanied by a Statement of Heritage Impact (SOHI) in which the reasons for removal and to what extent the bridge can no longer be used in its existing form, are set out. Other commitments made by the Roads and Maritime through the strategy include reporting, mitigation and interpretation measures. A number of the general mitigation measures incorporated into the strategy are applicable to the proposal. Roads and Maritime also proposes a specific interpretation strategy to mitigate the impacts of removal of Tabulam bridge.

The specific mitigation/interpretation measures proposed to be implemented as part of the Tabulam bridge proposal are as follows:

- Inclusion of Tabulam bridge in the proposed Roads and Maritime timber truss bridge publication
- Inclusion of Tabulam bridge in the proposed travelling display / exhibition in conjunction with the Powerhouse Museum Archival recording of the bridge prior to removal (July 2013)
- Retention of sections of truss as a "gateway" at either end of the bridge
- A small park or rest area is proposed
- Landscape elements to mark the site /alignment of the bridge on the western bank (at the site of the present western abutment at Bottle Creek Road)
- Reflecting features of the existing heritage bridge in the new bridge design
- Retention and conservation (eg in local or regional history museums) of other elements of fabric salvaged from the bridge
- Re-use of salvaged bridge components for maintenance of other historic timber truss bridges.

2.2.6 Bridges for the Bush

In October 2012, the NSW Government committed to improving road freight productivity by replacing or upgrading bridges over the next five years at 17 key locations in regional NSW.

One of the priority programs to help manage ageing assets and provide the biggest benefit to freight productivity includes the replacement of six heritage timber truss bridges to modern standards.

The existing bridge over the Clarence River at Tabulam was identified to be replaced with a new structure and the existing structure removed.

2.2.7 Higher mass limit vehicles

In 2006, the Council of Australian Governments agreed to implement HML for heavy vehicles with road friendly suspension. A commitment was also made to examine and, if necessary, upgrade sections of highway, bridges and appropriate arterial and local roads. Different levels of HML access are permitted on the road network in NSW according to vehicle type. It is expected that upon completion of the new bridge the Bruxner Highway between Casino and Tenterfield would be open to HML semi-trailers.

HML allow semi-trailer operators to increase their total mass from 42.5 tonnes to 45.5 tonnes. In order to operate a HML vehicle in NSW, the operator of the vehicle must follow strict management measures. Operators must enrol in the Intelligent Access Program which enables Roads and Maritime to track the locations and speeds of these vehicles to ensure compliance. Trucks must also have road friendly suspension, which reduces damage to the road pavement.

2.3 Existing road and infrastructure

2.3.1 Road reserve

The existing road reserve width along the length of the Bruxner Highway within the study area is variable. Typically the road reserve width between property boundaries is in the order of 30 metres west of the Clarence River, approximately 60 metres immediately east of Clarence River and approximately 40 metres through the Tabulam village.

2.3.2 Carriageway configuration

Existing travel lanes on the Bruxner Highway consist of two 3.5 metre wide sealed lanes with little or no sealed shoulder. At the approaches to the existing Tabulam Bridge the carriageway tapers to a narrower width of 4.6 metres, which is the width between kerbs on the bridge.

The existing bridge is a single lane configuration with the flow of traffic on the bridge controlled through a give way sign at the western end.

2.3.3 Horizontal and vertical alignment

The horizontal alignment west of the Clarence River is a combination of tight bends and less than standard reverse curves. The alignment east of the Clarence River comprises large radius bends and straights. At the western end of the bridge the grade of the existing road drops down to the Clarence River Overflow Bridge No. 1. The sign posted speed limit through Tabulam village is 50 kilometres per hour (km/h).

2.3.4 Intersections and private accesses

There are a number of private properties fronting the Bruxner Highway in the study area. These properties have direct access to the highway.

The major intersections east to west are Lawrence Street, Clarence Street and Tabulam Road east of the bridge, and Clarence River Road west of the bridge.

2.3.5 Structures

Bridge over Clarence River at Tabulam

The existing bridge over the Clarence River at Tabulam is primarily a timber structure and has an overall length of about 300 metres, comprising 13 timber approach spans and five composite timber/steel De Burgh truss central spans. The overall width between kerbs is 4.6 metres, accommodating single lane traffic only. The main spans are supported by concrete piers located in the river, whilst the approaches are supported by timber trestles. The existing bridge deck is above the approximate one in 100 year flood level. The bridge is shown in Figure 2-1.

Figure 2-1 Existing bridge over the Clarence River at Tabulam – view east

Clarence River Overflow Bridges No. 1 and No. 2

There are two concrete overflow bridges on the western side of the bridge over the Clarence River at Tabulam. These bridges span the overflow channels of the greater Clarence River floodplain. The lane configuration of the two bridges consists of two 3.5 metre lanes and one metre shoulders. The bridges were open to traffic in 2001. The bridge deck and approach levels for both overflow bridges are below the one in 100 year flood level and thus provide less flood immunity than the existing bridge over the Clarence River. These bridges are shown in Figure 2-2.

Clarence River Overflow Bridge No. 1 – view west

Clarence River Overflow Bridge No. 2 – view west

Figure 2-2 Existing Clarence River overflow bridges

2.4 Proposal objectives

The objectives of the proposal are to:

- Enhance road safety for all road users over the length of the proposal including improving safety for pedestrians and cyclists
- Investigate and determine the appropriate treatment for pedestrians and cyclists on the new structure
- Remove the existing bridge
- Improve traffic efficiency
- Improve road transport productivity and reliability
- Support regional and local economic development including improved opportunity for economic and tourism development for Tabulam
- Minimise impacts on the natural, social and built environment
- Coordinate construction traffic to minimise its impact and damage to the existing structure and to make allowance for potential maintenance works that may need to be conducted during the course of this proposal
- Consider constructability impacts
- Consider work health and safety impacts of the proposal.

2.5 Alternatives and options considered

This section of the REF describes the various alternatives and options considered as part of the proposal development process and explain how the preferred option was identified. The preferred option is the subject of assessment in this REF. Further information on the route development and selection phase of the proposal is available from the *New Tabulam Bridge for Bruxner Highway Preferred Route Option Report* (Roads and Maritime, May 2014).

The alternatives and options considered as part of this REF include:

- Do nothing
- Upgrade existing bridge
- Build new bridge and remove the existing bridge.

2.5.1 Identified options

Do nothing

The 'do nothing' option was considered and discounted. The implications of not upgrading the existing bridge or constructing a new bridge are three fold – reduced safety, reduced transport productivity and ongoing maintenance costs.

The existing bridge is a single lane structure with a width of 4.6 metres between kerbs. The existing trusses show signs of being struck by heavy vehicles and crash data indicates collisions have occurred on the bridge in recent years between vehicles attempting to cross in opposite directions at the same time. In addition, the bridge does not provide a dedicated shared path to enable safe crossing for pedestrians and cyclists who cross the Clarence River in Tabulam.

The annual average maintenance expenditure for the bridge over the last 10 years is about $700,000. Future maintenance costs would be higher due to critical elements which will need replacement. If funding were reduced, load limits would be placed on the bridge, therefore further impacting east-west freight movement throughout the region. The existing bridge is a major impediment to allowing more efficient semi-trailers to use the Bruxner Highway between Casino and Tenterfield. This has a long term impact on transport productivity and efficiency through this region.

Carrying out necessary bridge maintenance often results in the bridge being closed during the day for extended periods, inconveniencing local and through traffic, in particular heavy vehicles. Repeated disruptions can cause a significant reduction in transport efficiency.

Upgrade existing bridge

Due to reduced safety, reduced transport productivity and the ongoing maintenance costs of the existing bridge, an option of upgrading the existing bridge was considered.

As previously stated, the bridge over the Clarence River at Tabulam was assessed as part of the *Timber Truss Bridge Conservation Strategy*. The strategy found that the existing bridge is on a major State highway and cannot be upgraded to meet future operational requirements, such as providing for HML vehicles. The existing structure is currently the only impediment to opening the Bruxner Highway to HML semi-trailers between Casino and Tenterfield.

Construct new bridge

The option of building a new bridge involved a route option development process and identifying the preferred option, which included several steps:

- Review of existing data including reports, maps and other available information
- Site familiarisation and site visits including road, bridge and study area inspection
- Preliminary investigations and assessments to determine the opportunities and constraints for route options
- Development of preliminary route options taking into consideration road geometry and constraints and opportunities. Once route corridor options were developed, preliminary engineering alignments were fitted to these corridors based on current design standards and performance requirements
- Shortlisting workshop to review and assess preliminary route options and establish a shortlist of route options worthy of further development and investigation
- Route Options Development Report (2013) and display
- Identification and display of the preferred route.

2.5.2 Route option development process

Community involvement in the route development phase has taken place via a number of avenues since the start of the project. This has included various mail outs to the community, drop-in sessions to supplement public displays, landowner meetings and the provision of feedback forms.

A wide range of preliminary route options were developed within the study area, comprising of eleven options located within a few hundred metres both upstream and downstream of the existing bridge. A shortlisting workshop was held in August 2013 to evaluate 11 preliminary route options against the proposal objectives and establish a shortlist of route options for further development and investigation. At the conclusion of the preliminary route option assessment process the following route options were shortlisted for public display and further development and investigation:

- Option A - starts at the existing highway on the western approach, crossing the river upstream and parallel to the existing bridge, then converges and re-joins the highway at the Clarence Street intersection. This option uses only one of the existing overflow bridges on the western side of the river
- Option B - starts at the highway on the western approach, crossing the river upstream and parallel (curved alignment) to the existing bridge, connecting to the existing highway at the Clarence Street intersection. This option utilises both overflow bridges on the western side of the river
- Option C - starts at the existing highway on the western approach, crossing the river downstream and parallel to the existing bridge, then converges and rejoins the highway at the Clarence Street intersection. This option uses only one of the existing overflow bridges on the western side of the river
- Option D – starts at the existing highway at the most western overflow structure, crossing the river downstream on a slight angle to the existing bridge, then converges and re-joins the highway at the Clarence Street intersection. This option uses only one of the existing overflow bridges on the western side of the river.

A series of technical investigations and workshops followed to identify a preferred route option, with Option D identified as the preferred route option for the Tabulam bridge proposal. Option D was selected as the preferred route based on the following factors:

- Have little or no impact on flora and fauna
- Provide improved access to Clarence River Road
- Result in a better and safer road alignment outcome over other options for a similar cost
- Provide a 1 in 100 year flood immunity for the Clarence River Overflow No. 1 as well as the major bridge over the Clarence River
- Be located away from the existing bridge with minimal traffic impacts during construction
- Not impact on known Aboriginal cultural heritage
- Minimise private land acquisition
- Have least impact on public utilities
- Provide the best value for money solution.

Further details on the route selection process can be found in the *Preferred Route Option Report* (2014) on the projects website.

2.5.3 Preferred option

Construction of a new bridge

The replacement of the existing timber bridge with a modern structure at Tabulam allows HML semi-trailer access along the Bruxner Highway between Tenterfield and Casino.

The preferred option commences on the Bruxner Highway east of the Clarence River Overflow No. 2 Bridge. It crosses the river downstream on a slight angle to the existing bridge and re-joins the highway at the Clarence Street intersection. The preferred option is about 830 metres in total length, with a new 300 metre long bridge over the Clarence River and an additional 45 metre long overflow bridge on the southern side of the existing Clarence River Overflow Bridge No. 1. The existing Overflow Bridge No. 1 is to be retained as part of the proposal. The preferred option is shown in Figure 3-1.

Key benefits of the preferred option (Option D) are as follows:

- Most direct of the shortlisted route options consisting of a new 300 metre long bridge over the Clarence River and an additional overflow bridge on the southern side of the existing Overflow Bridge No. 1
- Commences at the Clarence Street intersection, east of the Clarence River, and connects to the existing Bruxner Highway east of the Overflow Bridge No. 2 structure west of the river
- Does not impact on the existing Overflow Bridge No. 2
- Traverses across the existing preschool site (owned by the Uniting Church), requiring full property acquisition of the site
- Avoids land currently the subject of an Aboriginal land claim on the western bank of the Clarence River
- Provides a new intersection and access point to Clarence River Road
- Reconstruction of the highway intersections with Clarence Street and Tabulam Road
- Provides a pedestrian and cyclist path along the length of the route providing access to and from Tabulam village to the western bank of the Clarence River.

The preferred route would provide decreased travel time and a shorter distance. It provides a more direct east-west route than the existing alignment. Traffic currently traverses a single lane bridge with a give way sign at the western end. The provision of a modern bridge with two travel lanes would eliminate delays.

Provision of an intersection east of the Overflow Bridge No. 2 provides safer access to Clarence River Road.

The provision of footways on the northern side of the new bridge and connection to Tabulam village to the east, and the new intersection to the west, provides safe pedestrian and cyclist connectivity that is currently not available.

The preferred route, being on the south side of the existing bridge, has no impact on known Aboriginal cultural heritage and avoids land currently the subject of an Aboriginal Land Claim adjacent to Overflow Bridge No. 2 on the western bank of the Clarence River.

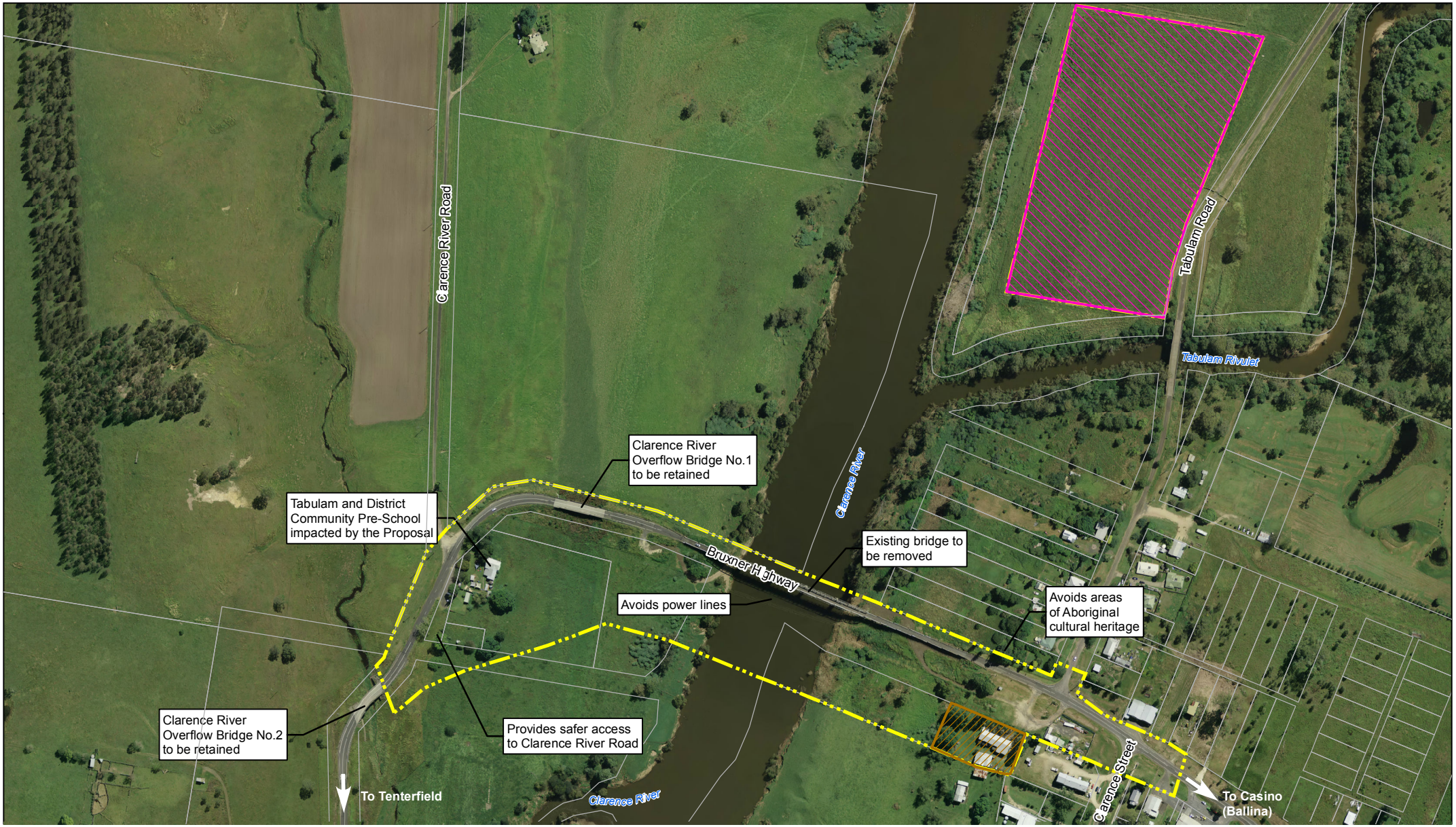
The preferred route does require property acquisition, but minimises the impact on private property where possible. The land on which the existing preschool is located would be acquired as part of the proposal. However the preschool has purchased land within the village of Tabulam and will be relocating in 2016.

The preferred option would include an additional overflow bridge on the southern side of the existing Overflow Bridge No. 1. Overflow Bridge No. 1 is to be retained to prevent impact on microbats that have been recorded in the structure.

Removal of existing bridge

The option of removal of the existing bridge via staged dismantling was identified as the preferred option for removal of the existing heritage bridge based on ongoing maintenance costs, practicality, resources available, safety considerations, potential for damage to the new bridge and environmental impacts.

An alternative option was considered and discounted including collapsing the structure onto the ground. This option would involve the collapsing of the bridge piers using machinery or explosives, leading to the collapse of the bridge into the creek and land below the bridge. This option was considered technically difficult, dangerous and would have a greater environmental impact on water quality and threatened fish habitat.As the existing bridge is listed on the NSW State Heritage Register, no action in respect of the physical removal of the existing bridge will be made until the bridge has been removed from the State Heritage Register in accordance the with the *Heritage Act* 1977 and the RMS Timber Truss Bridge Strategy which has been endorsed by the NSW Heritage Council. This strategy is available on the RMS website.



Paper Size A4

0 15 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Cadastre
- Site compound
- Proposed concrete batch plant *(Batch plant will utilise approximately 1ha. Actual location to be confirmed.)*

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Proposal overview

Figure 2-3

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF003_ProposalOverview_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay

2.6 Design refinements

Following the value management and technical group workshops and selection of the preferred route, consideration was given to a number of bridge construction options. A constructability workshop was held on 20 May 2014. The workshop involved representatives of Roads and Maritime, an experienced construction contractor and the project team.

The workshop included:

- A high-level review of bridge construction options available to allow selection of a shortlist of feasible construction options.
- A strategic review of the three feasible bridge construction options selected to stimulate discussion, and identification of the risks, issues and constraints of each option to be addressed and considered.
- Strategic cost estimates for the short-listed bridge construction options.
- Discussion to assist with the recommendation of a preferred bridge type, noting that the delivery method may be a governing factor in this selection.
- Constructability workshop outcomes.

Due to the overall length of the proposed crossing, multiple bridge types and construction methods were considered. Table 2-1 is a summary of bridge types considered in the briefing paper, along with a simple scoring for comparative purposes (#: Poor; * Average; ^ Good).

Table 2-1 Construction option comparison

Option	Environment & heritage	Geotechnical & foundations	Flooding & hydraulics	Arrangement & urban design	Maintenance & durability	Constructability	Cost
Precast box or arch culverts	#	#	#	#	#	#	#
Timber bridge	#	#	#	#	#	#	#
Precast deck planks	*	#	*	#	^	*	^
Precast super-T	*	*	^	*	^	^	^
Precast I girders or bulb tees	*	*	^	*	^	^	^
Insitu voided slab	*	^	^	*	#	#	#
Steel composite box girders	*	^	^	^	*	^	*
Launched concrete box girders	*	^	^	^	^	^	*
Steel truss	^	*	*	*	#	#	#
Balanced cantilever	^	^	^	^	^	*	#
Steel or concrete arch	^	#	^	*	*	*	#
Cable stay bridge	^	^	^	*	*	*	#
Suspension bridge	^	^	^	*	*	*	#

Smaller span structures such as box culverts, arches and timber bridges generally scored poorly as they are suited to much smaller spans and waterways and do not meet any of the criteria required for the proposed crossing.

The larger span structures such as cable stay bridges, suspension bridges and balanced cantilever structures are suitable when long spans are required over very difficult or inaccessible terrain or waterways, or the cost of pier construction is prohibitive. These options are also very expensive structures and out of character with the location. A post-tensioned insitu voided slab structure was also considered but was discounted given the existing terrain, and lack of available areas for temporary works facilities.

The steel truss span is able to achieve larger spans than the current bridge, thus reducing the number of piers. This option was discounted due to complexities around construction and fabrication. In addition, maintenance or durability requirements are likely to be more difficult to achieve, and it would be an expensive construction option.

Consequently, the following construction options were short listed:

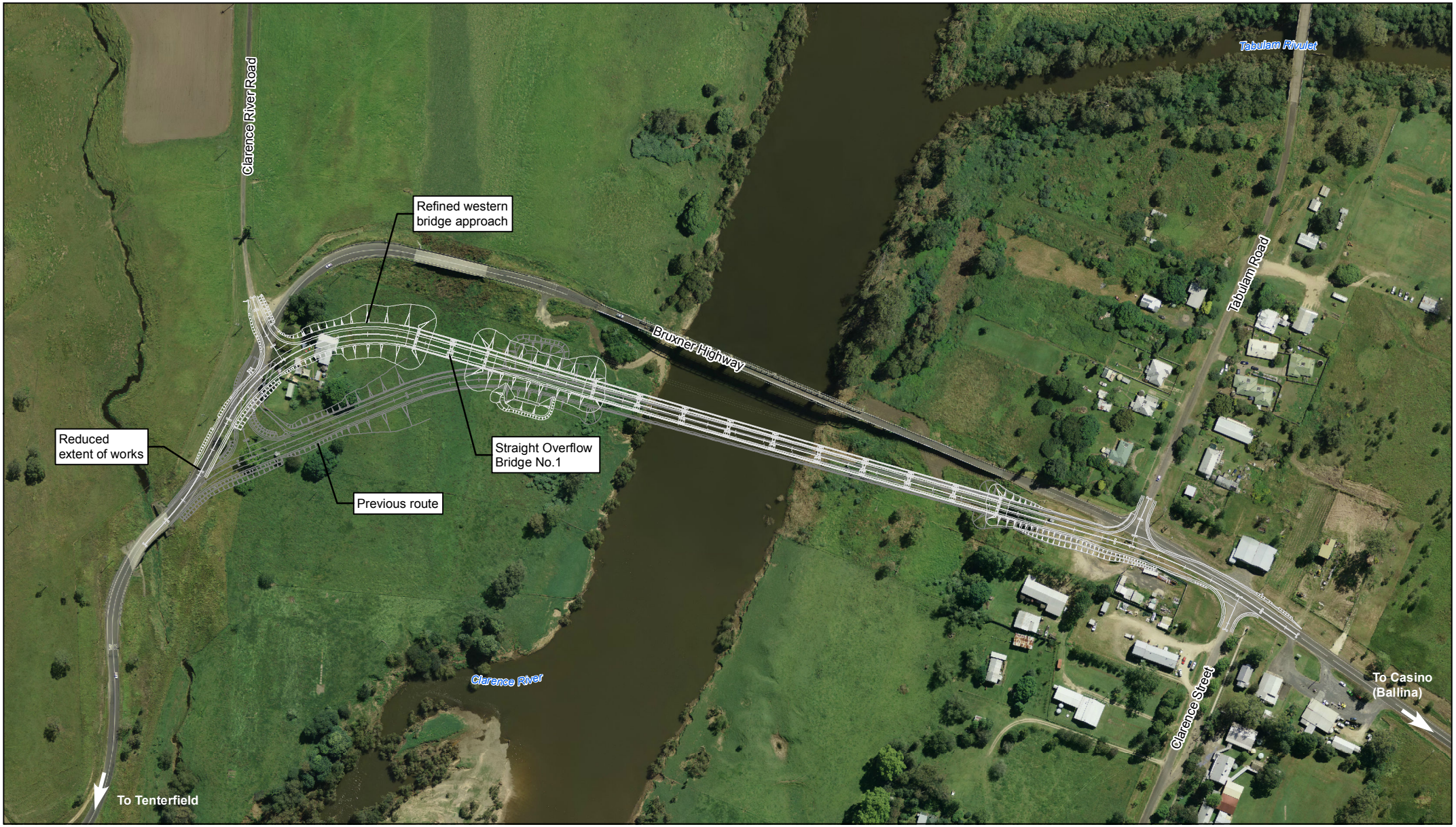
- Option 1: Precast super-T
- Option 2: Launched concrete box girder
- Option 3: Steel composite box.

Following the constructability workshop, it was decided to proceed with the precast super-T girders for the proposal.

Further design refinements were made during a constructability workshop in late 2014. These included refinements to the western approach based on advice received from the existing preschool, which indicated it would be relocating into Tabulam village in 2016. This provided an opportunity for Roads and Maritime to acquire the land and modify the alignment of the western approach so that the proposal was able to avoid Crown land the subject of an Aboriginal land claim.

Given this, the proposed western road approach of the Bruxner Highway has been realigned to traverse across the site where the preschool is currently located, before connecting with the new bridge alignment. The existing Overflow Bridge No. 1 would be retained, with an additional overflow bridge proposed to the south.

As a result of the proposal, some existing utilities in this location would be relocated, along with the boulder with a plaque noting the now demolished house of Harry Lasseter (of Lasseter's Lost Reef fame). Provision of an intersection east of the Overflow Bridge No. 2 would be maintained to provide safer access to Clarence River Road (refer to Figure 2-4).



Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

Refined design

Previous design

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Design refinement

Figure 2-4

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF005_DesignRefinement_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay, gmcdiarmid

3. Description of the proposal

3.1 The proposal

The proposal involves the construction of a new bridge over the Clarence River and the removal of the existing bridge. The new alignment would extend from the most western overflow structure, west of the Clarence River, before crossing the river approximately 50 metres at the widest point downstream and on a slight angle to the existing bridge, converging and re-joining the highway at the Clarence Street intersection. The proposal design is shown in Figure 3-1, and includes:

- Construction of a new concrete super-T girder bridge over the Clarence River approximately 288 metres long, nine metres wide and incorporating a two metre wide path for pedestrians and cyclists Alterations to the alignment of the road approaches to the east and west to link with the new bridge
- Retention of Overflow Bridge No. 1 and No. 2 to manage floodwaters and protect threatened fauna using the bridges as habitat
- Creation of a new intersection with Clarence River Road
- Reconstruction of the highway intersections with Clarence Street and Tabulam Road to the east of the Clarence River
- Acquisition of Lot 102 DP 752398 and removal of buildings
- Utility adjustments, including an overhead 11kV transmission line and underground optic fibre telecommunications cables.
- Provision of lighting on bridge consistent with relevant Australian lighting design standards
- Removal of the existing bridge.

A more detailed strategic concept design drawing of the Proposal is provided in Appendix A and photographs of the location of the proposal site are shown in Figure 3-2 to Figure 3-5.

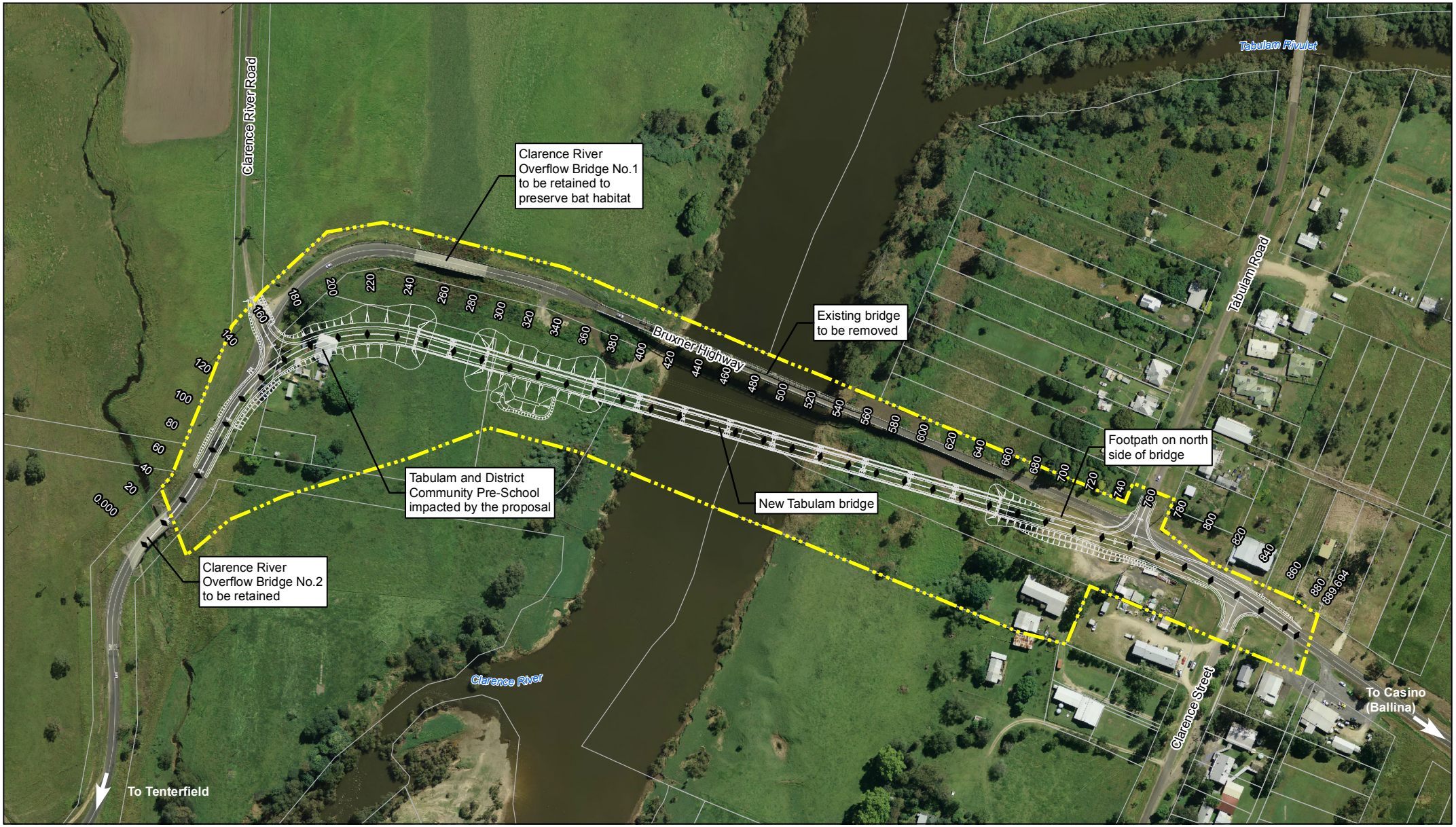
The proposal would be completed in a staged manner with the new bridge being constructed in the first phase and after diversion of traffic onto the new bridge, removal of the existing bridge. Existing road approaches would also be removed and upgraded.

Construction would require the establishment of a temporary site compound/ stockpile sites on the eastern alignment and a temporary concrete batching plant on land west of Tabulam Road immediately north of the Tabulam Rivulet (refer Figure 2-3).

The proposal requires the delisting of the existing bridge from the NSW State Heritage Register prior to removal. While the Heritage Council has endorsed the Timber Truss Strategy, the delisting of the bridge from the Register is a statutory process. This process, under Section 38 of the *Heritage Act 1977,* allows for delisting on financial hardship or economic grounds.

The existing bridge is owned by both Tenterfield Shire Council and Kyogle Council as the bridge spans the council boundary. Roads and Maritime maintains all bridges on the state road network on behalf of councils. Roads and Maritime has consulted with both councils and has support from both for the removal of the existing bridge due to the on-going maintenance cost burden.

Feedback to date on retaining the existing bridge has been carefully considered. However, due to the ongoing conservation, operational and financial challenges presented by retaining the existing bridge, Roads and Maritime is proceeding with the proposal, which includes identifying a replacement bridge location and removal of the existing bridge.



Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Cadastre
- Design

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Proposal design

Figure 3-1

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF002_ProposalDesign_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay, gmcdiarmid

Figure 3-2 View of new bridge location looking east to west

Figure 3-3 View of new bridge location looking west to east

Figure 3-4 View of intersection of Bruxner Highway and Tabulam Road looking east towards Clarence Street

Figure 3-5 View of proposed temporary concrete batching plant site (foreground only)

3.2 Design

The concept design for the proposal is included in detail in Appendix A.

3.2.1 Design criteria

The proposed bridge over the Clarence River, minor bridges, and approach roads would be designed to comply with the requirements of the Austroads Standards, Roads and Maritime supplement(s) and AS 5100 for bridge design. An outline of these design criteria is provided in the tables below.

Table 3-1 Geometric performance and design requirements - Horizontal and vertical alignment

Design criteria	Minimum design requirement
Design speed	70 km/h
Maximum grade	10 per cent

Table 3-2 Geometric performance and design requirements – Road cross

Design criteria	Minimum design requirement
Number of travel lanes	2
Travel lane width	3.5 metres
Shoulder width	1.0 metre

Table 3-3 Geometric performance and design requirements – Bridge

Design criteria	Minimum design requirement
Width between kerbs	9.0 metres
Length of bridge (between abutments)	280 metres
Lane numbers per carriageway and widths	3.5 metre wide lanes with one in each direction
Height clearance between underside of bridge and waterway	To meet Roads and Maritime requirements

Table 3-4 Geometric performance and design requirements – Pedestrian and cyclist shared pathway

Design criteria	Minimum design requirement
Width	2.5 metres
Crossfall	2 per cent

Further design aspects, including super-elevation design, safety barrier design, earthworks, sight distance checks, pavement widening and aquaplaning checks would be considered during concept and detailed design for the proposal.

3.2.2 Engineering constraints

Foundation design

A layer of organic material was encountered within the gravel stratum of the river banks during geotechnical investigations. Layers of dense to very dense river gravels and cobbles up to seven metres thick were also encountered overlying the sandstone bedrock. These conditions are likely to make the installation of driven piles difficult. The presence of these river gravels and organics would be considered during footing design and when confirming construction methodology.

Construction access and limitations

The construction of the new bridge and removal of the existing bridge would require access tracks, laydown areas, delivery of oversize elements, crane pads, river access, and suitable launching areas. Due to weight limitations and the need to maintain traffic flow throughout the construction period, the existing bridge could not be relied upon for construction.

The upper stratum across much of the site comprises predominantly clayey material. Under bridge construction/ removal traffic, if unprotected, these materials are likely to become heavily rutted and slippery. Allowance would be made for the construction of access tracks and bridging layers to facilitate the movement of construction plant and allow compaction of embankment fill.

River access would be via the construction of a temporary platform into and/ or over the river to enable the construction of piers and potentially for launching of the superstructure. The platform would be built to minimise impacts on the aquatic environment, including a requirement for a minimum of 20 per cent of the low-flow water surface to remain open. This is further discussed in Section 3.3.1.

Flooding

The Clarence River has a history of flooding in the Tabulam area with recorded floods in 1976 and 2011 reaching flood heights of 129 metres AHD and 127.3 metres AHD respectively.

The proposed construction work and local access roads are likely to be impacted by flood in the event of a significant rain event in the wettest summer months of the year. Construction planning would need to consider the potential impacts of flood upon works and a contingency plan developed.

The storage of materials and compound areas would need to be placed in areas that are not subject to regular flooding events.

Potable Water

Potable water would be required to meet the design specifications for concrete used in the new bridge. Tabulam village does not have a reticulated water supply so water would either be delivered to the proposed concrete batching plant site via water tankers and stored on-site or pumped directly from the Clarence River. Given the quantity of water required for the proposal, a licence to pump directly from the river is proposed.

Availability of girders for the new bridge

Super-T girders can only be fabricated by a pre-qualified contractor likely to be located either on the North Coast of NSW (Macksville) or in Brisbane. The girders would be delivered to site and either stored prior to placement or directly placed on the bridge. Delivery would require a trip of about six hours return from Brisbane or eight hours return from Macksville, and would require pilots and police escort. The route has been reviewed by a transport contractor to ensure these long loads are able to be delivered, especially between Tenterfield and Tabulam if inland routes are used, and the proposed route is achievable.

Existing electrical infrastructure

The ability to lift components of the new bridge into place and removal of the existing bridge components may be constrained by the position of the 11 kilovolt (kV) power lines located to the south of the existing bridge and immediately north of the new bridge. Special consideration, in consultation with the asset owner, would be given to construction/ bridge removal in proximity to the power lines.

Availability of soil, sand and gravel

A significant quantity of soil, sand and gravel would be required during construction and for final embankment treatments for the new bridge. Limited material exists in and around the site for these purposes. As the existing bridge is to be retained during construction, existing embankment material would not be available for the new bridge. A number of quarries operate around Casino and Tenterfield. Suitable material would be delivered to site from these facilities. Material not required following the removal of the existing bridge would be adequately disposed of at a licensed facility or validated prior to relocation to another site.

Removal of piers of existing bridge

Due to the size of the piers of the existing bridge and location within the river, removal of these components would be difficult. It is intended that these components would be cut below water level to minimise any obstruction to river users. Once cut they would be lifted out of the water and broken up for reuse either on-site or taken to an approved waste facility.

Removal of contaminated bridge components

Due to the potential for lead paint and copper, chromium, arsenic (CCA) treated timber on the existing bridge and the sensitive receiving environment beneath the bridge, special procedures would be developed to collect any debris or materials falling into the river during the removal process. Suitable containment devices would be hung beneath the bridge to ensure that any debris/ material is collected. All potentially contaminated components of the existing bridge would be taken to an approved waste facility. Alternatively bridge elements may be treated to enable reuse on other Roads and Maritime timber bridges or as elements incorporated into the new bridge and approaches to remember the existing heritage bridge.

3.2.3 Major design features

Western road approach realignment

The proposed western road approach of the Bruxner Highway would be realigned to traverse across the site where the preschool is currently located, before connecting with the new bridge alignment. The existing Overflow Bridge No. 1 would be retained. Some existing utilities in this location would be relocated. The boulder with a plaque noting the now demolished house of Harry Lasseter (of Lasseter's Lost Reef fame) would be relocated. Provision of an intersection east of the Overflow Bridge No. 2 provides safer access to Clarence River Road (refer to Figure 2-4).

New bridge

The new bridge would incorporate nine 32 metre long spans with an overall length of 288 metres. The superstructure of the new bridge would consist of six 1500 millimetre deep precast prestressed super-T girders with a 200 millimetre nominal depth insitu deck slab with a 75 millimetre asphaltic concrete wearing surface.

The substructure of the new bridge would consist of four large piers within the river or on the immediate banks, while four smaller blade piers would be constructed on land. Abutments would be reinforced concrete sill beams constructed at grade. An indicative pier design is shown in Figure 3-6 Indicative pier design

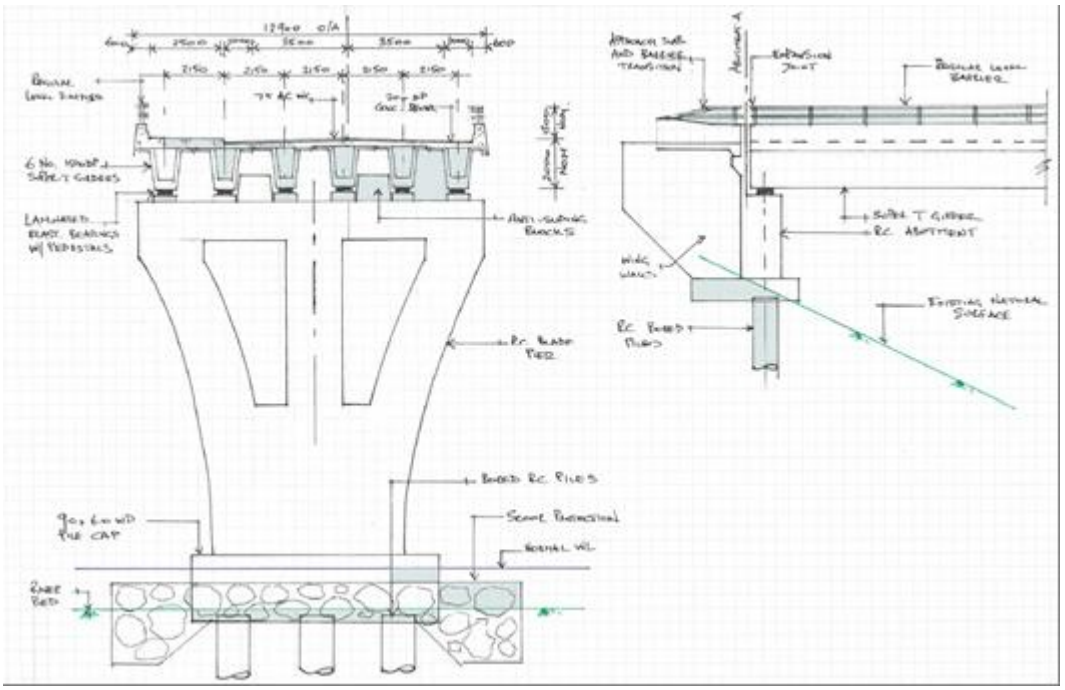


Figure 3-6 Indicative pier design

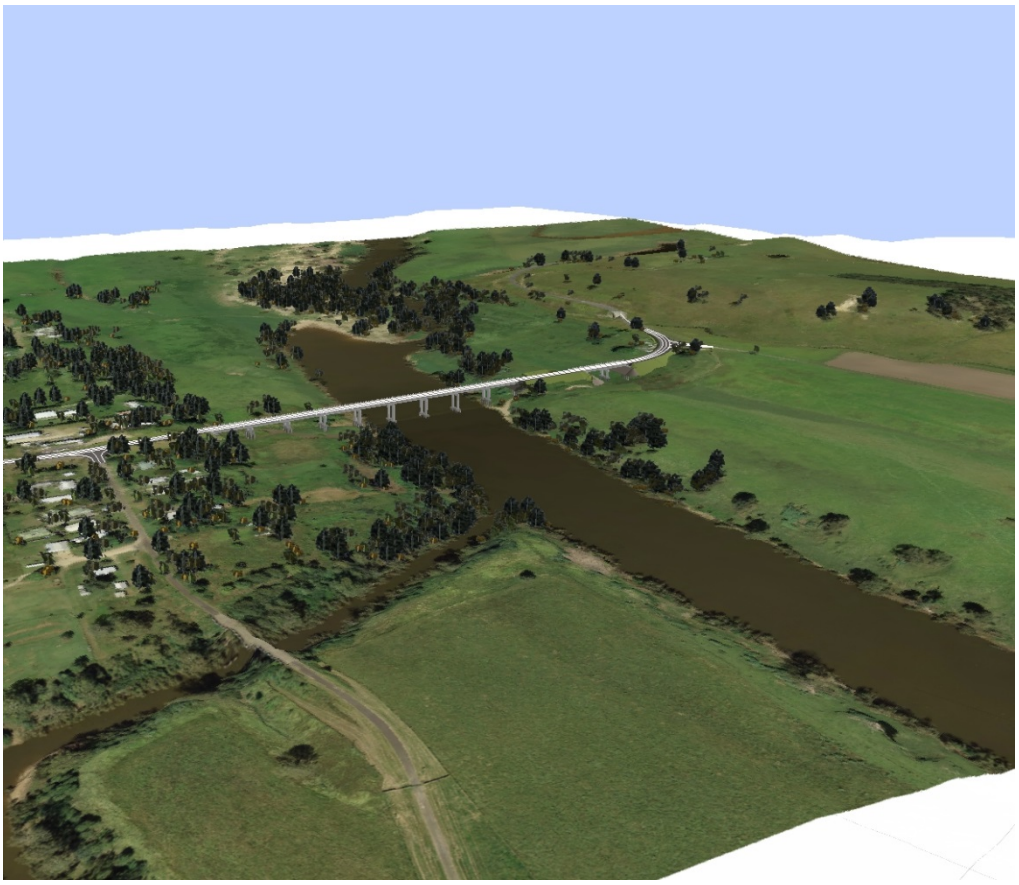
The provision of footways on the northern side of the new bridge and connection to Tabulam village to the east, and the new intersection to the west, provides safe pedestrian and cyclist connectivity that is currently not available.

Ongoing discussions with the community since the proposal was announced in 2013 have highlighted the desire for the existing heritage bridge to be appropriately commemorated. Roads and Maritime is investigating ways to recognise the heritage significance of the existing bridge and will continue to work with the community to determine the most appropriate ways the bridge could be remembered as part of the new bridge design.

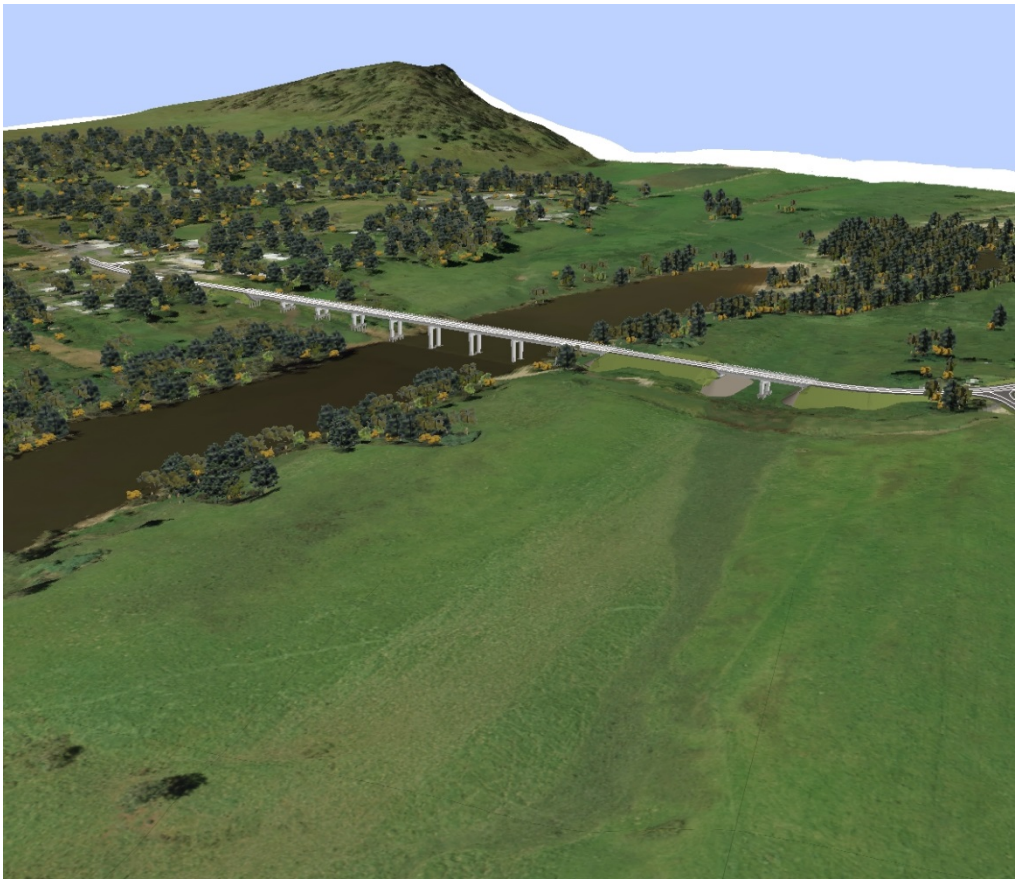
This includes potential design measures such as:

- Plantings along the existing bridge alignment on the eastern bank of the Clarence River
- Reuse of timber beams as bench seats within the proposed park on the eastern bank of the Clarence River adjacent to the new bridge
- Representative sections of timber truss at either end of the new bridge to reflect the significance of the former De Burgh heritage listed timber truss bridge
- A viewing platform placed on the upstream side of the new bridge on the pedestrian and cyclist shared pathway to overlook the alignment of the existing heritage bridge.

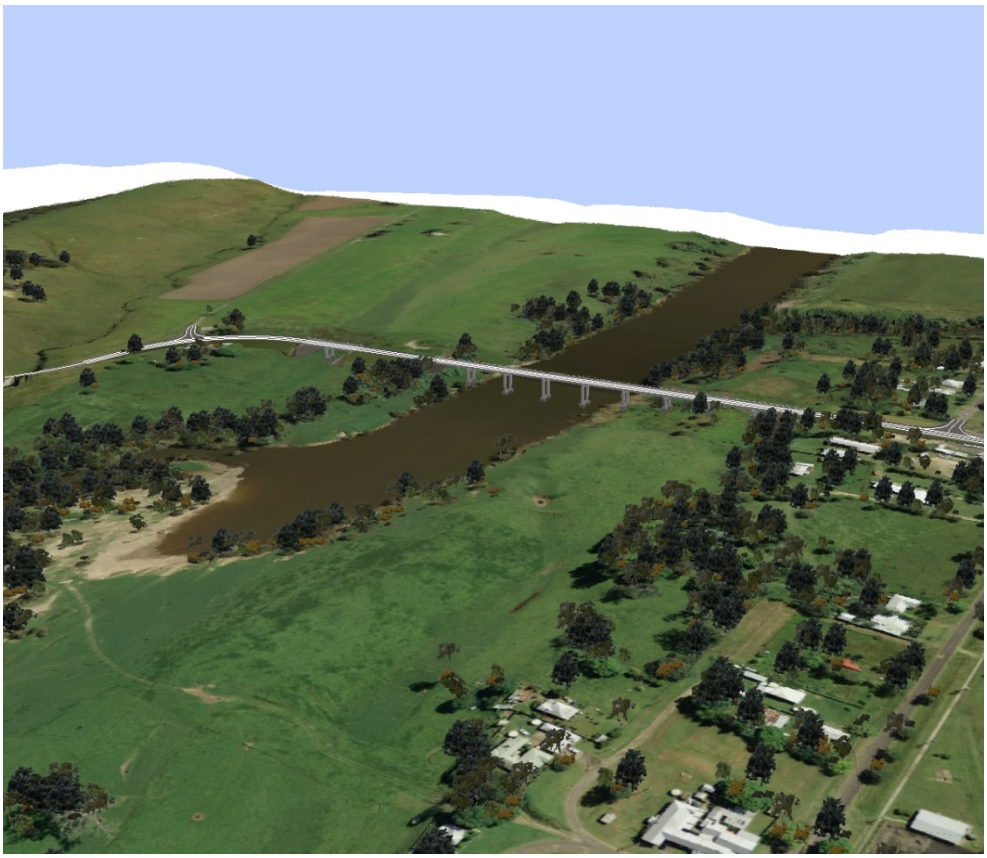
Three dimensional perspectives of the proposed new bridge are provided in Figure 3-7.



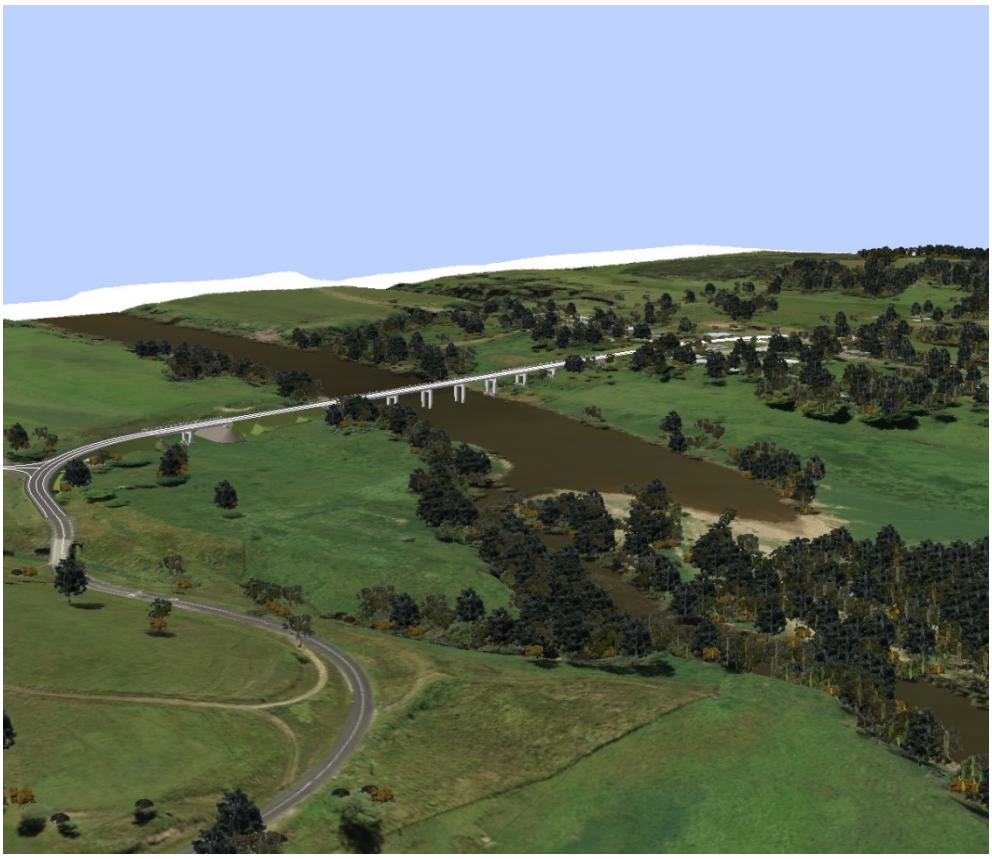
View north-east



View north-west



View south-east



View south-west

Figure 3-7 Three dimensional images of the proposal

Eastern road approach realignment

The proposed eastern road approach of the Bruxner Highway would be realigned to the south east to connect with the new bridge alignment. The proposal would involve reconstructing the highway intersections with Clarence Street and Tabulam Road.

Realignment of the highway to the south-east and upgrades to the highway intersections with Clarence Street and Tabulam Road would provide safer traffic movements through the village.

3.3 Construction/ removal activities

3.3.1 Work methodology

The indicative proposed work methodology is discussed below.

Preliminary activities and site establishment

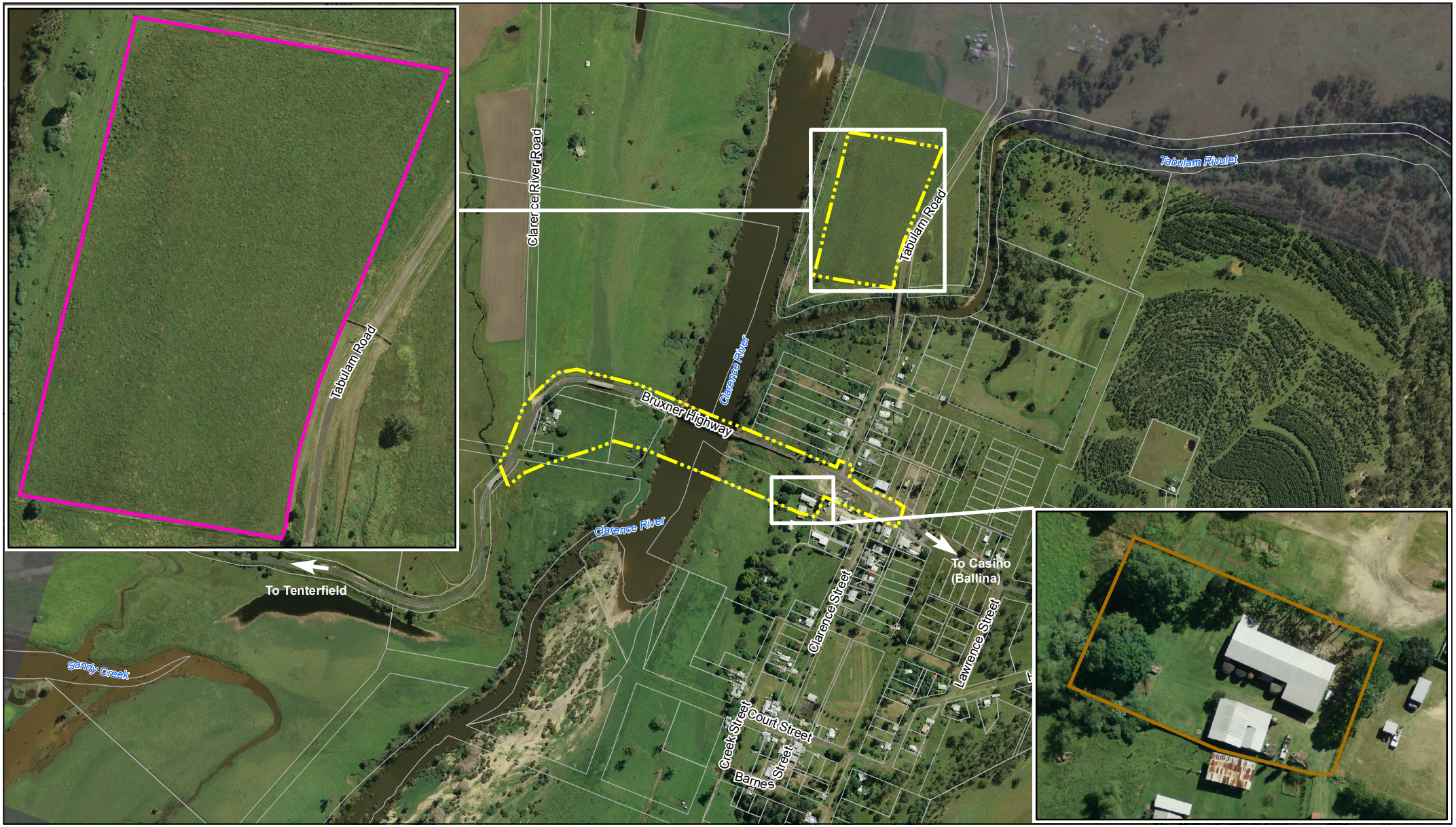
Upon start of the construction of the proposal the following activities would becarried out:

- Property acquisition and adjustments, including property access changes
- Detailed geotechnical investigations and survey
- Dilapidation surveys
- General site clearance, site establishment work, fencing and signage
- Temporary traffic management arrangements
- Progressive installation of environmental controls including temporary or permanent fencing, and erosion and sediment control measures
- Construction of temporary drainage controls
- Clearing and removal of vegetation
- Diversion of utilities.

Temporary works and staging

Construction compounds would be established at the eastern end of the proposed bridge alignment and on Tabulam Road (including the proposed concrete batching plant site) to accommodate building materials, stockpiles, offices and amenities required for the proposal. The indicative location of the proposal construction compounds is displayed in Figure 3-8.

Appropriately designed temporary access points would be required adjacent to and within the river banks to allow heavy vehicle access to the bridge site. This may include construction of crane pads, dependent upon the access option proposed by the contractor, as described below. Sediment and erosion control measures would be installed prior to any earthworks. Barriers and associated signage would be installed to prevent the general public from accessing the construction area.



Paper Size A4

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Cadastre
- Site compound
- Proposed concrete batch plant *(Batch plant will utilise approximately 1ha. Actual location to be confirmed.)*

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Proposed compounds

Figure 3-8

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF013_Compounds_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay

Foundations

Foundation work include bored piers with permanent casing socketed into rock through the upper strata (clays and gravels). The four river piers would need to be constructed using temporary platforms within the river for access. Sediment and water quality measures would be installed to minimise impacts on water quality. Signage would be erected to notify the general public of the works and to limit entry into the construction site.

Substructure/ road approaches

The piers would be orientated perpendicular to the bridge alignment introducing a slight angle (in the order of 10 degrees) relative to the river. Piers may be slip formed where possible, jump formed or precast and post-tensioned with appropriate temporary access required at the river piers for concrete pumps or lifting equipment. The width of the pier would suit the position of the girder bearing supports, so tapering and holes could be provided to reduce the quantity of concrete and mass of these structures. Additional width could be provided if a launching frame is adopted for construction.

Superstructure

The superstructure consists of 54 individual precast prestressed super-T girders of 32 metres length. The girders would be delivered to site and either stored prior to placement or directly placed on the bridge. The girders would be lifted into place via heavy lift cranes or dual lift cranes from specially constructed crane pads within the river banks. Delivery of the girders from storage to the river would require access road construction within the river banks to cater for these long and heavy loads.

Work over the waterway

Although the final construction/removal methodology is yet to be determined and may be subject to change by the construction contractor, the following description is considered indicative of the likely approach. An indicative design for the piers is shown in **Figure 3-6**.

Temporary work access along the bridge alignment across the full river width would need to be established. There are three main construction activities described by Myers (2014):

- Bored piling works, consisting of driving permanent steel casings into the river bed, which are subsequently excavated through drilling, reinforced and filled with concrete
- Substructure construction, consisting of the casting of pile caps and subsequent forming and pouring of the concrete support columns
- Girder erection, where the 55-60 tonne girders are placed in sequence between the columns to form the main structure of the bridge.

Large construction elements would be lifted and manoeuvred using a combination of bankside and work platform cranes. The crane sizing is dependent on the access arrangements and there would be numerous other items of heavy plant required to access the in-stream work site (Myers 2014).

Similar methods for working in the waterway can be used for both construction and removal. The construction of the new bridge as well as removal of the existing heritage bridge would lead to a number of temporary risks for the aquatic environment, as shown in Table 3-5.

The construction and removal of any in-stream work platforms pose the greatest potential risks for aquatic environmental impacts.

The existing bridge would be dismantled piece by piece prior to removal off-site to a yet to be determined location. An on-site area would be required to stockpile the timber as it is removed, including an area to dismantle the trusses into smaller, more manageable pieces to transport off-site.

The existing 11 kV over-head power lines on the downstream side of the bridge would limit the access to the existing bridge from either the upstream side or from on the bridge itself.

The mass concrete piers in the river would be removed from top down by an excavator/rock breaker that would work away at the pier slowly breaking it up into pieces for removal off-site. The piers would be removed to below water level approximately to the river bed. Similar to the construction of the new bridge, a suitable temporary work platform would be required to support the removal activities. The existing Tabulam bridge needs to be kept in service while the new bridge is constructed. This single lane bridge does not have sufficient capacity to handle heavy construction loads and therefore alternative cross-river access, suitable for heavy loads is required at the works location. In addition to providing load access across the river, the construction of the new bridge and eventual removal of the existing bridge would require a stable platform on which to undertake in-stream works. Three broad options to meet these requirements are considered:

- Option 1 – Erection of a full channel width temporary construction bridge
- Option 2 – Construction of a central rock fill work platform/island, linked to either bank by temporary bridge connections
- Option 3 – Use of work barges with associated docking/loading facilities.

A full analysis of the options considered is contained in Appendix C (Aquatic Habitat Assessment). Table 3-5 summarises the findings of this analysis.

Table 3-5 Ranking of potential impacts associated with temporary work platform options

Impact	Option 1: Temporary Bridge	Option 2: Rock platform	Option 3: Barge / Wharves
Riparian vegetation removal and disturbance	1	2	2
Aquatic vegetation damage and disturbance	1	3	2
Large woody debris removal	2	3	2
Aquatic fauna disturbance	1	3	3
Aquatic fauna passage barrier	1	2	1
Altered stream flow	1	1	1
Turbidity and sedimentation	2	3	2
Spills and debris	2	2	2
Spills and debris	1	1	1

Impact rankings are as follows:

1 – Negligible
2 – Minor and temporary
3 – Larger scale but temporary
4 – Widespread with potential for on-going impact

As demonstrated in Table 3-5, different phases of the proposal pose different environmental impacts. Option 1 (temporary bridge) has a minimal in-stream footprint and can be constructed with the least bankside disturbance. This significantly reduces the potential of aquatic and riparian vegetation destruction, has lower risks for sedimentation and turbidity, and is unlikely to result in any appreciable alteration of stream flows or aquatic fauna passage.

Option 2 (in-stream work platform/island) has the highest potential for damage to the aquatic environment due to direct burial of a large area of aquatic habitat, greatest potential for loss of riparian vegetation (due to likely bank protection works and significant amount of foreign material to be placed and removed from the river.

Option 3 (Barges and load out wharves) is potentially low impact, however the load out wharves would need to extend into the river channel and water depths within parts of the river may be limiting for barge access, thereby necessitating localised dredging works. Although these requirements are currently unknown, the overall aquatic environmental risks of this option are greater than Option 1.

To address the identified impacts to the aquatic environment a suite of mitigation measures have been identified and are provided in Section 6.2.4.

Construction of temporary working platforms for the new bridge

Subject to the construction methodology chosen and construction contractor program of works, if temporary working platforms are utilised, a series of safeguards will need to be implemented to protect the aquatic environment. These platforms would be located within the construction work zone and would extend from the existing banks into the river to enable stable and safe access to construction barges and platforms, and piling areas as required. Any temporary working platforms would be designed in accordance with the following principles:

- Constructed of hard, sound, durable rock free of fine particles and not contaminated with foreign materials
- Designed to allow for effective and regular clean-up of sediment and spill management
- Designed to prevent small rock or fine capping materials from being washed out of the platform
- Designed and operated in a manner that minimises the re-suspension of sediments or substrates
- Remain in the waterway for the minimum time possible
- Contained to ensure durability during a 1:10 year average rainfall interval flood event as a minimum
- Be protected by anti-pollution booms and heavy duty silt curtains which are designed, installed/anchored and maintained specific to the waterway, with installation to occur prior to any work that may generate sedimentation
- Facilitate appropriate water flow to safely convey water and reduce impacts in high flow events, including but not limited to downstream bank and bed scouring and associated deposition
- Include appropriate fish passage treatments, including a requirement to ensure a minimum of 20 per cent of natural river channel remain open at any one time

In designing any temporary working platforms consideration would be given to the following factors:

- River flow velocity during non-flood events
- Flooding characteristics including but not limited to afflux constraints (eg proximity of sensitive receivers), catchment size, flow velocity during a two year, 10 year and 20 year average recurrence interval flood events, associated potential scour impacts and flood evacuation procedures
- River morphology including but not limited to bed shape, depth, major flow channels and substrate type
- Navigational requirements including but not limited to visibility, speeds and navigational channels
- Commercial and recreational uses of the waterway including but not limited to fishing, water skiing or other leisure activities
- Procurement and delivery of working platform materials and components including but not limited to mobilisation, proximity to existing river structures, transportation/access for barges, access to clean rock (ie hard, sound, durable rock free of fine particles and not contaminated with foreign materials)
- Maintenance works and associated management (eg refuelling, routine maintenance and spill management)
- Rehabilitation requirements associated with decommissioning
- Applicability of industry innovations and/or sustainability initiatives (eg reuse of materials).

Any temporary working platforms would be developed and designed in consultation with the appropriate regulatory agencies to ensure that potential impacts from the installation, operation and decommissioning of the working platforms are managed to minimise impacts on the surrounding waterways.

Finish - deck, parapets and rails

Once girders are positioned, insitu concrete deck pours would complete the deck. A concrete batching plant located on Tabulam Road, close to the proposal site, is proposed to provide ready access to required concrete.

Road treatment and intersection upgrades

The proposed road approaches of the Bruxner Highway both to the east and west would be realigned to connect with the new bridge alignment. The intersections of the highway with Clarence River Road, Clarence Street and Tabulam Road would be developed. Work would include:

- Placement and compaction of earthworks
- Road widening, including construction of box cuts and road surfaces
- Installation of traffic signals, roadside furniture and lighting
- Installation of road markings
- Construction of any retaining walls and subsurface drainage
- Construction of road surface
- Construction of pedestrian and cycle path
- Progressive landscaping and tree planting.

Bridge removal activities

Removal of the existing bridge would be carried out when the new bridge is operational and would use the same work methodology employed for construction of the new bridge. In addition, removal activities would include storage, assessment, reuse and disposal of removed bridge elements.

Landscaping and rehabilitation

Rehabilitation of the site would involve:

- Removal of all structures, equipment and other materials from the works area including compound and concrete batching plant sites
- Minor earthworks and landscaping to reform the land
- Revegetation (as required) using native, endemic (and/or sterile non-invasive) species. Erosion and sedimentation control would remain in place until the site is appropriately reinstated and revegetated.

3.3.2 Construction hours and duration

The proposal would be completed in a staged manner with the new bridge being constructed in the first phase and after diversion of traffic onto the new bridge, removal of the existing bridge.

All work for the proposal would be undertaken during recommended standard hours as outlined in the Interim Construction Noise Guideline (DECC, 2009), which are:

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

In the event that work is required outside of standard construction hours, it would be in accordance with the *Interim Construction Noise Guideline* (DECC 2009) and the *Roads and Maritime Services' Environmental Noise Management Manual 2001 - Practice Note 7.* This would include notifying the local community in advance of any work planned to be undertaken outside of standard construction hours.

3.3.3 Machinery and equipment

The following machinery and equipment would be used in the proposal:

- Trucks (for equipment and material transportation)
- Mobile cranes
- Barges, punts, if needed to access waterway
- Excavators
- Drilling rigs
- Cranes
- Pile drivers
- Compressors
- Hand tools (motorised and pneumatic)
- Chain saws
- Generators
- Oxy torches and welders
- Elevated work platforms
- Shoring
- Scaffolding
- Bitumen sprayer and ancillary equipment
- Asphaltic concrete paver.

3.3.4 Earthworks

Some earthworks would be required during the proposal, including:

- Creating the compound and concrete batching plant sites
- Developing/ widening the access tracks
- Creating pads for the crane and support props
- Levelling the temporary stockpile area on the eastern and western side of the existing bridge
- Depending on the construction method chosen for building the new bridge, potentially filling for a rock platform in the river to allow access to pier locations and shaping to place rock as scour protection on riverbank
  Excavating around the base of the piers to facilitate the cutting and removal of the piers
- Excavating the abutments
- Reinstating the abutment area, stockpile sites and compound/ batching plant locations.

It is anticipated that all material excavated would be stockpiled for up to one month at locations assessed in this REF and reused during reclamation of the site. Additional fill may be required but there would not be any excess fill requiring disposal.

The earthworks volumes have not been estimated at this time. It is expected that the volume of earthworks will not require the engagement of a Soil Conservation Specialist for construction with erosion and sediment managed in accordance with mitigations in Table 7-1 of this REF.

3.3.5 Source and quantity of materials

It is anticipated the Proposal would not generate significant amounts of spoil. Construction materials would need to be imported.

Construction

Being on an alluvial plain, potential construction material sources in the immediate vicinity of the town are limited, with the majority of historical and current extractive industries focused on mining for gold and silver. Topographical maps identify a small number of potential material sources in the area with the closest identifiable commercial sources for construction material predominantly centred on Casino, 55 kilometres to the east.

The rock material required for the proposal would be sourced from a licensed supplier within the local region. Exact material quantities are unknown at this stage but would include rock, core fill, sand and topsoil. Estimates of the material quantities required are outlined in Table 3-6.

Table 3-6 Estimated quantity of materials required

Material type	Volume required
Rock	4,000 cubic metres (m^3)
Core fill	10,000 m^3
Sand	1,400 m^3
Topsoil	1,800 m^3
TOTAL	17,200 m^3

Removal

Rock material required for improving the existing access track and constructing the pad for the crane and support props would be sourced from the material used during the construction of the new bridge. If this material is not deemed suitable, material would be imported from an approved, off-site location.

Minimal amounts of material (less than 50 cubic metres) would be required for the construction of a pad for the stockpile sites and reclamation of the abutments. This material would be sourced from local suppliers.

Petrol, diesel and lubricating oils in quantities required for the operation of machinery would be sourced from local suppliers.

3.3.6 Traffic management and access

Bridge construction and removal machinery would access the site via the Bruxner Highway. Access to either end of the bridge is available via the existing road reserve and land to be acquired as part of the proposal. Access to the river for the crane and other machinery would be via an existing access track on the eastern side of the river, south (downstream) of the existing bridge. It is not anticipated that machinery would work from the new bridge.

Access to and from the temporary concrete batching plant would be from Tabulam Road with all traffic using Tabulam Road and the Bruxner Highway to access the construction site.

The proposal would result in an increase in truck movements (an average of five per day and maximum of ten per day), possible delays to traffic during construction (where overhead work is deemed to endanger road users), and possible delays to traffic during removal (where machinery is moved across the new bridge to access the western abutment).

A traffic management plan would be developed as part of the construction environmental management plan (CEMP). The traffic management plan would detail traffic management and access safeguard measures to ensure safe passage of motorists, pedestrians and cyclists during the construction/ removal phases of the proposal.

3.4 Ancillary facilities

A work compound/ temporary stockpile area would be located on the eastern approach of the bridge as shown in Figure 3-8. The compound would include a portable toilet, secure and bunded storage areas for site materials including fuel and chemicals, and possibly a lunch room and office for on-site personnel.

The hardstand area would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. The compound site would be erected on-site from approximately week one of the construction program, before the mobilisation of machinery until the completion of removal activities, which is estimated to be about 18 to 24 months. Upon completion of the removal work, the temporary site compound, work area and stockpiles would be removed, the site cleared of all rubbish and materials and the site rehabilitated.

A concrete batching plant site (approximately one hectare in area) is proposed on private property on the western side of Tabulam Road (Lot 226 DP43976) to the north of Tabulam Rivulet as shown in Figure 3-8. This site has been identified as the best location as it is:

- Relatively level ground which is elevated to assist drainage and allow treatment of runoff
- Easily accessible to a water supply from the Clarence River
- An area of low ecological and heritage conservation significance
- Would not require vegetation clearing
- Located at least 200 metres from dwellings or other activities that may be affected by noise and other impacts
- Generally above the 1 in 100 year flood event
- Easily accessible from Tabulam Road and in close proximity to the proposal site
- Serviced with electricity and telephone services.

The size and type of batching plant would be determined by the contractor but would include, as a minimum, mixers (either tilt-up or horizontal or in some cases both), cement batchers, aggregate batchers, conveyors, radial stackers, aggregate bins, cement bins, heaters, chillers, cement silos, batch plant controls, water management systems, erosion and sediment control, and dust collectors. Environmental risks associated with concrete batching include release of dust and / or particulates into the air, release of high pH and contaminated water and sediments, noise from handling, mixing and transport operations and waste management. The construction contractor would comply with specific safeguards to minimise impacts from the operation of the batching plant. This is further discussed in Section 6.

3.5 Public utility adjustment

Essential Energy assets are located throughout the proposal site. The assets are generally confined to the township and road reserves with the exception of:

- An overhead 11kV transmission line which crosses the Clarence River just south of the existing bridge
- Underground optic fibre telecommunications cables on the western approach.

Relocation of these utilities would be required to allow construction of the new bridge.

3.6 Property acquisition and use

The proposal would require acquisition or negotiation of temporary use of several parcels of land, including Crown land. Properties that would be acquired or temporarily used are summarised in Table 3-7. The properties are shown in Figure 3-9.

Roads and Maritime has started negotiations with all affected land owners. Acquisition or use of Crown land is carried out in accordance with the *Crown Lands Act 1989*. Acquisition of private land is negotiated under the *Land Acquisition (Just Terms Compensation) Act 1991*. Temporary use of private land would be formalised via a temporary easement over the land under the *Conveyancing Act 1919*.

Table 3-7 Property acquisition and adjustment

Map ID	Lot details	Land owner	Other agreements relevant to the land	Use/ acquisition	Area of impact (ha)
1	Crown road	Crown land	-	Acquisition	0.0069
2	Lot 7347 DP1178935	Crown land	-	Acquisition	0.0848
3	Lot 163 DP752398	Uniting Church in Australia Property	-	Acquisition	0.0025
4	Lot 102 DP752398	Uniting Church in Australia Property	-	Acquisition	0.8980
5	Lot 7006 DP1068757	The State of NSW	R88164 for public recreation devolved to Tenterfield Shire Council.	Acquisition	1.012
6	Crown waterway	Crown land	-	Acquisition	0.3272
7	Crown waterway	Crown land	-	Acquisition	0
8	Lot B DP379425	Mr T J Brown	-	Use/ acquisition	0.0712
9	Lot 226 DP43876	Mr D J Ross	-	Use	0

Paper Size A4

0 15 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Property acquisition boundary
- Cadastre
- Impacted lots - freehold
- Impacted lots - Crown land

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Properties affected by the proposal

Figure 3-9

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF007_AffectedProperties_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay

4. Statutory and planning framework

4.1 State environmental planning policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy 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 road infrastructure facilities and is to be carried out on behalf of Roads and Maritime, it can be assessed under Part 5 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 affect land or development regulated by *State Environmental Planning Policy No. 14 - Coastal Wetlands*, *State Environmental Planning Policy No. 26 - Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Major Development) 2005*.

Part 2 of the 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 required by ISEPP (where applicable), is discussed in section 5 of this REF.

4.1.2 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy 44 - Koala Habitat Protection (SEPP 44) 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 kKoala population decline'.

Clause 6 of SEPP 44 states that the SEPP applies only to land 'in relation to which a development application has been made'. Clause 94 of ISEPP precludes the proposed works from requiring development consent therefore part 2 of SEPP 44 does not apply to the proposal. It is Roads and Maritime's policy, however, to consider environmental issues relating to its works to the fullest extent possible, including impacts on koalas.

A Terrestrial Flora and Fauna Assessment was carried out as an input to the REF (Appendix C). The proposal site does not contain any koala feed tree species listed on schedule 2 therefore the area does not constitute potential or core koala habitat. Therefore, a koala management plan, pursuant to SEPP 44, is not required for the proposal.

4.1.3 North Coast Regional Environmental Plan

The *North Coast Regional Environmental Plan* (REP) provides regional policies that protect the natural environment, encourage an efficient and attractive built environment and guide development into a productive yet environmentally sound future. The REP provides general guidance for plan making related to transport infrastructure (Part 5 Division 1). The existing bridge is listed as a heritage item of state and regional significance under Schedule 2 of the REP. This issue is further discussed in Section 6.4.

4.2 Local environmental plans

The Clarence River forms the boundary between the Kyogle and Tenterfield LGAs. The village of Tabulam is located to the east of the river, within the Kyogle LGA, whilst other areas, which are considered to be part of Tabulam, lie to the west of the river within the Tenterfield LGA.

Tabulam village is zoned RU5 Village under the Kyogle Local Environmental Plan (LEP) 2012. The village zone allows for a range of land uses including residential, commercial, industrial, infrastructure and tourism related development. Development must reflect or enhance the local character and identity of the village and should not adversely affect the amenity of the village.

Beyond the village zone, the surrounding land is zoned RU1 Primary Production under the Kyogle LEP 2012 and Tenterfield Shire LEP 2013 respectively. The RU1 zone allows for a range of rural and agricultural development provided it leads to sustainable primary industry production by maintaining and enhancing the natural resource base. Each LGA has its own LEP. These are addressed below.

4.2.1 Kyogle Local Environmental Plan 2012

The proposal site is within the following zones under the Kyogle LEP 2013:

- RU1 Primary Production
- RU5 Village.

The proposal would be permitted with consent under each of the above zones. Clause 5.12 of the LEP states that '…this Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under *State Environmental Planning Policy (Infrastructure) 2007*'.

As the proposal is permitted without consent under ISEPP (refer Section 4.1.1), the consent requirements of the LEP do not apply.

4.2.2 Tenterfield Local Environmental Plan 2013

The proposal site is within the following zones under Tenterfield LEP 2013:

- RU1 Primary Production.

The proposal would be permitted with consent under the above zone. Clause 3.1 of the LEP states that '…this Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under *State Environmental Planning Policy (Infrastructure) 2007*'.

As the proposal is permitted without consent under ISEPP (refer Section 4.1.1), the consent requirements of the LEP do not apply.

4.3 Other relevant NSW legislation

4.3.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes, amongst other things, the procedures for issuing licences for environmental protection in relation to aspects such as waste, air, water and noise pollution control. The owner or occupier of premises engaged in scheduled activities is required to hold an environment protection licence and comply with the conditions of that licence.

Under Part 3.2 of the POEO Act, the carrying out of scheduled development work as defined in Schedule 1 requires an environmental protection licence. Schedule 1, Clause 35 (road construction) is potentially relevant to the proposal. Road construction is defined by Clause 35(1) as '…the construction, widening or re-routing of roads, but does not apply to the maintenance or operation of any such road.'

Clause 35(2) specifies that road construction is declared to be a scheduled activity if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road (but not a freeway or tollway) under the *Roads Act 1993*, for at least three kilometres of its length in the metropolitan area, or five kilometres of its length in any other area.

The proposal does not involve construction of four or more traffic lanes and is not five kilometres in length. Therefore an environmental protection licence for road construction is not required.

The operation of the temporary concrete batch plant is not a scheduled activity therefore an environmental protection licence is not required.

Section 6 of the POEO Act indicates that the EPA is the appropriate regulatory authority for development by public authorities which would be Roads and Maritime for the Proposal. Roads and Maritime would be required to notify the EPA immediately of any 'pollution incident' that is likely to have an impact on the environment.

Offence to pollute waters

Section 120 of the POEO Act applies a general prohibition to water pollution, ie all water pollution is prohibited unless it is authorised in some way.

Air pollution

Unlike water pollution, there is no general prohibition on causing air pollution. However, the POEO Act contains a number of specific offences which regulate certain activities that result in air pollution.

Air pollution is defined as the emission into the air of any impurity, including dust, smoke, cinders, solid particles, gases, fumes, odours and radioactive substances.

Noise pollution

Unlike water pollution, there is no general prohibition on causing noise pollution. However, the POEO Act contains a number of specific offences which regulate certain activities that result in noise pollution. Appropriate noise criteria to be applied to avoid disturbance upon the surrounding environment are specified within the policies adopted by the EPA as discussed in Section 6.4.3 of this REF.

4.3.2 Heritage Act 1977

The *Heritage Act 1977* is administered by the NSW Heritage Council and aims to ensure that the heritage of NSW is adequately identified and conserved. The *Heritage Act 1977* is concerned with all aspects of conservation ranging from the most basic protection against damage and demolition, to restoration and enhancement.

Under Section 57 of the *Heritage Act 1977*, a permit must be obtained for works, which have the potential to interfere with a heritage item or place, which is either listed on the State Heritage Register or the subject of an interim heritage order. The existing bridge over the Clarence River at Tabulam is listed on the State Heritage Register.

As previously discussed in Section 2.2.5, the existing bridge over the Clarence River at Tabulam was identified to be replaced with a new structure as part of the *Timber Truss Bridge Conservation Strategy* (2012) and the existing structure removed.

Pursuant to Section 38 of the *Heritage Act 1977*, the Minister may, after considering the recommendation of the Heritage Council on the matter, direct the removal of a listing from the State Heritage Register. The existing bridge would therefore require delisting from the State Heritage Register in accordance with Section 38 prior to being removed. This is further discussed in Section 6.4.

The *Timber Truss Conservation Strategy* has received endorsement from the Heritage Branch of OEH including the removal of the bridge at Tabulam.

The construction of the new bridge is not anticipated to have any adverse impacts upon heritage items.

4.3.3 Crown Lands Act 1989

The proposal would require works within the Clarence River and would traverse Crown land and therefore the *Crown Lands Act 1989* applies. Under clause 34(1), the Minister has the power to:

'in such manner and subject to such terms and conditions as the Minister determines:

(b) grant easements or rights-of-way over, or licences or permits in respect of, Crown land, on behalf of the Crown.'

In accordance with the *Crown Lands Act 1989,* work proposed to be carried out on Crown land (such as the Clarence River and adjoining lands) requires a licence. A licence would be sought, if applicable, following consultation with the Department of Trade and Investment (Crown Lands Division). Refer to Section 5 for outcomes of this consultation.

4.3.4 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) lists a number of threatened species, populations or ecological communities to be considered in deciding whether there is likely to be a significant impact on threatened biota, or their habitats, as the result of an activity. If a significant impact is deemed likely, an assessment of significance that addresses the requirements of section 5A of the EP&A Act must be completed to determine the significance of the impact.

A Terrestrial Flora and Fauna Assessment has been carried out for the proposal (Appendix B). The presence of and potential for threatened species, populations and ecological communities listed under the TSC Act in the study area was assessed. Assessments of significance in accordance with section 5A of the EP&A Act were completed for a number of species as detailed in Section 6.1. The assessments concluded there would be no significant impact on threatened species, populations or communities, or their habitats, as a result of the proposal. Therefore a species impact statement, under the TSC Act, is not required.

4.3.5 Fisheries Management Act 1994

The Fisheries Management Act 1994 (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

The FM Act requires consideration of the impacts of certain work including dredging or reclamation, and works that block fish passage or harm marine vegetation. Pursuant to section 199 of the FM Act, a public authority (other than a local government authority) must, before it carries out or authorises the carrying out of dredging or reclamation work, give the Minister written notice of the proposed work, and consider any matters concerning the proposed work that are raised by the Minister within 28 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

Dredging is defined under the Act as any work that involves excavating water land, or any work that involves the removal of material from water land. Reclamation refers to using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or draining water from water land for the purpose of its reclamation.

The proposal would involve dredging and reclamation during the construction of the in stream accesses (crane pad, temporary bridge, barges, wharf), placement of scour protection and bridge support prop footings. Pursuant to Clause 199 of the FM Act, Roads and Maritime does not require a permit for dredging or reclamation. However notification of the Minister (via the Department of Primary Industries (Fisheries) is required.

The FM Act also lists a number of aquatic threatened species, populations or ecological communities to be considered in deciding whether there is likely to be a significant impact on threatened biota, or their habitats, as the result of an activity. If a significant impact is deemed likely, an assessment of significance that addresses the requirements of section 5A of the EP&A Act must be completed to determine the significance of the impact.

An Aquatic Habitat Assessment was carried out (Appendix B). The presence of and potential for threatened species, populations and ecological communities listed under the FM Act in the study area was assessed. Assessments of significance in accordance with section 5A of the EP&A Act were completed for a number of species as detailed in section 6.2 The assessments concluded there would be no significant impacts on threatened species, populations or communities, or their habitats, as a result of the proposal. Therefore a species impact statement, under the FM Act, is not required.

4.3.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The NPW Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage, and provides for the preservation and management of national parks, historic sites and certain other areas identified under the Act. The NPW Act is administered by the NSW Office of Environment and Heritage (OEH).

All native fauna and some native flora are protected under the NPW Act. Potential impacts on native flora and fauna are discussed in Section 6.1.

The closest protected areas to the proposal site are the Mallanganee National Park approximately 10 kilometres to the east, and the Jubullum Flat Camp Aboriginal Area approximately 0.5 kilometres to the north.

No known Aboriginal objects or places were identified within the study area, despite it being within a significant archaeological and cultural landscape for Aboriginal cultural heritage. However, directly north of the existing bridge on the eastern side of the Clarence River are three places of cultural importance - the 'Big House', 'Black Camp' and 'The Birthplace'. The proposal would not impact on these sites. This is further discussed in Section 6.3.

4.3.7 Aboriginal Land Rights Act 1983

The provision of land rights and establishment of Aboriginal land councils in NSW is governed by the *Aboriginal Land Rights Act 1983*.

The proposal boundary has been amended to avoid impacting on land which is subject to an Aboriginal land claim under the *Aboriginal Land Rights Act 1983*.

4.3.8 Water Management Act 2000

The *Water Management Act 2000* (WM Act) is administered by the NSW Office of Water (DPI) and aims to 'provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations'.

Statutory water sharing plans are implemented under the WM Act. These plans cater for 80 per cent of water extraction in NSW. In areas not covered by water sharing plans, licensing for water extraction is required under the *Water Act 1912* until plans are gazetted for these areas. A water sharing plan does not apply to the Clarence River. Therefore a licence for the proposed water extraction would be required under the *Water Act 1912.*

The WM Act also requires controlled activity approvals to carry out specified controlled activities on or under waterfront land. Public authorities, such as Roads and Maritime, are exempt from obtaining a controlled activity approval under the *Water Management (General) Regulation 2011*.

4.3.9 Water Act 1912

A water licence or authority to take water from a stream or river via a pump or other work for all purposes other than for basic landholder rights is required under the *Water Act 1912*. This would be sought for the proposal prior to construction from the NSW Office of Water. Refer to Section 5 for outcomes of this consultation.

4.3.10 Roads Act 1993

According to section 138 of the *Roads Act 1993,* consent is required for certain actions in relation to public and classified roads, including disturbing the surface of the road.

Section 138 of the Roads Act states:

1. A person must not:
    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 otherwise than with the consent of the appropriate roads authority.

This section applies to a roads authority and to any employee of a roads authority in the same way as it applies to any other person.

As the proposal would involve the rerouting of the Bruxner Highway and the connection of an access road to a classified road, by Roads and Maritime, no approval from Tenterfield Shire Council and Kyogle Council (as the roads authority) is required under the *Roads Act 1993*. Refer to Section 5 for outcomes of this

consultation.

4.3.11 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act) provides for the declaration of noxious weeds in NSW. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land. This is further discussed in Section 6.1.

4.3.12 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating and (where appropriate) remediating land that the NSW Environment Protection Authority (EPA) considers to be contaminated significantly enough to require regulation. The CLM Act outlines the responsibilities for assessing, managing and reporting contamination of land. Land contamination is further discussed in Section 6.9.

4.3.13 Marine Safety Act 1998

The Clarence River is a navigable waterway as defined under the *Marine Safety Act 1998* (see Section 4). Accordingly, requirements from the Roads and Maritime – Maritime Division would be incorporated into proposal design, construction and operation. This is further discussed in Sections 5.4 and 7.2.

4.3.14 Waste Avoidance and Resource Recovery Act 2001

The objects of the Waste Avoidance and Resource Recovery Act are as follows:

1. Encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development.
2. Ensure that resource management options are considered against a hierarchy.
3. Provide for the continual reduction in waste generation.
4. Minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste.
5. Ensure that industry shares with the community the responsibility for reducing and dealing with waste.
6. Ensure the efficient funding of waste and resource management planning, programs and service delivery.
7. Achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis.
8. Assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997*.

Waste safeguards and mitigation measures have been identified in Section 6.17.

4.4 Commonwealth legislation

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (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.'

The proposal site was assessed for the presence of and potential for threatened species, populations, ecological communities and migratory species listed under the EPBC Act in the ecological assessments in Appendix B and C. Assessment of significance in accordance with the requirements of the EPBC Act found there would be no significant impacts on threatened species, populations or communities, or their habitats, as a result of the proposal.

The assessment of the proposal's impact on all matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact (Appendix D). Accordingly, the proposal has not been referred to the Australian Government Department of the Environment.

4.4.2 Native Title Act 1993

The Commonwealth *Native Title Act 1993* administers processes relating to the recognition, protection and determination of native title and dealings with native title land. Native title is concerned with the rights and interests of Aboriginal and Torres Strait Islander peoples in relation to land and water in Australia and its territories. The Commonwealth Department of the Environment administers this Act.

If native title has been granted over the study area under the *Native Title Act 1993*, consultation with the native title holder or claimants must be carried out. A search of the National Native Title Tribunal has found that there is a pending application for native title adjacent to the proposal boundary.

Site surveys of the shortlisted route options, including the proposal, have been carried out with Jubullum Local Aboriginal Land Council representatives and Western Bundjalung native title claimants in accordance with the Roads and Maritime (2011) Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). This is further discussed in Section 5.

4.4.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act) is to preserve and protect areas and objects in Australia and Australian waters that are of significance to the Aboriginal community.

Part II of the ATSIHP Act the Federal Minister for Indigenous Affairs has powers to protect items by means of ministerial declaration. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition. The Act can, in certain circumstances override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced.

The assessment undertaken for the Proposal (refer to Appendix F) did not identify that items or areas of Aboriginal heritage significance that would be impacted by the Proposal therefore this Act has not been triggered

4.5 Confirmation of statutory position

The proponent and determining authority for the proposal is Roads and Maritime. Clause 94 of the ISEPP provides that the proposal may be carried out without the need for development consent. The proposal is therefore subject to assessment and determination under Part 5 of the EP&A Act.

Refer to Table 7-19 for other licensing and approval requirements.

5. Stakeholder and community consultation

5.1 Consultation strategy

A Community Participation Plan (2014) has been implemented for the proposal since its inception. The local community has provided important information on issues and constraints in the study area that has assisted in identifying a preferred route option for the new bridge. Community consultation has been carried out in accordance with the Roads and Maritime Community Involvement Practice Notes and Resource Manual.

Activities to date have included:

- A letter informing each resident of the proposal and study area in August 2013
- A staffed drop-in session in Tabulam on 15 August 2013 following the announcement of the study area and proposal
- Announcement of the shortlisted route options and publication of a community update in December 2013
- A staffed drop-in session in Tabulam on 10 December 2013 following the announcement of the shortlisted route options
- Advertising and media coverage (print and electronic) informing the community of key aspects of the proposal and opportunities for involvement
- Provision of a free call community information line (1800 810 680) and email for proposal inquiries - community.input@ghd.com
- Meetings/briefings for Tenterfield Shire Council and Kyogle Council, Tabulam Chamber of Commerce and special interest groups in December 2013
- A dedicated webpage on the Roads and Maritime website
- A Preliminary Feedback Summary Report (2013) following the display of the study area and receipt of community feedback, which is available on the Roads and Maritime website
- A Community Feedback Summary Report (2014) following the display of the shortlisted route options and receipt of community feedback, which is available on the Roads and Maritime website
- Community and stakeholders participation in the value management workshop on 18 February 2014, providing input into the selection of a preferred route option
- The Preferred Route Option Report (2014) placed on public display for a period of four weeks between May and July 2014 and public comment invited
- A community update sent to the proposal mailing list and property owners within or near the preferred route option corridor. The update included a description of the preferred route option, outcomes of the value management process, details about the displays, and how to make a submission
- A staffed drop-in session on 26 June 2014 during the display period to enable the community to ask questions about the route options and provide feedback
- Following exhibition of the preferred route option, review of submissions during the development of the concept design and environmental assessment process
- Community and stakeholder consultation activities throughout the process of developing the concept design and preparation of the REF
- Community and stakeholder consultation activities to seek feedback on potential measures to remember the existing heritage bridge.

5.2 Community involvement

The community and other stakeholders have provided input into the development of the route options and the assessment and refinement of the preferred route through a number of avenues since the start of the proposal. Local residents and property owners have provided invaluable knowledge about the history of Tabulam, the existing bridge, the behaviour of floods and other aspects of the proposal.

5.2.1 Announcement of study area

The start of investigations was announced in August 2013 by the local State member Mr. Thomas George. A community information drop-in session was held on Thursday 15 August 2013 at the Tabulam Community Hall. Approximately 60 people attended the drop-in session with 36 feedback forms returned either on the day of the drop-in session or sent by email or post following the session.

A *Preliminary Feedback Summary Report* (2013) was published and made available on the Roads and Maritime website. The report summarises the community feedback received during the initial stages of the proposal. This feedback was integrated into the development of the route options.

5.2.2 Announcement of shortlisted route options

The announcement of four shortlisted route options was made in December 2013. A drop-session was held on Tuesday 10 December at the Tabulam Community Hall. A total of 29 community members attended, which included local residents and other interested community members.

Meetings with landowners affected by any of the four shortlisted route options were also held in December 2013.

5.2.3 Feedback on the shortlisted route options

Following the announcement of the shortlisted route options, the community update and the drop-in session on 10 December 2013, a *Community Feedback Summary Report* (2014) was published and is available on the Roads and Maritime website. A summary of the feedback received is outlined in Table 5-1.

Table 5-1 Summary of public display feedback

Option	Benefits/opportunities	Challenges/issues
A	Good road alignment Reduced flooding impacts Minor impact on nearby properties Better approach to bridge Minimal traffic disruption.	This option is longer and only uses one of the overflow bridges Safety impacts on preschool Potential for drivers to speed Impacts to flora and fauna Dangerous bend at western approach Loss of existing overflow structure – perception bridge will not be replaced Loss of usable farmland.
B	Shortest and cheapest option Uses existing overflow bridges Pleasant view of the bridge from Tabulam Road Curved structure reduces degree of curve on first overflow bridge Most economical of the four options with less risk of a motor vehicle accident.	Bridge is curved which can be a risk for drivers Likelihood of flooding impacts both during and after construction The loss of a cohesive village due to impact on farmland, picnic area and access points to river during construction Impacts to flora and fauna Traffic impacts during construction.
C	Minor impacts on properties located on both sides of the river Potential for less interference on livelihood (eg farming) Similar location to existing bridge.	Corner very tight past preschool on the western side Loss of useable farmland, picnic area and access to the river Encroachment on preschool Dangerous bend near intersecting road (Clarence River Road) Only uses one overflow bridge.
D	Good alignment gives room to have a park on eastern side Least interruption and effect on residents Takes the highway away from the preschool and eliminates a sharp corner A more direct route Fewer impacts on native fauna Still uses one of the overflow bridges Better for semi-trailers.	Risk of flooding during construction Loss of useable farmland, picnic area and access to river The difficulty may be the cost of access roads Longer and therefore more expensive. Only uses one overflow bridge.

5.2.4 Value management workshop

Following the display of the four shortlisted route options and analysis of community comment, a value management workshop was held on 18 February 2014 at Casino to assess the four shortlisted route options and recommend a preferred route option.

The workshop was attended by 26 participants, which consisted of representatives from Roads and Maritime, Transport for NSW, GHD (Roads and Maritime Contractor), relevant sub-consultants, Kyogle Council, Tenterfield Shire Council, six community members and a workshop facilitator.

The workshop recommended that Options C and D should move forward as the preferred options to be progressed.

Further investigations and assessment resulted in Option D being recommended as the preferred option. The preferred route option was identified following consideration of the technical investigations, community feedback and the outcomes of the value management workshop.

5.2.5 Public display of the preferred option

Option D, the proposal, was placed on public exhibition between May and July 2014. The consultation included:

- Community update
- Display of the *Preferred Route Option Report* on Roads and Maritime website
- A drop-in session at Tabulam Community Hall on 26 June 2014 to answer questions and receive input. Feedback forms were also available.

The feedback received as a result of the consultation has been considered in the development and assessment of the proposal.

5.2.6 Remembering the existing heritage bridge

The issue raised most by the community during consultation on the proposal was the loss of the existing state heritage listed bridge, given many in the community identify with the existing Tabulam bridge. The removal of the existing bridge forms part of this proposal, for reasons provided in Section 6 of this document. As part of the development of mitigation strategies, Roads and Maritime consulted with interested community members and stakeholders to investigate measures to remember the existing bridge when the new bridge is built. The development of such measures would take into consideration the history of the Tabulam bridge and how it can be remembered.

The consultation included:

- Project update
- Meetings with community members and stakeholders to discuss potential options around remembering the bridge, including reuse of materials, landscaping, and urban design elements incorporated into the design of the new bridge.

5.3 Aboriginal community involvement

Roads and Maritime has consulted with Aboriginal representatives following the guidelines set out in *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI).

Site surveys of the four route options have been carried out with Jubullum Local Aboriginal Land Council representatives and Western Bundjalung native title claimants in accordance with the PACHCI process.

No known Aboriginal objects or places were identified within the study area, despite the area being within a significant archaeological and cultural landscape for Aboriginal cultural heritage. However, directly north of the existing bridge on the eastern side of the Clarence River are three places of cultural importance - the 'Big House', 'Black Camp' and 'The Birthplace'.

The sensitivity and cultural importance of the past presence of the 'Big House', 'Black Camp' and 'The Birthplace' have been considered in route option development. This is further discussed in Section 6.3.

5.4 ISEPP consultation

Consultation with councils and other public authorities is prescribed in clauses 13 to 17 of the ISEPP. Consultation is required in relation to specified development (Clause 16) or development that impacts on:

- Council related infrastructure or services (Clause 13)
- Local heritage (Clause 14)
- Flood liable land (Clause 15).

Legal advice is that the existing bridge is owned by both Tenterfield Shire and Kyogle councils as the bridge spans the council boundary.

As the proposal has the potential to impact on council related infrastructure, local heritage and is partially located on land subject to flooding, Roads and Maritime has consulted with Kyogle and Tenterfield Shire councils. Consultation has included a number of meetings to discuss the proposal with representatives of each council present at the regular design progress meetings and at the risk management workshop.

Formal written consultation from Roads and Maritime to Kyogle and Tenterfield Shire Councils was completed in July 2014 in accordance with clause 13 of ISEPP. The correspondence outlined the proposal, enclosed a sketch of the concept design, and requested additional comments on the proposal.

Both councils have given verbal support for the proposal and provided written feedback (see Appendix E). Tenterfield Shire Council has requested that Aboriginal heritage be appropriately considered, which is addressed in section 6.3. Kyogle Council requested consideration of flooding (see Section 6.8).

Roads and Maritime would continue to consult with Kyogle and Tenterfield Shire Councils throughout the detailed design and construction phases of the proposal.

The project team consulted with the Roads and Maritime Services Maritime Division in relation to construction of structures in and over a navigable waterway (as required under clause 16 of ISEPP). The Maritime Division (refer to the correspondence in Appendix E) have confirmed that the Clarence River is a navigable waterway as defined under the *Marine Safety Act 1998* and have requested the following measures be implemented during construction and operation of the proposal:

Construction

- A navigational aids plan to be prepared and approved by the Maritime Division prior to works started
- Appropriate navigational marks, signage and notices to be installed as per the approved plan
- Notices to be placed in local newspapers and on the website to update the community and waterway users of construction progress
- Consultation to be carried out with the Maritime Division to manage waterway traffic during construction.

Operation

- A dedicated channel to be provided under one bridge span each for both upstream and downstream traffic
- A schedule of work to be submitted to Maritime Division outlining proposed navigational aids on the bridge
- Suitable navigational aids to be provided on the bridge, including signage, reflectors and buoys
- A hydrographic survey to be carried out of the proposal site to ensure that the area is free of obstructions on completion of construction.

The measures described above have been incorporated into the development of the proposal design and the summary of safeguards and management measures in Section 7.2.

The proposal would not impact on any other relevant matters listed in clause 16 of ISEPP. Therefore no further ISEPP consultation has been carried out.

5.5 Government agency and stakeholder involvement

In addition to the ISEPP consultation, Roads and Maritime have invited comment from the following government agencies:

- Department of Primary Industries (DPI)
- NSW Office of Water
- Local Land Services (LLS)
- Crown Lands Division (Department of Trade and Investment)
- Environmental Protection Agency (EPA).

Feedback from these agencies is included in Appendix E and addressed in Table 5-2.

Table 5-2 Stakeholder feedback

Agency	Feedback and date received	Response
DPI	No objections to the proposal.	Not applicable however DPI (Fisheries) will be notified of dredging and reclamation works.
NSW Office of Water	Response provided on 1 August 2014 included: 1. Wherever possible there should be minimal disturbance of the bed & banks of the river. This is to be incorporated into the design and during construction of the new bridge and removal of the existing heritage structure and supports. 2. Appropriate sediment and erosion control should be undertaken during construction and post construction until the site has been stabilised. 3. The riparian zone should be managed in line with the 'Guidelines for Riparian Corridors on Waterfront Land' brochure. 4. A vegetation management plan should be developed for the proposal to maintain or enhance the riparian zone and minimise any possible future erosion on the site.	Comments addressed in the following sections: 1. Measures to minimise bed and bank disturbance are provided in Table 6-25 2. Measures to minimise erosion and sedimentation are provided in Table 6-21. 3. Measures to manage riparian land are provided in Table 6-4. 4. Requirements for the vegetation management plan for the proposal are provided in Table 6-4.
LLS	Response received 29 August 2014. No comment provided.	Not applicable.

Agency	Feedback and date received	Response
Crown Lands Division	Response provided on 12 August 2014. Details of the Crown land affected by the proposal was confirmed and the following comments provided: 1. Impacts on recreation values of the river including noise, visual amenity and water quality must be considered. 2. Tabulam Water Board should be consulted. 3. Council should be consulted regarding Reserve 88164. 4. Redundant areas of the old road once the existing bridge is removed should be considered for inclusion in the council reserve. 5. Impacts on the recreation values of Reserve 88164 should be considered. 6. DPI should be contacted regarding Tabulam dip site. 7. Access and impacts to Reserve 47692 should be considered for travelling stock and recreation. 8. Ongoing consultation requested.	1. Potential noise, visual and water quality impacts of the proposal are addressed in sections 6.5, 6.10 and 6.12. 2. The Secretary of the Tabulam Water Board was contacted by phone on 8 September 2014 who was aware of the proposal and had received community updates. No concerns were raised on behalf of the Board. It was advised the Board would be notified of the REF exhibition in order to make a submission if desired. 3. Ongoing consultation with both affected councils is being undertaken by Roads and Maritime regarding all aspects of the proposal. 4. Acquisition of public land following bridge removal is currently being negotiated with council. 5. Impacts on the recreation values of Crown land affected by the proposal are addressed in section 6.15. 6. Details of the dip site at Tabulam have been acquired from DPI. This issue is addressed in section 0. 7. Impacts on the values of Crown land affected by the proposal are addressed in section 6.15 8. Ongoing consultation would be undertaken by Roads and Maritime with Crown Lands regarding the proposal.
EPA	Response provided on 24 September 2014. The EPA confirmed that they are the appropriate regulatory authority for the proposal and that the works are not scheduled under the POEO Act. Correspondence stated the EPA does not provide planning input to proposals but requested best practice management, as demonstrated by Roads and Maritime on other Pacific Highway jobs, be implemented to manage water, noise, air and contamination impacts.	Measures to manage potential air, noise, water quality and contamination impacts are summarised in section 7.2.

5.6 Ongoing or future consultation

Future planned consultation to be carried out would include:

- Meetings with Kyogle and Tenterfield Shire councils and other relevant stakeholders, including government agencies, utility providers, adjacent landowners, business owners and community stakeholders during the construction planning phase and construction and removal period
- Providing proposal updates to the local community during the construction planning phase and construction and removal period
- Updating the Roads and Maritime 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 proposed new bridge, and the removal of the existing bridge.

All aspects of the environment potentially impacted by the proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required? (DUAP 1999) and Roads and Related Facilities (DUAP 1996)* under clause 228(1)(b) of the *Environmental Planning and Assessment Regulation 2000*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in Appendix D. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Terrestrial biodiversity

This section addresses the terrestrial biodiversity impacts associated with the proposal and details the mitigation measures proposed to mitigate these impacts.

The information presented in this section is drawn from the Terrestrial Flora and Fauna Assessment (2014). The complete report is provided in Appendix B.

6.1.1 Methodology

The methodology carried out to prepare the Terrestrial Flora and Fauna Assessment is described in the following sections.

Database searches and literature review

The following documentation was reviewed prior to the field investigations:

- Commonwealth Department of the Environment Protected Matters Search Tool for relevant matters of national environmental significance listed under the EPBC Act (June 2014, buffered at 10 kilometres)
- OEH Wildlife Atlas database for threatened species listed under the TSC Act (within a 10 kilometre radius of the site)
- Online threatened biodiversity profiles for endangered ecological communities known to occur within the locality (Northern Rivers)
- DPI Threatened and Protected Species Records Viewer for threatened species listed under the FM Act previously recorded within the Northern Rivers
- OEH Vegetation Types Database for information regarding vegetation types
- DPI Noxious Weeds Database for information regarding noxious weeds
- Tabulam Bridge Microbat survey results.

Field surveys

Field surveys of the proposal site were conducted during the route options development stage by two ecologists on 15 - 17 January 2014. Further terrestrial surveys were completed on 30 June and 1 July 2014 to specifically assess the second overflow bridge and the concrete batching plant site.

Flora survey and vegetation mapping

A combination of random meander and targeted searches for threatened species was used to survey the proposal site and to map vegetation communities. Detailed descriptions of the survey techniques are provided in the Terrestrial Flora and Fauna Assessment (refer Appendix B).

Fauna survey

Searches for potential habitat for threatened fauna species included but were not limited to:

- Koala feed trees
- Hollow-bearing trees
- Potential roosts for microchiropteran bats
- Vegetated ponds, riparian vegetation and drainage lines for frogs and waterbirds.

The fauna survey comprised:

- Two days of diurnal bird and reptile surveys
- Two nights of spotlighting for threatened microbats, arboreal mammals and owls
- Deployment of a bat call recording device (Anabat) to record microchiropteran bats and targeted microbat survey of the bridge and overflow structures.

Ground debris searches were also carried out during the survey while incidentally traversing the site. These included active searches for small fauna and opportunistic observation of fauna activity such as scats, tracks, burrows or other traces.

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys.

Likelihood of occurrence of threatened species

Following collation of database records and species and community profiles a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the proposal site. The likelihood of threatened and migratory biota occurring in the proposal site was assessed based on the presence of records from the locality, species distribution and habitat preferences, and quality of potential habitat present.

6.1.2 Existing environment

Flora species

A total of 97 species of flora were recorded within the proposal site, comprising 24 native and 73 exotic species, mainly grasses and herbs. No threatened plant species were recorded within the proposal site. The full list of plant species recorded is presented in the Terrestrial Flora and Fauna Assessment in Appendix C.

Noxious and environmental weeds

The proposal site contains numerous exotic flora species, eight of which are declared as noxious weeds in the Kyogle and Tenterfield LGAs. A list of the noxious weeds recorded within the proposal site is provided in Table 6-1 . In addition to these noxious weeds there are a number of environmental weeds, in particular, exotic grasses, that occur throughout the proposal site.

Table 6-1 Declared noxious weeds of the Kyogle and Tenterfield LGAs recorded during the field survey

Scientific name	Common name	Control class
Lantana camara	Lantana	4
Xanthium species	Bathurst/Noogoora Burr	4
Rubus fruticosus aggregate species	Blackberry	4
Ageratina adenophora	Crofton Weed	4
Sorghum halepense	Johnson Grass	4
Ligustrum sinense	Narrow-leaf Privet	4
Ambrosia artemesiifolia	Annual Ragweed	5
Cestrum parqui	Green Cestrum	3

Class 5 noxious weeds (restricted plants) require control as per requirements for the notifiable weed. Class 4 weeds (locally controlled weeds) are widely spread and likely to spread further. Control is undertaken according to specific measures by a local control authority. Class 3 weeds (regionally controlled weeds) are likely to spread and must be fully and continuously suppressed and destroyed.

Vegetation types

Overall the proposal site is highly modified with no remnant native vegetation. The site predominantly comprises a dense cover of exotic grasses and weeds, including Paspalum (*Paspalum dilatatum*), Rhodes Grass (*Chloris gayana*), Buffalo Grass (*Stenotaphrum secundatum),* Couch (*Cynodon dactylon*), Kikuyu (*Pennisetum clandestinum*), Pigeon Grass (*Setaria incrassata*) and Purpletop (*Verbena bonariensis*).

There are occasional, isolated trees and shrubs, predominantly exotic or garden species, including Jacaranda (*Jacaranda mimosifolia*), Crepe Myrtle (*Lagerstroemia* sp.), Cadagi (*Corymbia torreliana)* and the native Weeping Bottlebrush (*Callistemon viminalis*) and Lightwood (*Acacia implexa*). Dense stands of the exotic Castor Oil Plant (*Ricinus communis*) occur on the eastern bank of the Clarence River.

Fauna species

Seven mammals, one frog, four reptiles and 33 bird species were observed. The full list of fauna species recorded is presented in Terrestrial Flora and Fauna Assessment in Appendix B. Guilds and bird species observed included:

- Forest birds including the Pied Currawong (*Strepera graculina*) and Laughing Kookaburras (*Dacelo leachii)*
- Parrots common in urban and agricultural landscapes such as the Rainbow Lorikeet (*Trichoglossus haematodus*) and introduced bird species, including the Common Myna (*Acridotheres tristis*).

No owls, ground-dwelling or arboreal mammal species were recorded during field surveys.

One common frog, the Eastern Dwarf Tree Frog (*Litoria fallax),* was recorded along the banks of the Clarence River.

The threatened Grey-headed Flying-fox (*Pteropus poliocephalus*) was observed flying downstream of the proposal site. However there is no foraging or roosting habitat available at the site. Community feedback has identified that the remnant native riparian vegetation to the north-east of the site is often used by Grey-headed Flying- foxes for feeding during eucalypt flowering periods and temporary roosting (2014).

Four common reptiles were recorded, including the Longneck Turtle (*Chelodina longicolli)* and Eastern Water Dragon (*Physignathus lesueurii).*

It is considered highly likely that platypus (*Ornithorhynchus anatinus*) are present as water ripples consistent with platypus activity were observed.

Six microchiropteran bat species were confidently identified via calls recorded from underneath the bridge and Overflow Bridge No. 2, including one threatened species (the East-coast Free-tailed Bat *Mormopterus norfolkensis)* and five common species (Table 6-2). A number of other species were assigned as probable or species groups, including five threatened species (the Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*, Greater Broad-nosed Bat *Scoteanax rueppellii*, Eastern False Pipistrelle *Falsistrellus tasmaniensis,* Little Bentwing-bat *Miniopterus australis* and Large-footed Myotis *Myotis macropus*) (Table 6-2).

A total of 155 calls were recorded on the Anabat. Approximately 54 microbat individuals were spotlighted.

Table 6-2 Summary of anabat call analysis (January and June 2014)

Species name	Legislative status	Common name	Confidence rating	Total calls	Roost preference
Chalinolobus gouldii	Not listed	Gould's Wattled Bat	Definite	1	Tree hollows and buildings
Chalinolobus gouldii	Not listed	Gould's Wattled Bat	Probable	3	Tree hollows and buildings
Chalinolobus gouldii *Mormopterus* sp.	Not listed	Gould's Wattled Bat	Species group	1	Tree hollows and buildings
Chalinolobus morio	Not listed	Chocolate Wattled Bat	Probable	1	Tree hollows, caves, disused fairy martin nests, bridges, culverts and buildings
Miniopterus schreibersii oceanensis *Vespadelus* sp.	Vulnerable TSC Act Not listed	Eastern Bentwing-bat/ *Vespadelus* sp.	Species group	8	Caves, mines, bridges, culverts and buildings
Mormopterus norfolkensis	Not listed	East-coast Free-tailed Bat	Definite	6	Tree hollows and buildings
Mormopterus ridei/ norfolkensis	Not listed	East-coast Free-tailed Bat	Species group	8	Tree hollows and buildings
Mormopterus sp.	Not listed	-	Species group	1	
Myotis macropus Nyctophilus sp.	Vulnerable TSC Act	Large-footed Myotis	Species group	38	Caves, disused fairy martin nests, bridges, culverts and buildings
Rhinolophus megaphyllus	Not listed	Smaller Horseshoe Bat	Definite	1	Tree hollows, caves, nests, bridges, culverts and buildings
Scoteanax rueppellii *Scotorepens orion Falsistrellus tasmaniensis*	Vulnerable TSC Act Not listed Vulnerable TSC Act	Greater Broad-nosed Bat/ Eastern Broad-nosed Bat/ Eastern False Pipistrelle	Species group	11	Tree hollows and buildings
Tadarida australis	Not listed	White-striped Freetail-bat	Definite	1	
Vespadelus darlingtoni	Not listed	Large Forest Bat	Definite	1	Tree hollows
Vespadelus darlingtoni	Not listed	Large Forest Bat	Probable	5	Tree hollows
Vespadelus darlingtoni/ regulus	Not listed	Large Forest Bat/ Southern Forest Bat	Species group	21	Tree hollows
Vespadelus pumilus *Miniopterus australis*	Not listed Vulnerable TSC Act	Eastern Forest Bat/ Little Bentwing-bat	Species group	1	Tree hollows, caves, mines, bridges and buildings
Vespadelus pumilus	Not listed	Eastern Forest Bat	Definite	1	Tree hollows

Species name	Legislative status	Common name	Confidence rating	Total calls	Roost preference
Vespadelus regulus	Not listed	Southern Forest Bat	Probable	7	Tree hollows
Vespadelus sp. *Chalinolobus morio*	Not listed Not listed	Chocolate Wattled Bat	Species group	7	Tree hollows, caves, disused fairy martin nests, bridges, culverts and buildings
Vespadelus troughtoni *Vespadelus vulturnus/ pumilus*	Vulnerable TSC Act Not listed	Eastern Cave Bat/ Little Forest Bat/ Eastern Forest Bat	Species group	14	Caves and buildings/tree hollows
Other bats	Not listed	-	-	18	NA

The survey (2014a) found:

- Potential microbat roosting habitat at Tabulam bridge
- No significant bat colonies were recorded roosting at Tabulam bridge
- A total of 254 call sequences were analysed. Three species were recorded as definite: the threatened Little Bentwing-bat (*Miniopterus australis),* the threatened East-coast Freetail-bat (*Mormopterus norfolkensis)* and *Mormopterus* sp. Six species were recorded as probable, including the threatened Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and Southern Myotis *(Myotis macropus*)
- Approximately 91 microbats were spotlighted roosting in the Clarence River Overflow Bridge No. 1. They were likely to be from the family Vespertilionidae, with probable Large-footed Myotis and bentwing bats observed.

Fauna habitats

Apart from the microbat habitat discussed above, the proposal site contains limited habitat for terrestrial flora and fauna species. There are three main habitat types in the proposal site:

- Exotic vegetation
- Bridge and overflow structures
- Clarence River.

These habitat types are described below.

Exotic vegetation

This habitat type is dominated by exotic grasses and weeds, with a few (mostly exotic) isolated trees and shrubs. Structural diversity of the vegetation and density of leaf litter is low, and this vegetation is unlikely to provide important shelter and foraging resources for native invertebrates, reptiles and ground-dwelling mammals.

There is no intact native canopy or shrub layer and this vegetation is unlikely to provide foraging habitat for forest birds or arboreal mammals. Foraging habitat is only available for birds that use open grasslands, such as raptors and ravens. There are no hollow-bearing trees and this vegetation would not provide nesting or denning habitat for hollow-dependant arboreal mammals, bats or birds.

Bridge and overflow structures

The existing timber bridge has concrete in-water pylons and timber/steel on-bank supports. The deck consists of timber slats on a metal frame. Potential microbat roosting habitat occurs throughout Tabulam bridge, including decking gaps across the bridge, split timber headstocks on the approach span and timber joins at the piers. Welcome Swallows (*Hirundo neoxena*) were noted nesting in the existing bridge rails.

The Clarence River Overflow Bridges No. 1 and 2 have concrete pylons and surfaces with gaps underneath that provide microbat roosting habitat. Guano staining is present around the concrete gaps on the underside of the overflow bridges, indicating microbat usage. Disused Fairy Martin (*Hirundo ariel*) nests also provide potential microbat roosting habitat.

Clarence River

The Clarence River is shallow (approximately two metres deep and 100 metres wide) with slow flowing freshwater. There are no riffles, sandbanks, emergent woody snags or backwaters within the proposed site, although emergent woody snags occur upstream and downstream of the site. Riparian vegetation consists of exotic grasses and weeds, Weeping Bottlebrush and Castor Oil Plant. There is a moderate amount of aquatic vegetation present, including the native species of Ribbonweed (*Vallisneria* sp.) and Swamp Lily (*Ottelia ovalifolia*).

The introduced aquatic plant, Dense Water Weed (*Egeria densa*) was also present.

It is considered highly likely that platypus (*Ornithorhynchus anatinus*) occur at the site as water ripples consistent with platypus activity were observed. There is abundant in-stream and fringing aquatic reeds and sedges, providing potential habitat for aquatic macroinvertebrates and fish. The river also offers potential foraging habitat for microbats, birds, frogs and reptiles, including the threatened East-coast Free-tailed Bat (*Mormopterus norfolkensis*) and Large -footed Myotis (*Myotis macropus*) which has been previously recorded (probable confidence rating) foraging beneath the bridge.

Aquatic habitats are further discussed in Section 6.2.

Threatened ecological communities

Threatened Species Conservation Act (1995)

The desktop review indicates six endangered ecological communities listed under the *Threatened Species Conservation Act* (TSC Act) are known to occur in the locality, being the area within 10km of study area. The vegetation community that occurs at the site is not characteristic of any endangered ecological community listed under the TSC Act.

Environment Protection and Biodiversity Conservation Act (1999)

The desktop literature review indicates two threatened ecological communities listed under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act), lowland rainforest of subtropical Australia and white box-yellow box- Blakely's red gum grassy woodland and derived native grassland, are predicted to occur at the site.

The vegetation community that occurs at the site is not characteristic of a threatened ecological community listed under the EPBC Act.

Groundwater dependent ecosystems

The *Risk Assessment Guidelines for Groundwater Dependent Ecosystems – The Conceptual Framework* (Serov *et. al.,* 2012) developed by the NSW Office of Water and the OEH provides an approach to identification, classification, ecological valuation, and ecological risk assessment for a given activity or potential impact on a groundwater source. It also details a series of steps to identify and infer the level of groundwater dependency and provides a summary of risk assessment guidelines for groundwater dependent ecosystems.

A search of the NSW Natural Resource Atlas was carried out to determine groundwater levels within the proposal site. Two boreholes have been drilled west of the Clarence River in Tabulam. These bore holes identified the standing water level at 11.8 metres.

Given the relatively deep groundwater levels recorded at the proposal site it is unlikely that the exotic vegetation occurring at the proposal site has the potential to be drawing on groundwater.

Threatened species and endangered populations

Flora

The desktop literature review indicates that four threatened plant species listed under the TSC Act have been previously recorded or are predicted to occur in the locality. The review also indicated 11 threatened flora species listed under the EPBC Act previously recorded, or predicted to occur in the locality. No threatened flora was recorded at the proposal site during the field surveys. The threatened flora species known or predicted to occur in the locality are considered unlikely to occur at the site as they have limited ranges and/or habitat requirements, which are not present at or surrounding the proposal site.

Fauna

The desktop literature review indicates 14 threatened fauna species listed under the TSC Act that have been previously recorded in the locality. Two species of microbat have been previously recorded with a definite confidence rating (2014a) during previous assessments at the proposal site (see Table 6-2):

- Little Bentwing-bat (*Miniopterus australis*)
- East Coast Freetail-bat (*Mormopterus norfolkensis).*

Additionally, four microbats have been recorded with a probable confidence rating (2014) during previous assessments at the proposal site:

- Large-footed Myotis (*Myotis macropus*)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis).*

There is potential foraging habitat associated with the Clarence River and roosting habitat associated with the bridge and overflow structures for these six microbats, two of which are known to occur and four of which are highly likely to occur. Additionally, Beccari's Freetail Bat (*Mormopterus beccarii)* has been previously recorded at Tabulam and is highly likely to occur at the proposal site. Of these threatened microbats, East Coast Freetail-bat, Greater Broad-nosed Bat and Beccari's Freetail Bat primarily roost in tree hollows and buildings rather than culverts/ tunnels or bridges. Little Bentwing-bat and Eastern Bentwing-bat may roost in the overflow structures outside of breeding season, but these sites are highly unlikely to be maternity roosts as the species have very specific maternity site requirements.

There are numerous records of Black-necked Stork (*Ephippiorhynchus asiaticus)* associated with the Clarence River floodplains east and west of the proposal site. Although there are no wetlands or floodplains and no potential roosting trees at the proposal site, the Clarence River provides potential foraging habitat for the species and there is a moderate likelihood that it could occur at least on occasion. The proposal site is unlikely to be important habitat for the species in the locality, but the species would nevertheless occur at the proposal site on occasion as part of a wider area of occupancy.

The desktop review also indicated 15 threatened fauna species listed under the EPBC Act that is predicted to occur in the locality. The threatened fauna predicted to occur in the locality are considered unlikely to occur on the site as they have limited ranges and/or habitat requirements which are not present at or surrounding the proposal site.

Migratory and marine species

The EPBC Act Protected Matters search identified 12 migratory and 15 marine species that have either been recorded or are predicted to occur within the locality.

No migratory species listed under the EPBC Act were recorded during field surveys. Based on a desktop review of known habitat association and the field survey, there is broadly suitable foraging habitat for three migratory species at the proposal site:

- Cattle Egret (*Ardea ibis*)
- Great Egret (*Ardea alba*)
- Rainbow Bee-eater (*Merops ornatus*).

Wildlife connectivity corridors

The proposal site does not intersect any key habitats or corridors mapped by OEH. The nearest areas of mapped key fauna habitat are approximately two kilometres north and south of the proposal site. There are no fauna corridors within the vicinity of the proposal site.

The vegetation at the proposal site is highly modified, consisting of predominantly exotic grasses and weeds. Wildlife movement through the proposal site is likely to be generally limited to the aquatic corridor associated with the Clarence River.

6.1.3 Potential impacts

Loss of vegetation/habitat

Threatened flora and ecological communities

This proposal site contains 11.12 hectares of exotic vegetation with scattered occurrences of native shrubs and trees, which is not characteristic of a threatened ecological community listed under the TSC Act or EPBC Act. Not all of this vegetation would be removed. Clearing would be minimised wherever possible.

Impacts on microbats

The proposal site encompasses 11.12 hectares of exotic vegetation with scattered occurrences of native shrubs and trees, unlikely to represent foraging habitat for these species. The aquatic corridor associated with the Clarence River is likely to be an important foraging resource for microbats, particularly Southern Myotis. However the proposal would not result in the permanent loss of this resource.

The proposal would remove the existing bridge and result in the loss of microbat roosting habitat. However the overflow structures, where the vast majority of microbats were recorded, are being retained. Only one microbat was recorded roosting under the existing bridge (2014a), whereas 91 were recorded roosting in the Overflow Bridge No. 1 (2014a) and 54 in Overflow Structure No. 2. Additionally, the new bridge and associated overflow bridge would provide additional microbat roosting habitat once constructed.

East Coast Freetail-bat, Greater Broad-nosed Bat, Eastern False Pipistrelle and Beccari's Freetail Bat primarily roost in tree hollows and buildings rather than culverts/tunnels or bridges (see Table 6-2). Little Bentwing-bat and Eastern Bentwing-bat may roost in the Tabulam Bridge and overflow structures outside of breeding season. But these sites would not be maternity roosts for these species as they have very specific maternity sites, which have been mapped elsewhere.

Large-footed Myotis could potentially use Tabulam bridge and overflow structures as maternal roost sites. Alternative roosting habitat (including hollow-bearing trees) occurs along the Clarence River north of the site. There are also other bridges (Glebe Bridge, Sportsmans Creek Bridge and McFarlane Bridge) in the wider area that all contain large maternities colonies of the threatened Southern Myotis (2014a).

No barriers to movement of microbats are anticipated. The proposal would remove the existing bridge and construct new in-stream pylons for the new bridge, which would allow for movement under and around the structure. The proposed works do not involve any structures that would pose a significant obstruction or hazard to the flight of birds or bats in the context of existing land uses in the locality.

The removal of the bridge may cause death or injury to any bats that may be roosting in the bridge at the time of removal. To minimise potential impacts on roosting bats, a microbat management plan (2014) has been prepared to provide specific safeguards during construction. Refer to Appendix D.

Impact on other native fauna

The proposal site includes approximately 11.12 hectares of exotic vegetation with scattered occurrences of native shrubs and trees. The proposal would not clear any important terrestrial foraging habitat (such as native canopy trees or structurally and floristically diverse native shrub and groundcover layers), hollow logs, hollow-bearing trees or stags.

The Clarence River is the most important fauna habitat feature of the proposal site, and a range of fauna including birds, microbats and amphibians may potentially forage at the proposal site on a transient and opportunistic basis as part of a wider area of occupation. The proposal would not result in the loss of this habitat.

Habitat fragmentation

The proposal does not intersect any key habitats or corridors mapped by OEH. The proposal involves constructing a new bridge and road adjacent to the existing bridge and road, which would therefore constitute a negligible impact. The severity of impacts arising from fragmentation and edge effects would be limited by the presence of existing disturbance.

Wildlife injury and mortality

The proposed work present an inherent risk of injury and mortality to native fauna. Specific risks include:

- Machinery during clearing and construction
- Operational traffic after completion, likely to be similar to the existing environment.

Management measures to address these impacts would be detailed in the CEMP, including vegetation clearing protocols and specific flora and fauna management measures.

Weeds

Construction may increase the degree of weed infestation through dispersal of weed propagules (seeds, stems and flowers) into areas of adjacent native vegetation via wind, water, workers' shoes and clothing, and construction vehicles. Although there is no native vegetation on site, vehicles and workers would be excluded from adjacent areas of native vegetation to assist in the management of weeds.

A vegetation management plan is recommended for the proposal, which would contain measures to avoid direct and indirect impacts on native vegetation adjoining the proposed development. The proposal is unlikely to result in an increase in weed infestation if properly managed under a vegetation management plan.

Pests and pathogens

Construction activities within the proposal site have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*) and Myrtle Rust (*Uredo rangelii*) through vegetation disturbance. There is little available information about the distribution of these pathogens within the locality, and no evidence of these pathogens was observed during field surveys. Phytophthora and Myrtle Rust can result in the dieback or modification of native vegetation and damage to fauna habitats.

A 'clean on entry, clean on exit' policy would be implemented during construction activities and include in the vegetation management plan.

Noise, vibration and light

Noise and vibration

The proposal site is within an existing road corridor with relatively low but constant traffic volumes. Habitats adjacent to the proposal site therefore already experience exposure to traffic noise, light and vibration. Construction of the proposal would occur within proximity of the overflow structures over approximately 18 months. Work is likely to result in noise and vibration impacts for microbats during this time.

At the completion of construction, site conditions would return to those currently experienced. Measures to mitigate noise and vibration impacts during construction, such as pre-construction surveys, construction buffers and construction monitoring, are included in the microbat management plan (2014).

Artificial lighting

The site currently experiences artificial lighting impacts from traffic, adjacent residential areas and street lighting. Night time security lighting can potentially discourage habitat use where diffuse light penetrates into adjoining areas of vegetation. The foraging regimes of some nocturnal native mammals and birds can be disrupted by lighting and make them vulnerable to predation by cats, dogs and foxes.

The magnitude of impact from artificial lighting would be low, as resident fauna are likely to have already adapted to conditions at the site. However additional construction lighting would be designed as ‘down lights’ wherever practicable and be directed inwards so as to not spill into the overflow structures, which are being utilised as microbat roost sites.

Key threatening processes

A key threatening process (KTP) is defined under the TSC Act as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities
- Could cause species, populations or ecological communities that are not currently threatened to become threatened.

There are currently 36 KTPs listed under the TSC Act, seven listed under the FM Act and 19 under the EPBC Act. A number of KTPs are listed under more than one Act. KTPs relevant to the proposal site are summarised in Table 6-3.

Table 6-3 Key threatening processes

KTP	Status	Comment
Clearing of native vegetation	TSC Act; EPBC Act	Clearing of native vegetation has occurred historically within and around the proposal site. This has resulted in a variety of impacts on the remaining native vegetation including increased weed invasion due to soil disturbance and edge effects. No native vegetation would be cleared for the proposal. A maximum of approximately 11.12 hectares of exotic vegetation would be impacted.
Loss of hollow-bearing trees	TSC Act	Past clearing at the site is likely to have resulted in a loss of hollow-bearing trees. At present there is a mixture of mature and immature vegetation within the proposal site. No hollow-bearing trees would be cleared for the proposal.
Removal of dead wood and dead trees	TSC Act	Past clearing at the site is likely to have resulted in a loss of trees. At present there is a mixture of mature and immature vegetation within the proposal site. No dead wood or trees would be cleared for the proposal.
Invasion of plant communities by perennial exotic grasses	TSC Act	The site has been subject to historical disturbance and consequently there are a number of invasive exotic perennial grasses that have invaded areas of native vegetation. This KTP is unlikely to be exacerbated on the site or in adjoining areas with the implementation of weed management measures.
Invasion establishment and spread of Lantana camara	TSC Act	The site has been subject to historical disturbance and consequently Lantana has invaded small patches of the proposal site. This KTP is unlikely to be exacerbated on site or in adjoining areas with the implementation of weed management measures.
The removal of large woody debris from NSW rivers and streams	FM Act	There is no emergent woody debris at the proposal site and it is not anticipated that the proposal would require the removal of large in-stream woody debris.
The degradation of native riparian vegetation along NSW water courses	FM Act	Clearing of riparian vegetation has occurred historically within and around the proposal site. This has resulted in a variety of impacts on the remaining native vegetation including increased weed invasion due to soil disturbance and edge effects. No native riparian vegetation would be cleared for the proposal.
In-stream structures and other mechanisms that alter natural flow	FM Act	The existing bridge alters flow on a small scale. However fish passage is not impeded. The new bridge would result in similar small-scale flow alterations and would not impede fish passage. Installation of in-stream structures for construction would enable natural flow and fish passage.

Operation

There would not be any significant additional impacts on native flora and fauna during proposal operation.

6.1.4 Safeguards and management measures

The measures described in Table 6-4 would be implemented to avoid or minimise potential impacts on native flora and fauna.

Table 6-4 Terrestrial biodiversity safeguards and management measures

Impact	Environmental Safeguards	Responsibility	Timing
Potential for direct impacts on native fauna species	A microbat management plan (2014b) has been developed and would be implemented during construction. The microbat management plan includes measures around: • Timing of works • Ecologist involvement • Pre-removal survey • Roost exclusion • Removal of individuals • Monitoring of bridge removal • Protection of roost sites • Creation of additional roost habitat • Work methods statements • Daily inspections • Inductions • Fauna handling and care of injured or captured animals.	Construction contractor	Construction
Potential for direct impacts on native fauna species	A pre-clearance procedure would be developed and implemented in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 1: Pre-clearing process) (RTA 2011a).	Construction contractor	Construction
Potential for direct impacts on native fauna species	Fauna handling would be conducted in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 9: Fauna handling) (RTA 2011). Any unexpected threatened species finds would be dealt with in accordance with the Biodiversity Guidelines Guide1: Unexpected threatened species finds procedure (RTA, 2011).	Construction contractor	Construction
Direct impacts to vegetation	A vegetation management plan would be prepared for the proposal and include:	Construction contractor	Pre-construction
Direct impacts to vegetation	Relevant measures from the Office of Water Guidelines for Riparian Corridors on Waterfront Lands and Guidelines for Vegetation Management Plans.	Construction contractor	Construction
Direct impacts to vegetation	Exclusion zones to be identified and demarcated in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 2: Exclusion zones) (RTA 2011).	Construction contractor	Construction
Direct impacts to vegetation	Protocols for clearing of vegetation to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 4: Clearing of vegetation and removal of bushrock) (RTA 2011).	Construction contractor	Construction
Direct impacts to vegetation	Protocols for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 7: Pathogen Management) (RTA 2011).	Construction contractor	Construction

Impact	Environmental Safeguards	Responsibility	Timing
Direct impacts to vegetation	Protocols for preventing or minimising the spread of noxious and environmental weeds to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management) (RTA 2011).	Construction contractor	Construction
Direct impacts to vegetation	Protocols for the re-establishment of native vegetation to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 3: Re-establishment of native vegetation) (RTA 2011).	Construction contractor	Post - construction
Potential for artificial lighting impacts on native fauna	Down-lights and motion sensor lighting would be used to reduce light spill and the associated secondary impact on nocturnal fauna species potentially utilising the adjoining vegetation, bridge and overflow structures.	Construction contractor	Construction

6.2 Aquatic biodiversity

This section addresses the aquatic biodiversity impacts associated with the proposal and details the management measures proposed to mitigate these impacts.

The information presented in this section is drawn from the Aquatic Habitat Assessment which is provided in Appendix C.

6.2.1 Methodology

Desktop review

A desktop review of relevant information was carried out to determine the aquatic fauna and habitat likely to be present at the site and the potential impacts of the proposal. Information reviewed included:

- Published and unpublished literature research and reports
- Aerial photography
- DPI Threatened and Protected Species Records Viewer.

Aquatic survey

An aquatic field survey of the proposal site was conducted on 17 July 2014. The survey extended from approximately 40 metres upstream of the existing bridge to approximately 240 metres downstream of the proposed new bridge.

The aquatic survey consisted of:

- Aquatic habitat survey - A total of 49 samples sites were surveyed from a boat over six transects traversing the river within the proposal area. At each site the depth; vegetation species, cover and height; substrate type; and presence of woody debris were recorded. Water clarity was such that virtually all habitats across all depths at the site could be visually assessed from the surface. However, samples of vegetation (and sediment) were also obtained by grapple
- Side-scan echo sounder survey - an echo sounder survey of the area immediately upstream and immediately downstream of the proposal site was undertaken. The survey utilised both side- and down-imaging to record submarine habitat features, indications of substrate type and water depth throughout the entire study area. The sonar was monitored during the survey to highlight areas of interest, with sonar files logged for later verification. All aquatic habitat types present at the site were identified and appropriately characterised during the field inspection
- Depth data collected during the sonar survey were utilised to produce a bathymetric map of the study area, which further assisted in mapping of aquatic habitat features
- Bankside woody debris (that was not recorded in the transect surveys) was located by global positioning system (with reference to aerial photography) and recorded. Dominant species and approximate location of riparian vegetation was also recorded.

Aquatic vegetation mapping

Aquatic vegetation was surveyed over an area of approximately 2.8 hectares. Vegetation between these sites was inferred using comprehensive depth data, side-scan and down-scan imaging records and additional field observation notes. Data were imported into MapInfo to produce a detailed vegetation distribution map of the study site.

6.2.2 Existing environment

River substrate and depth

The river bed throughout the study area generally consists of soft sediment. The substrate varied from a fine silt mud through coarse sandy mud to areas towards the bar/riffle section at the downstream end of the pool where it was cobble and pebble sized rocks interspersed by coarse sandy sediment.

In general the depth of the study area was relatively shallow with the majority less than 2.5 metres in depth (see Figure 6-1). The downstream end of the study area was generally the shallowest being mostly less than two metres deep. There were a number of deeper areas, around 3.5 metres deep, downstream of the existing bridge, likely due to increased scour from flow constriction between the existing bridge piers.

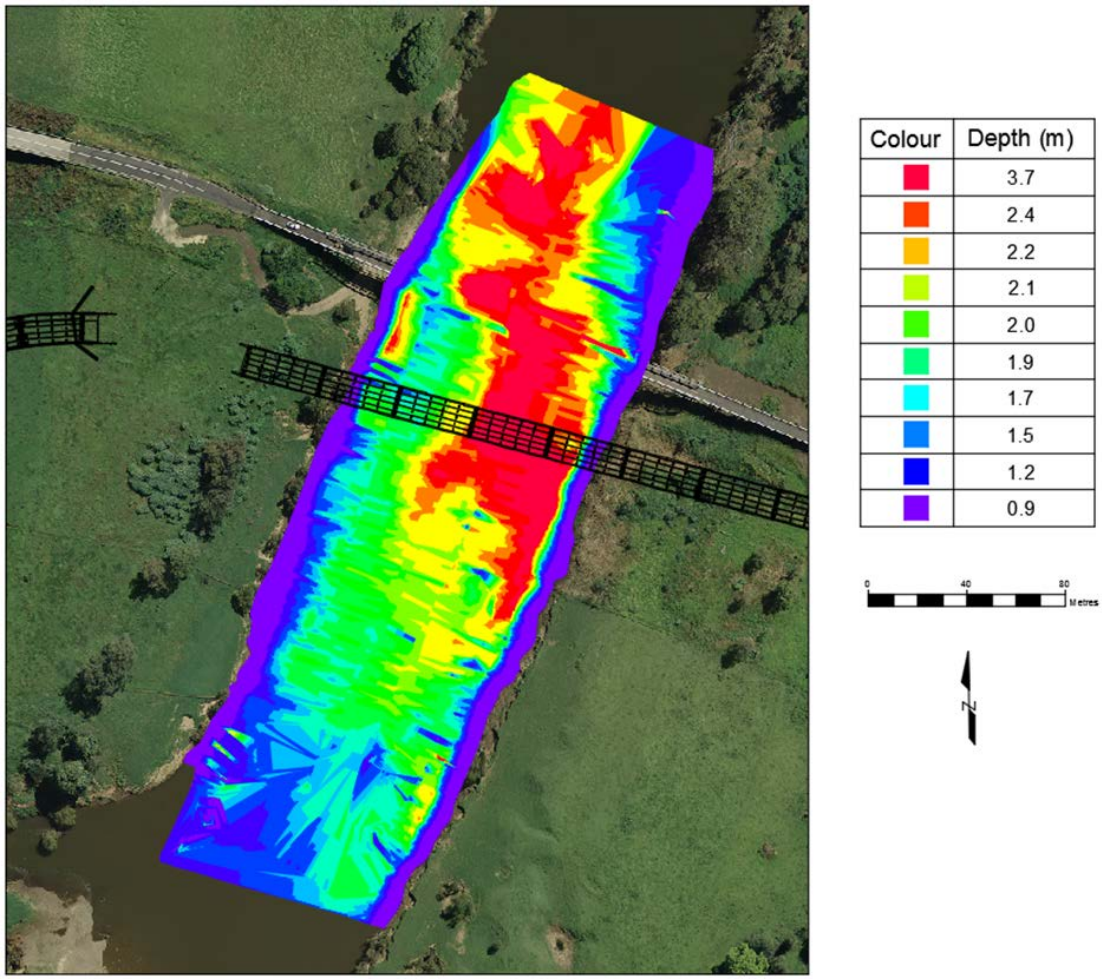


Figure 6-1 River depth (source: Hydrosphere Consulting)

Aquatic vegetation

Field surveys revealed significant areas of aquatic vegetation within the study area (refer Figure 6-2). The vegetation consisted of charophytes and five species of macrophytes. The most dominant vegetation present throughout the area were charophytes (*Chara* spp./*Nitella* spp.). Coverage of charophytes at the survey sites ranged from five to 100 per cent and heights within the water column ranged from approximately 0.3 metres to 3.2 metres above the river bed. Significant areas of charophytes were also intermixed with *Hydrilla verticillata* or *Najas tenuifolia*.

Aquatic vegetation along the fringing shoreline (particularly the eastern bank) was dominated by the floating emergent *Ludwigia peploides* spp. *Montevidensis,* which was generally underlain by *Chara* spp./*Nitella* spp. There were some smaller areas where *Vallisneria nana*, *Potamogeton crispus* (towards the southern end of pool), *H. verticillata* and/or *N. tenuifolia* were also present underneath the *L. peploides* spp. *montevidensis*. All aquatic vegetation species were native and not listed as threatened under state or federal legislation.

Figure 6-2 Aquatic vegetation map (source: Hydrosphere Consulting)

Large woody debris

Large woody debris plays an important role in the healthy functioning and sustainability of many freshwater rivers and creeks by:

- Providing shelter and structure to aquatic organisms to hide from predators, ambush prey and refuge from strong flows
- Providing structure for algae and aquatic macrophytes to colonise
- Providing structure for fish spawning sites
- Providing refuge, nesting and roosting sites for birds
- Providing a source of organic nutrients and food for detritivores
- Stabilising river banks and channels
- Promoting different geomorphological features such as scour holes, bars, islands and channels.

Only a limited amount of large woody debris was observed in the study area during the field survey. These ranged from small logs to large complex tree snags standing in-stream (refer Figure 6-2).

Riparian vegetation

Riparian vegetation at the study site was relatively modest (refer Figure 6-2). The majority of the riparian trees (primarily *Callistemon* sp.) were present on the western bank downstream of the existing bridge and overlapping the likely footprint of the proposed bridge. There was also a significant area of bank vegetation on the eastern side upstream of the existing bridge.

There is little riparian vegetation on the eastern bank of the river under and downstream of the new bridge alignment. This area offers little in terms of fish habitat apart from the dense sub-surface macrophyte growth.

Although riparian vegetation was relatively sparse within the study area, there are significant areas of riparian habitat close to the site and throughout the wider Clarence River.

Habitat type and waterway classification

The aquatic habitat present within the Clarence River at the proposal site includes large areas of native aquatic vegetation and woody debris larger than 300 millimetres in diameter. This is characteristic of a Type 1 habitat - ‘highly sensitive key fish habitat’.

The river at this location is a permanently flowing or flooded freshwater waterway and hosts potential habitat for threatened species (Eastern Freshwater Cod; Purple Spotted Gudgeon) which is characteristic of a ‘Class 1- major key fish habitat’ waterway (DPI 2013).

Aquatic fauna

A range of aquatic fauna species were identified as having the potential to inhabit or utilise the site based on surveys of the habitat present at and within the vicinity of the site and the aquatic communities known to occur in other parts of the Clarence River. These are listed in the Aquatic Habitat Assessment (refer Appendix C) and include 20 species of fish, as well as crustaceans, turtles and platypus. Of these, two species have conservation significance; Eastern Freshwater Cod (*Maccullochella ikei*) - listed as endangered under the FM Act and EPBC Act and Purple Spotted Gudgeon (*Mogurnda adspersa*) - listed as endangered under the FM Act. Additionally, Australian bass and Eel-tailed Catfish are considered to be recreationally important angling species. Two pest species were also identified as likely being – the goldfish and mosquito fish.

6.2.3 Potential impacts

Construction

The construction phase is expected to have the highest potential impacts and in particular the establishment and subsequent removal of any in-stream works platforms. The key environmental impacts associated with the proposal for the aquatic environment are:

- Habitat removal and disturbance including clearing of riparian vegetation, disturbance and destruction of aquatic vegetation and removal of large woody debris
- Aquatic fauna disturbance including disturbance and displacement of platypus, turtles, fish and other aquatic fauna
- Aquatic fauna passage barriers, regarding physical, behavioural and hydraulic barriers to aquatic fauna passage including migrating/dispersing fish, platypus and turtle movement
- Altered stream flows
- Water quality, in particular sedimentation and turbidity, but also industrial liquids spills, construction debris and general litter and in-situ concrete pours
- Aquatic weeds, in particular, the potential for the introduction or exacerbation of aquatic weeds in the waterway.

Habitat removal/ disturbance

Riparian vegetation

A small area of riparian vegetation would be removed on the western bank for the construction of the new bridge and removal of the existing heritage bridge. This may result in a reduction of local aquatic habitat features including shading, bank structure and the potential to contribute to large woody debris. Given the modest levels of riparian vegetation within the reach, any destruction is considered potentially significant and therefore rehabilitation of any areas cleared of riparian vegetation is required (refer Table 6-5).

Aquatic vegetation

The river bed immediately upstream, within and downstream of the proposal site is almost entirely covered by aquatic vegetation of varying species dominated by *Chara* spp./*Nitella* spp.

Construction of the proposal would impact on aquatic vegetation during:

- Temporary in-stream works - construction of in-stream work pads for both construction of the new bridge and removal of existing bridge over any areas of aquatic vegetation would result in the destruction of vegetation directly under the footprint of the pads
- Construction of the new bridge - in-stream piers and any associated form/foundation work would result in the destruction of any aquatic vegetation in their direct footprint. Shading by the bridge structure may reduce future aquatic vegetation growth within the immediate vicinity of the bridge
- Removal of the existing heritage bridge - some disturbance around the piers during removal is expected (in addition to the work platform impacts), but is likely to be minimal. The shading due to the new bridge would be largely, but not totally, offset by the removal of the existing heritage (narrower) bridge
- Site disturbance - any turbid water or sedimentation discharged from the proposal site has the potential to impact aquatic vegetation not only within the proposal site but also downstream.

The impact of the direct destruction of aquatic vegetation during the construction phase of the works is likely to be significant but temporary and localised. It would not pose a significant threat to the aquatic ecosystem in this area and conditions would resemble pre-construction conditions relatively quickly following completion of work.

Large woody debris

There is very little large woody debris within the proposal site, apart from a small number of branches on the western bank under the new alignment and a single tree branch wedged against the existing bridge. If removed, these can be replaced elsewhere in close proximity, which would offset any potential impact.

Aquatic fauna disturbance

Construction works within or in the vicinity of waterways have the potential to disturb aquatic fauna. Disturbance would occur through burial during excavation and filling (e.g. construction of the temporary work platforms), noise/vibration impacts or direct contact or displacement/relocation. The proposal requires in-stream work at the new bridge and around the existing bridge and therefore aquatic fauna in the direct footprint and immediate vicinity of the work would be disturbed.

Barriers to passage

Many of the species of fish and other fauna that occupy freshwater reaches are, for at least a part of their lifecycle, considered to be migratory or undertake broad scale (non-migratory) movements. Work within the river has the potential to create a barrier to this movement. Measures provided in Table 6-5 would ensure that construction activities do not create a total barrier for aquatic fauna.

Altered stream flows

Stream flow alterations can negatively affect a range of ecosystems and species. The proposal would be constructed in a way that does not significantly alter downstream flows.

Water quality

The majority of the river bed at the proposal site is very muddy or sandy-mud substrate. In-stream works present the risk of remobilising this fine grained sediment deposited on the river bed. The re-suspension and remobilisation of the sediments can potentially result in the release of highly turbid water downstream of the proposal site.

Tracking of machinery into and within the proposal site would expose bare soils, which has the potential to exacerbate erosion and subsequently turbid run-off during rainfall events. Depending on the volume, downstream transport of turbid water has the potential to redistribute nutrients, increase oxygen demand, smother in-stream habitats and modify bathymetry of the stream bed. This would negatively impact local and downstream aquatic ecosystems.

Construction machinery has the inherent risk of potential fuel/hydraulic fluid spillage. Other work, such as grit blasting or painting, may also introduce the risk of contaminants due to fine debris, chemical treatments or paint. The close proximity to the waterway at the proposal site exacerbates the potential impact of such risks. The removal of the existing bridge poses the additional risk of deposition of construction and/or removal debris within the river.

Potential water quality impacts would be managed in accordance with the measures described in Table 6-5.

Aquatic weeds

Construction work within the vicinity of the river bring the inherent risk of the introduction of aquatic weeds. This could occur through the importation of seeds or plant material on construction machinery and/or imported materials.

Threatened species

Due to the potential presence of Eastern Freshwater Cod (Maccullochella ikei) and Purple Spotted Gudgeon (Mogurnda adspersa) at the proposal site an assessment of significance under both state and federal legislation has been completed in the Aquatic Habitat Assessment (Appendix C). The assessment found, that if the management measures described in Table 6-5 are carefully planned and executed, the proposal is unlikely to have a significant impact on these threatened species.

Operation

Operation of the proposal would not result in any significant additional impacts on aquatic flora and fauna, or their habitats.

6.2.4 Safeguards and management measures

Table 6-5 Aquatic biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aquatic habitat removal or disturbance	The following are recommended to address issues associated with habitat disturbance and would be incorporated into the vegetation management plan: • Disturbance of aquatic fauna, habitat and riparian zones would be minimised in accordance with Roads and Maritime Biodiversity Guidelines – Guide 10: Aquatic habitat and riparian zones (2011) • Riparian vegetation disturbance/removal would be kept to a minimum and any riparian vegetation disturbance/removal as a result of the proposal would be rehabilitated to pre-construction (or better) condition by: • Placement of matching soil types, contouring and stabilisation of banks subjected to earthworks • Targeted planting of riparian natives such as Callistemon and Lomandra • Exclusion of cattle from regeneration areas and / or protection of individual plantings • In-stream work areas would be kept to a minimum • In-stream work pads would be fully contained by sufficient means prior to construction in order to minimise the work platform footprint, reduce sediment loads and limit turbid run-off • The design and construction of in-stream structures would comply with the Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013) • Disturbance of large woody debris would be avoided where possible • Any large woody debris disturbed would be relocated in accordance with DPI(Fisheries) requirements and sufficiently secured in close proximity to provide comparative habitat value.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Disturbance of aquatic fauna	The following measures are recommended for issues associated with fauna disturbance and would be incorporated into the CEMP: • Banks within the direct footprint of works would be inspected for platypus dens by a qualified ecologist immediately prior to and during breaking ground along the banks • Fauna handling is to be conducted in accordance with the RTA Biodiversity Guidelines (Guide 9: Fauna handling) (RTA, 2011) • The river bank works footprint would be minimised to reduce the potential for encountering platypus or turtles • Initial excavation and fill of the affected banks would be gradual to allow resident fish and other fauna to move to safety.	Construction contractor	Construction
Potential barrier to movement of aquatic fauna	• The proposal would be undertaken such that at least 20% of stream width remains as natural open channel at any one time. Whilst this width may be higher than in required for hydraulic connectivity (i.e. to ensure that flow velocities are not limiting), this width is considered necessary to ensure that behavioural affects due to avoidance of noise/vibration/habitat edge effects are also minimised.	Construction contractor	Construction
Potential alteration to stream flow	• A minimum of 20% of the river channel (in accordance with the fauna passage criteria) is to remain unrestricted during construction to ensure that river flows through the site are maintained and not significantly affected.	Construction contractor	Construction
Potential impacts to water quality	In addition to the measures provided in Table 6-25 the following measures would be implemented: • Screening or netting around and/or under work areas to contain debris, litter and other materials • Use of grit blasting and painting enclosures • Minimising volumes of fuels, lubricants and other fluids within the in-stream work site and ensuring all fluids are stored within containment bunds and that hydrocarbon booms are utilised as required to minimise risk of spills to the waterway • Ensuring that all work platforms, access roads and bank clearing areas associated with the proposal would be subject to strict runoff and turbidity controls to reduce water quality risks to the downstream environment. This will require a suite of standard environmental protection measures including erosion and sediment controls designed, installed and maintained in accordance the Blue Book requirements and RMS QA Specification G38	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Potential introduction and/ or spread of aquatic weeds	• Ensure that imported fill materials (particularly from riverine sources) are weed free • Equipment brought to site would be inspected and if necessary washed before entering the site to ensure they are free of excess soil and material that may contain weed material or seeds • Protocols for preventing or minimising the spread of noxious and environmental weeds are to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management) (RTA 2011e).	Construction contractor	Construction

6.3 Aboriginal heritage

This section addresses the Aboriginal heritage impact associated with the proposal and details the management measures proposed to mitigate these impacts.

The information presented in this section is drawn from the Aboriginal Archaeological Assessment. The complete report is provided as Appendix F.

An additional site for the concrete batching plant was assessed by the Roads and Maritime Aboriginal Heritage Officer. Correspondence about this assessment is also included in Appendix F.

6.3.1 Methodology

The Aboriginal assessment was carried out in accordance with the PACHCI using the following methodology:

- Desktop review of relevant heritage registers including:
  - Aboriginal Heritage Information Management System (AHIMS)
  - Kyogle Local Environment Plan 2012
  - Tenterfield Local Environment Plan 2013
  - The World Heritage List
  - Register of the National Estate
  - Commonwealth Heritage List (Australian Heritage Council)
  - The National Heritage List (Australian Heritage Council)
  - The State Heritage Register (NSW Heritage Office).
- Review of historic aerial photography from 1948, 1962, 1975 and 1997
- Review of historic parish maps from 1889, 1915 and 1932
- A site inspection by an archaeologist on 05 December 2013
- Consultation and site inspections with relevant Aboriginal stakeholders including:
  - Consultation with Jubullum Local Aboriginal Land Council in December 2013
  - Consultation and a site inspection with native title claimants and local Elders in February 2014
  - Consultation and a site inspection with representatives of the Western Bundjalung in February 2014
  - Value management workshop in February 2014

- Predictive modelling to identify landforms with the potential to contain surface and/or subsurface Aboriginal objects
- Assessment of heritage significance and potential impacts
- Formulation of appropriate management measures.

6.3.2 Existing environment

The archaeological and cultural landscape of the study area is generally of high significance to the Aboriginal people of the Clarence and Richmond Valley regions. Prior to European settlement, this was an area that was rich in resources. It was known to be a favourite camping place, and ceremonial and sacred sites are relatively common in the immediate region.

The earliest archaeological survey at Tabulam was conducted in 1974 as part of a regional archaeological survey including the New England Tablelands and the Upper Clarence and Richmond Rivers. The survey recorded a large number of ceremonial, spiritual and natural mythological sites between 1974 and the 1980s. Sites include natural mythological sites, bora ceremonial areas, increase sites (djurbils) and various other types of sites, of which details remain confidential.

The Plan of Management for Jubullum Flat Camp Aboriginal Area (DECCW 2010b), which was prepared with extensive consultation with the Tabulam Aboriginal community, identifies 11 sites of significance to the local community including the Jubullum Flat Camp Aboriginal Area which is a protected area under the NPW Act (see Figure 6-3).

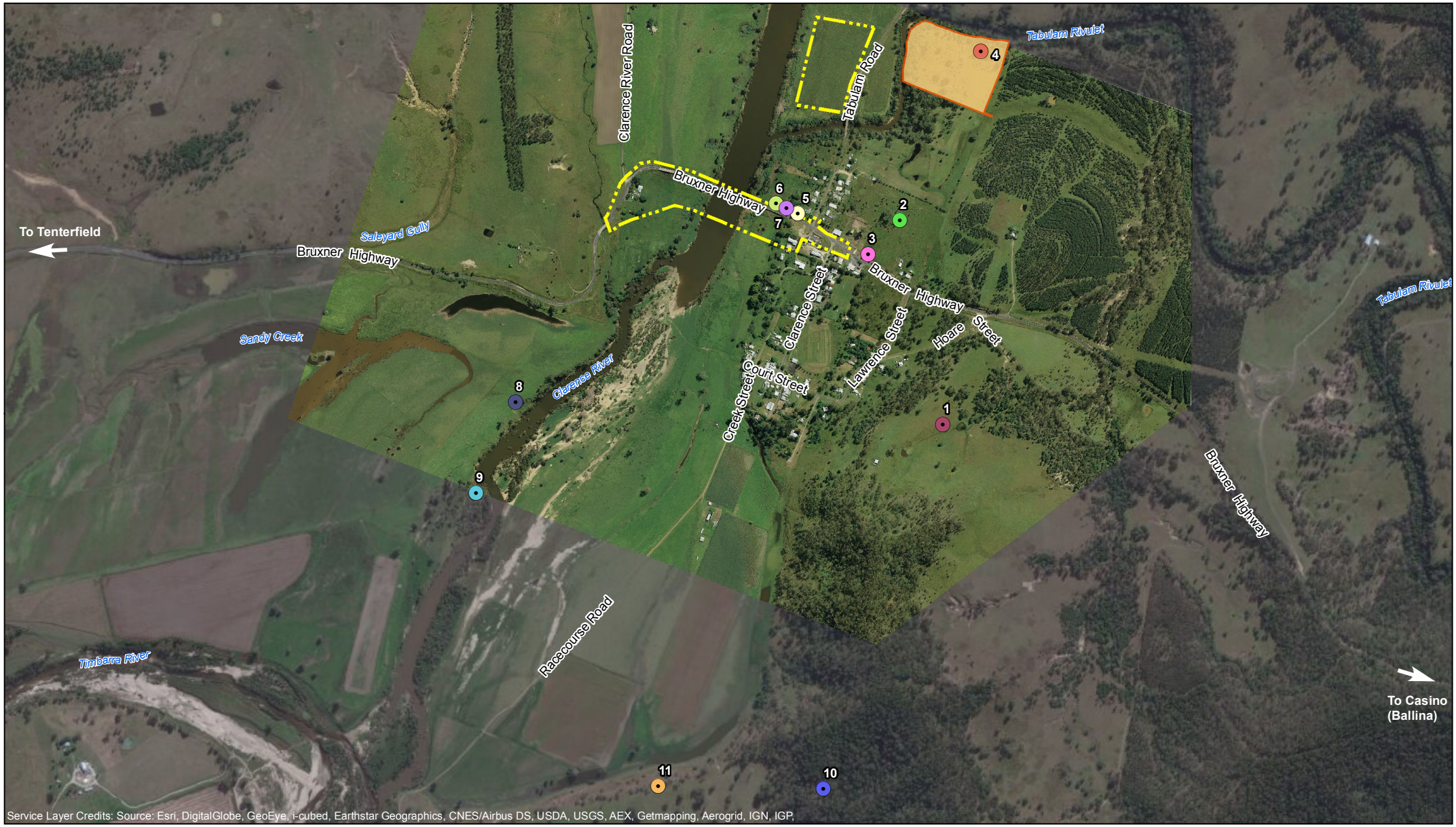
The ‘Big House’, ‘Black Camp’ and ‘Birthplace’ Aboriginal sites are in close proximity to the proposal (see Figure 6-3).

The ‘Big House’ was a house built for the Mundine family by the Barnes family, early settlers to the region. It was situated immediately north of the proposal. The house was a simple slab construction and comprised of two rooms with a tin roof. Other shelters (humpys) were erected around the house from time to time. The house was an important social focal point to the local Aboriginal population. People would gather there before holding cultural ceremonies and dances. The house was subsequently taken from the Mundine family and demolished in the 1950s, with its occupants moved down to the mission at Turtle Point.

The ‘Blacks Camp’ was as an occasional camp ground used predominately by men as they moved about the region. Any camp remnants have likely already been destroyed by land clearing, grazing and bridge construction works.

The ‘Birthplace’ was said to be east of the Big House and in the Big House. However, during the site inspection, the gardens to the south and west of the existing residence, within the two northern route option alignments, were also said to be part of the Birthplace. The number of persons born in this area is unknown.

An Aboriginal Land Claim (Land claim no. 28093 lodged 27/7/2010 by NSW Aboriginal Land Council).exists over Lot 7007 DP1068757 adjacent to Overflow Bridge No. 2 on the western bank of the Clarence River.



Paper Size A4

0 60 120 240 360 480

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

Proposal site
Cadastre

Aboriginal heritage
1, Top Camp
2, Morgue
3, Camp
4, Cemetery
5, Big House
6, Black Camp
7, Birthplace
8, America
9, Granny Suzy's house
10, Turtle Point mission
11, Ochre site

Jubullum flat camp

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Aboriginal heritage

Figure 6-3

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF012_AboriginalHeritage_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012; ESRI: Imagery 2014. Created by: tmorton, fmackay

6.3.3 Potential impacts

The ‘Big House’, ‘Black Camp’ and ‘Birthplace’ Aboriginal sites are in close proximity to the proposal (see Figure 6-3). Route assessment and selection considered this and the preferred option was chosen so as not to directly impact on these sites.

Construction

Given the extensive ground disturbance of the proposal site, the lack of physical Aboriginal cultural heritage recorded during surveys and inspections, and a review of the archaeology and land use patterns of the region, it is not considered likely that proposal works would impact on subsurface Aboriginal objects. The potential for the proposal to impact on archaeologically significant Aboriginal objects during construction is considered low.

The proposal would not impact on Lot 7007 DP1068757, currently the subject of an Aboriginal Land Claim, adjacent to Overflow Bridge No. 2 on the western bank of the Clarence River.

Operation

The proposal is situated within a highly significant and well documented cultural landscape to the Aboriginal people of the Tabulam region. The new bridge would be situated adjacent to an existing bridge and would avoid all known significant sites in the locality. The potential for the new bridge to impact on these sites or the cultural landscape during operation is considered low.

6.3.4 Safeguards and management measures

The safeguards described in Table 6-6 would be implemented to avoid or minimise potential impacts on Aboriginal heritage.

Table 6-6 Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Potential for direct impact on cultural objects and sites	A cultural heritage site induction for personnel undertaking initial ground disturbance would be undertaken by an appropriate person from the Jubullum Local Aboriginal Land Council. The induction would cover: • Basic legislative requirements, including fines for the destruction of Aboriginal cultural heritage • A discussion on traditional Aboriginal culture, and why the management of Aboriginal cultural heritage is important to Aboriginal peoples • An introduction on how to identify Aboriginal objects • A description of proposal areas considered likely to contain Aboriginal Objects and to be avoided • A review of the management measures for the proposal	Construction contractor	Construction
Potential for direct impact on cultural objects and sites	The CEMP would include an unexpected finds procedure in accordance with the Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds (2012b) that would incorporate: • Work in the surrounding area is to stop immediately • A temporary fence is to be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site • The Roads and Maritime Aboriginal Cultural Heritage Officer and Environmental Manager, Northern Region would be contacted immediately. • Work would not recommence until advised.	Construction contractor	Construction
Potential for direct impact on cultural objects and sites	The CEMP would include a procedure for the discovery of human remains that would incorporate: • All works must halt in the immediate area to prevent any further impacts to the remains. • The location where remains were found would be cordoned off and the remains themselves would be left untouched. • The Roads and Maritime Aboriginal Cultural Heritage Officer and Environmental Manager, Northern Region would be contacted immediately. • Work would not recommence until advised.	Construction contractor	Construction
Potential for direct impact on cultural objects and sites	If Aboriginal cultural materials are uncovered as a result of proposal activities, the site would be registered as a site in the AHIMS. Any management outcomes for the site would also be provided to the AHIMS.	Construction contractor	Construction

6.4 Non-Aboriginal heritage

This section addresses the non-Aboriginal heritage impacts associated with the proposal and details the management measures proposed to mitigate these impacts.

The information presented in this section is drawn from the Statement of Heritage Impact (SOHI) prepared by The Heritage Group, NSW Government Architect's Office (The Heritage Group 2014). The complete SOHI is provided in Appendix G.

6.4.1 Methodology

- Desktop review of relevant heritage registers was undertaken including:
  - Kyogle Local Environment Plan 2012
  - Tenterfield Local Environment Plan 2012
  - The World Heritage List
  - Register of the National Estate
  - Commonwealth Heritage List (Australian Heritage Council)
  - The National Heritage List (Australian Heritage Council)
  - The State Heritage Register (NSW Heritage Office)
  - Road & Maritime, RMS Heritage & Conservation Register, 1999 ('s170 Register').
- Review of historic aerial photography from 1948, 1962, 1975 and 1997
- Review of historic parish maps from 1889, 1915 and 1932
- A review of the following background documents:
  - NSW Heritage Office, State Agency Heritage Guide: Management of Heritage Assets by NSW Government Agencies, 2005
  - Road & Maritime, Timber Truss Bridge Conservation Strategy - Submissions Report and Revised Conservation Strategy, August 2012
  - Heritage Council of NSW, Timber Truss Road Bridges of NSW: Review of Roads & Traffic Authority's Proposed Approach to Conservation, July 2011
  - McMillan, Britton & Kell Pty, Timber Truss Bridges: Study of Relative Heritage Significance of All Timber Truss Bridges in NSW, 1998
  - Austral Archaeology Pty Ltd, Bridge over Clarence River at Tabulam - Conservation Management Plan, September 2003
  - Everick Heritage Consultants Pty Ltd, RMS Tabulam Bridge Route Options Aboriginal Archaeological Survey Report, for RMS, February 2014.
- A site inspection by an archaeologist in December 2013 and February 2014
- Assessment of heritage significance and potential impacts
- Formulation of appropriate management measures.

6.4.2 Existing environment

The township of Tabulam has a rich settlement history. It was initially a small pastoral community settled on the banks of the Clarence, which became the focal point in the history of Australia's mounted arms history as the birthplace of the Upper Clarence Light Horse Cavalry. Despite the extensive history of the Tabulam township, only one item of historic heritage is located near the proposal site, being the existing Tabulam bridge. The heritage significance of the Tabulam bridge is specifically addressed in the Statement of Heritage Impact in Appendix G (The Heritage Group 2014).

Built in 1903, the bridge carries a 4.6 metre roadway and comprises five De Burgh truss spans and timber beam approach spans. The total length is 297 metres. Further details regarding the truss design and local history are provided in Appendix G (The Heritage Group 2014).

Statutory listing

The Tabulam bridge is a State listed heritage item on the State Heritage Register (SHR). This means removal, damage, development, removal or alteration of the object, place or land require approval by the Heritage Council of NSW as prescribed under s57 of the *NSW Heritage Act 1977*.

The Tabulam bridge is also listed in the Roads and Maritime Heritage & Conservation Register. Section 170A(2) of the *NSW Heritage Act 1977* requires that State agencies manage items on their heritage and conservation registers with due diligence in accordance with the principles approved by the Minister, on the advice of the Heritage Council. Roads and Maritime has addressed these obligations through its *Timber Truss Bridge Conservation Strategy*. The Roads and Maritime has committed to carry out environmental assessment of each of the bridges scheduled for removal, including identification of management measures to offset the heritage impact.

The bridge is also heritage item of local significance listed in Schedule 5 of the *Kyogle LEP 2012*. Though part of the bridge is owned by Tenterfield Shire Council, the item is not listed in the Schedule 5 of the *Tenterfield LEP 2013*.

Table 6-7 summarises the statutory listing for Tabulam bridge.

Table 6-7 Statutory listings for Tabulam Bridge

Listing	Instrument	Level of Significance	Description	Details
NSW State Heritage Register	*Heritage Act 1977*	State	Road Bridge	Listing No.01461
s.170 State Agency Heritage Register (RMS Heritage & Conservation Register)	*Heritage Act 1977 (Section 170)*	State	Road Bridge	Heritage Register No. 4301043
Kyogle Local Environmental Plan 2012	*Environmental Planning & Assessment Act 1979*	Local	Road Reserve	Item No. I154

The Tabulam bridge is also listed on the Australian Heritage Database (Former Register of the National Estate), and National Trust Register which are non-statutory registers.

Though not listed on local, state or national heritage registers or under legislation, there are two sites of some community significance in proximity to the proposal, namely:

- Saint Pius Catholic Church – the church is approximately 50 metres from the eastern end of the proposal site
- Monument to Lewis Hubert (Harry) Lasseter – the monument is located in the car park on the western side of the river.

6.4.3 Potential impacts

Roads and Maritime proposes to remove the Tabulam timber truss bridge in order to provide a new bridge over the Clarence River for modern road transport needs.

Construction

Removal of the Tabulam bridge will have a detrimental impact on the heritage significance of the item itself for the following reasons:

- Tabulam bridge is a State heritage item listed under the *NSW Heritage Act 1977*
- Tabulam bridge was identified as the sixth most significant timber truss bridge in the Roads and Maritime portfolio at the time the initial significance analysis was undertaken by McMillan, Britton & Kell (MBK 1998) for the Timber Truss Bridge Strategy
- Removal is total, permanent and irreversible.

Furthermore, removal of the Tabulam bridge has implications for all DeBurgh truss bridges in NSW:

- The RMS *Timber Truss Bridge Conservation Strategy* has a high percentage of De Burgh trusses scheduled for replacement. Removal reduces the overall profile of De Burgh truss bridges in NSW (a species of truss that is already rare). The loss rate of De Burgh Truss bridges since 1998 is of concern in regard to Criterion F (Rarity) of the State Heritage Criteria.

However, Roads and Maritime has demonstrated that Tabulam bridge is operationally unsuitable to modern road infrastructure demands. Through the *Timber Truss Bridge Conservation Strategy*, endorsed by the NSW Heritage Council, Roads and Maritime has examined adaptive re-use strategies that would enable conservation of Tabulam bridge, as prescribed in the Strategy.

In line with the strategy, Roads and Maritime has put in place a comprehensive set of management measures to offset or compensate for adverse heritage impacts of all timber bridges scheduled for replacement in the state. Having determined that adaptive re-use of Tabulam bridge entails strategic and operational risks the agency is not willing to take on, Roads and Maritime has followed strategy protocols to develop a set of specific managements for this particular proposal. These are summarised in Section 6.4.4.

The following aspects of significance assessed against the State Heritage Criteria used in NSW are extracted from the State Heritage Register record for the Tabulam bridge. Table 6-8 outlines the aspects of significance and associated impacts.

Table 6-8 Aspects of significance and impacts

Aspect of significance	Level of significance	Heritage impact
Association with the expansion of the NSW road network. Historically important acceptance of American bridge design ideas (Criterion A).	State	Adverse impact. Irreparable loss of the longest De Burgh truss bridge in Australia. Diminishing evidence of the significance of Tabulam as a historical river crossing dating to the 1840s.
Association with Ernest De Burgh. (Criterion B).	Local/State	Adverse impact. Further loss of De Burgh bridges in NSW (five out of nine De Burgh truss bridges identified for removal in the Strategy).
Technical quality of design. Imposing landmark for road travellers and major piece of state infrastructure. Nationally significant example ranked 6th out of 82 timber bridges in NSW by McMillan Britton & Kell, 1998. (Criterion C).	Local, moderate	Adverse impact (although the bridge is somewhat altered from its original form). Irreparable loss of constructional elements, additions and details.
Social visibility. Contribution to group value. (Criterion D).	Local	Adverse impact. Irreparable loss of the bridge as a landscape element; potential for harm to values of nearby 'Black Camp' and 'The Birthplace', overshadowed by the bridge.
Representative of major technical developments in timber truss design. Imposing bridge with 18 spans, approx. 300m in length and 20m high, largest De Burgh truss built. (Criterion E).	State	Moderate impact. Offset by RMS retention strategy.
Rarity - in 2011 there were 9 surviving De Burgh trusses in NSW of the 20 built. (Criterion F).	State	Adverse. Further loss of De Burgh bridges in NSW (five out of nine De Burgh truss bridges identified for removal in the Strategy).
Significance in demonstrating the principal characteristics of a class of NSW's cultural or natural places (Representativeness).	State	Adverse. Offset by Roads and Maritime retention strategy.

Removal of the Tabulam bridge has been an objective under the Roads and Maritime's *Timber Truss Bridge Conservation Strategy* and concurs that alternative options for relocation, retention and adaptive re-use have been addressed in the context of the Strategy. Heritage Council endorsement has been obtained for the Strategy as a whole. Roads and Maritime have committed to a range of substantive management measures to offset the heritage impacts of removal as part of the Strategy.

The removal of the Tabulam timber truss bridge will detrimentally impact on heritage significance of the heritage item.

However the heritage impact assessment is satisfied that:

- Long term operability of the bridge for modern road infrastructure and regional development has been shown to be untenable
- The option for retention and re-use of the structure as a cycle-pedestrian bridge has been explored but a pedestrian only bridge is likely to receive a lower share of the maintenance budget and could fall into disrepair
- Retention of a divested bridge without beneficial use, maintenance and conservation (ie postponing removal) is not a viable approach as the bridge will rapidly fall into disrepair
- The *Timber Truss Bridge Conservation Strategy* has charted positive long term strategic goals for timber truss bridges in NSW and is being followed through in accordance with commitments made to the Heritage Council
- Heritage advice, research and community consultation in the lead up to the scheduling of Tabulam bridge for divestment and removal have been systematic
- Archaeological and Aboriginal heritage issues have been taken on board during proposal planning.

Operation

Operation of the proposal would not result in any significant additional impacts on heritage.

Recommendations

The following recommendations would assist Roads and Maritime progress the proposal with the NSW Heritage Division:

- Engineering and navigational studies be prepared in support of an application to NSW Heritage Division for delisting of the bridge from the State Heritage Register. Other key elements of fabric, such as concrete bridge piers or the stumps of such piers, cannot be safely retained in situ
- Collate supporting evidence to show how the operational and management constraints and liabilities of retention were conveyed during community consultation, as well as the options presented and scenarios explored
- Written notice to the NSW Heritage Council not less than 14 days prior to the start of transferral or removal work of any items listed on an s.170 register. Also provide written notice of the intention to carry out the proposed works, with a copy of the SoHI to the Tenterfield Shire and Kyogle councils.
- Incorporation of features or elements of the existing bridge into the design of the new bridge should be refined in greater detail. The new bridge design should have a character and identity of its own, sympathetic to the landscape and setting, respectful of the presence of the existing heritage bridge as a once dominant landscape element, but in no way trivialising or constituting a pastiche of the existing heritage bridge.

- A design-based approach to rehabilitation of the river banks after removal should be undertaken. Schematic representations of the landscape will enable the integration of the new Park/Rest Area, access, views and landscape markers on the western bank overlooking the river to be more effectively visualised by the approval authorities
- The eastern approaches are in a high risk area for Aboriginal Heritage. It is recommended that due diligence be incorporated into the proposal (refer to the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*).

6.4.4 Safeguards and management measures

The measures described in Table 6-9 would be implemented to avoid or minimise potential impacts on non-Aboriginal heritage.

Table 6-9 Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Potential impact to St Pius Catholic Church or Lasseter's monument	• An exclusion zone would be established around the church during construction, if required, to avoid any accidental impact. The exclusion zone would be identified with temporary fencing or the like.	Construction contractor	Construction
Potential impact to St Pius Catholic Church or Lasseter's monument	• The monument would be removed during construction and re-erected in the car park on completion of works. The location would be identified in consultation with council and the preschool.	Construction contractor	Construction
Potential impact to St Pius Catholic Church or Lasseter's monument	• Site induction would include information on the heritage significance of the bridge, church and monument and workers' responsibilities during works.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Unexpected finds	The CEMP would include an unexpected finds procedure in accordance with the Roads and Maritime *Standard Management Procedure: Unexpected Archaeological Finds* (2012) that would incorporate: • Work in the surrounding area is to stop immediately • A temporary fence would be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site • The Roads and Maritime Aboriginal Cultural Heritage Officer and Environmental Manager, Northern Region would be contacted immediately. • Work would not recommence until advised.	Construction contractor	Construction
Offset the heritage impacts	• Photographic archival recording (and measured drawings) prior to removal in line with NSW Heritage Branch guidelines *How to Prepare Archival Records of Heritage Items*, and this will further offset the loss of the item • Interpretation strategies to maintain a link between the bridge and the heritage values of Tabulam are to be developed. • Roads and Maritime to update s.170 Register to reflect changes to the bridge portfolio and to monitor heritage safeguards for other timber truss bridges • Elements of existing bridge fabric (DeBurgh trusses) are to be retained to use as gateway elements for the new bridge .	Roads and Maritime	Pre-construction
Irreparable loss of the longest De Burgh truss bridge in Australia	• Interpretation including Timber Truss Bridges book; travelling exhibition; interpretation signs and heritage markers in the proposed Rest Area on the eastern side of the bridge are to be implemented.	Roads and Maritime	On-going
Further loss of De Burgh bridges in NSW	• Cobram (a De Burgh truss) Bridge to be upgraded to State Heritage Register	Roads and Maritime	On-going

Impact	Environmental safeguards	Responsibility	Timing
Irreparable loss of constructional elements, additions and details	• Investigate conserving fabric elements in local history museums of other regional towns	Roads and Maritime	On-going
Irreparable loss of the bridge as a landscape element	• Landscaping elements are to be installed including small park on the eastern approach with retaining wall/terrace and marker trees on western approach providing landscape references	Construction contractor	Post construction
	• Bi-annual reporting to the Heritage Council of NSW on the progress of the Strategy and its associated conservation actions	Roads and Maritime	On-going

6.5 Noise and vibration

This section addresses the noise and vibration impacts associated with the proposal and details the management measures proposed to mitigate these impacts.

The information presented in this section is drawn from the Noise and Vibration Impact Assessment (2014). The complete report is provided in Appendix H.

6.5.1 Methodology

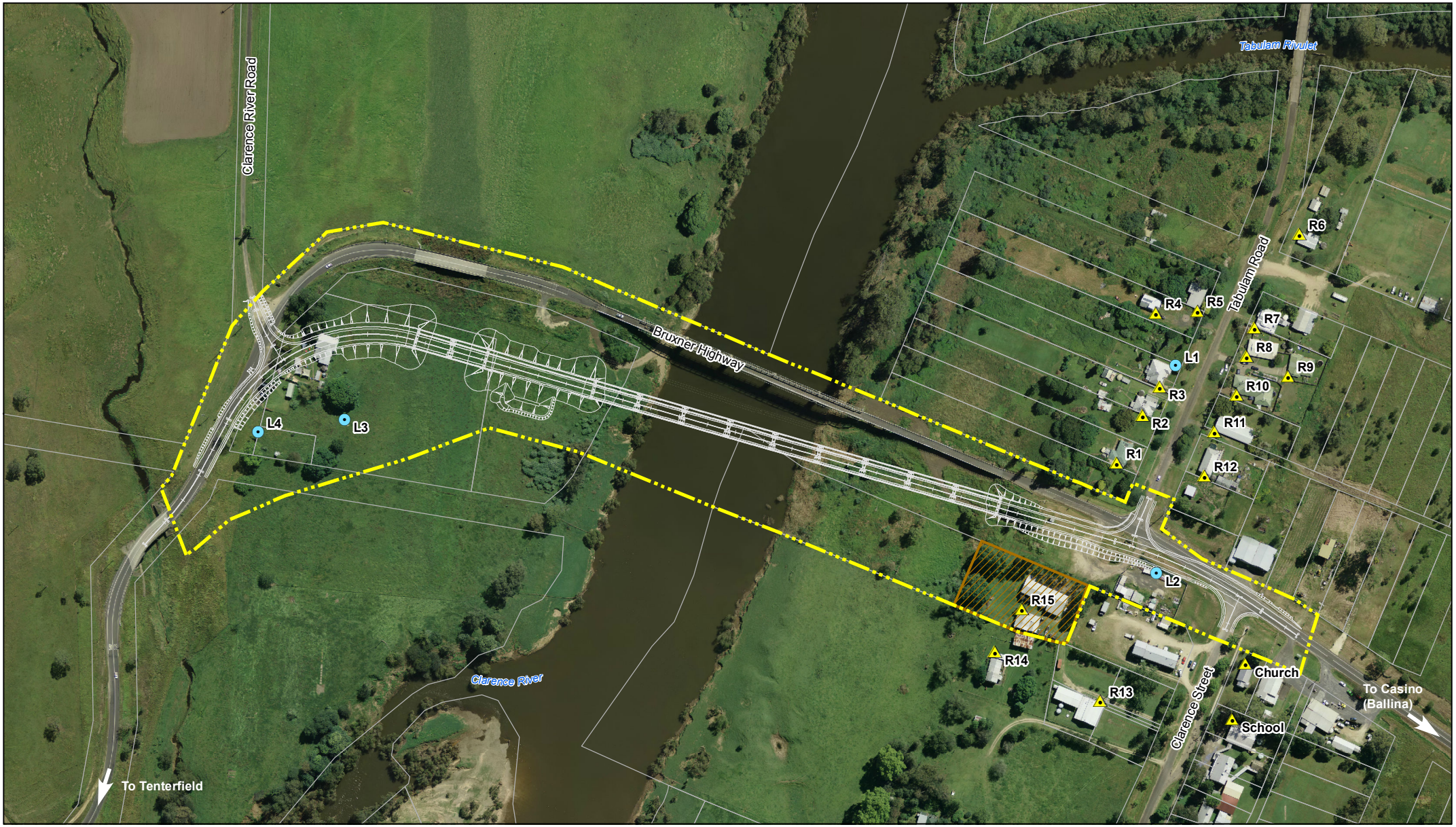
The methodology for the Noise and Vibration Impact Assessment includes:

- Identification of noise sensitive receivers in the study area
- Noise monitoring at four locations
- Establishment of road traffic noise assessment criteria with consideration to the *Road Noise Policy* (DECCW, 2011)
- Preparation of the following noise models:
  - Year 2014 'no build option' (Traffic flow on the existing alignment for year opening)
  - Year 2014 'build option' (Proposed design for year opening)
  - Year 2024 'no build option' (Traffic flow on the existing alignment 10 years after opening)
  - Year 2024 'build option' (Proposed design 10 years after opening).
- Assessment of predicted noise levels against the road traffic noise criteria
- Discussion of potential in-principle management measures with consideration to the *Environmental Noise Management Manual* (RTA, 2001), where predicted noise model results indicate exceedance of the criteria
- Establishment of the construction noise management levels with consideration to the *Interim Construction Noise Guideline* (DECC, 2009)
- Prediction of noise associated with construction works and assessed against the construction noise management levels
- Assessment of vibration from construction plant and equipment with consideration to the vibration criteria
- Discussion of appropriate construction noise and vibration management measures where predicted noise levels indicate exceedance of the construction noise management levels.

6.5.2 Existing environment

Tabulam is a small town located in a rural setting in northern NSW. A number of sensitive receivers adjacent to the existing Bruxner Highway through Tabulam have been identified. East of the bridge, there are a number of commercial premises such as a service station, storage yards, a State Emergency Services building and warehouses located adjacent to the Bruxner Highway. There are also a number of residential receivers located within the township, in the vicinity of Tabulam Road, as well as a school and church located off the Bruxner Highway and Clarence Street.

A map of the identified sensitive receivers is shown in Figure 6-4. Monitoring was carried out in areas considered representative of the sensitive receivers. The noise monitoring results at locations 1 and 3 are typical of a rural environment, with low background noise levels, particularly during the evening and night periods. The noise monitoring results at locations 2 and 4 are typical of areas influenced by road traffic noise, which is expected due to the close proximity to the Bruxner Highway.



Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Cadastre
- Site compound
- Noise monitoring
- Sensitive receiver
- Design

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Noise receiver and monitoring locations

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Figure 6-4

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF011_NoiseMonitoring_Receiver_Locations_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. Created by: tmorton, fmackay, gmcdiarmid

6.5.3 Potential impacts

The proposal would generate noise and vibration during construction due to the various equipment and machinery that would be used during site works. Construction traffic would also generate noise. Operational noise would arise from use of the new bridge and approach roads.

The primary phases of construction with the potential to generate adverse noise and vibration impacts have been identified as:

- Establishment and operation of the concrete batching plant
- Heavy vehicle movements on Tabulam Road associated with the concrete batching plant
- Heavy vehicle movements on the existing and proposed highway associated with bridge construction
- Operation of the concrete batching plant off Tabulam Road – impacting on residential receivers on Tabulam Road
- Piling activities during bridge construction
- Activities within construction compound areas located close to sensitive receivers
- Out of hours construction work.

Construction

Noise

The *Interim Construction Noise Guideline* (DECC, 2009) provides guidance for assessment of construction noise. However it does not address construction traffic noise. This is addressed under the *Road Noise Policy* (DECCW, 2011). The *Road Noise Policy* provides non-mandatory traffic noise assessment criteria for land use developments with the potential to create additional traffic on existing freeways/arterial, sub-arterial and local roads. Tabulam Road, a local road, would be affected by the additional traffic during construction works due to the operation of the temporary concrete batch plant.

Potential noise impacts on the surrounding sensitive receivers during construction were predicted using computer aided noise abatement (CadnaA) modelling. The predicted noise levels at each receiver are shown in Table 6-10, indicating the potential exceedances of the construction noise management levels during standard construction hours. No receivers are predicted to exceed the highly noise affected construction noise management level of 75 decibels dB(A).

Based on predicted construction noise levels in Table 6-10, there is the potential for sleep disturbance impacts, if construction activities occur during the night-time period within close proximity of sensitive receivers.

Table 6-10 Construction plant and equipment noise levels at residential receivers during standard hours, dB(A)

Sensitive receiver	Daytime construction noise management level	Modelled noise source – highway construction Category 1*	Concrete batch plant (alone)	Vibratory piling (alone)
R1	40	**^49**	28	**^63**
R2	40	**^44**	**^44**	**^61**
R3	40	**^42**	**^45**	**^61**
R4	40	40	**^46**	**^60**
R5	40	39	**^46**	**^59**
R6	40	37	**^48**	**^57**
R7	40	39	**^46**	**^58**
R8	40	40	**^45**	**^59**
R9	40	**^41**	**^45**	**^58**
R10	40	**^41**	**^45**	**^59**
R11	40	**^43**	**^44**	**^60**
R12	40	**^45**	**^43**	**^56**
R13	40	**^44**	40	**^61**
R14	40	**^44**	40	**^64**
R15	40	**^47**	**^41**	**^64**
School	551	45	40	**^58**
Church	551	51	41	**^58**
Preschool	551	53	38	**^57**

* Equipment is grouped into Category 1: up to 110 dB(A) sound power; Category 2: up to 115 dB(A) sound power; Category 3: up to 120 dB(A) sound power. ^Bold indicates exceedance.

Sensitive receiver	Daytime construction noise management level	Modelled noise source – highway construction Category 2*	Concrete batch plant (alone)	Vibratory piling (alone)
R1	40	**^54**	28	**^63**
R2	40	**^49**	**^44**	**^61**
R3	40	**^47**	**^45**	**^61**
R4	40	**^45**	**^46**	**^60**
R5	40	**^44**	**^46**	**^59**
R6	40	**^42**	**^48**	**^57**
R7	40	**^44**	**^46**	**^58**
R8	40	**^45**	**^45**	**^59**
R9	40	**^46**	**^45**	**^58**
R10	40	**^46**	**^45**	**^59**
R11	40	**^48**	**^44**	**^60**
R12	40	**^50**	**^43**	**^56**

Sensitive receiver	Daytime construction noise management level	Modelled noise source – highway construction Category 2*	Concrete batch plant (alone)	Vibratory piling (alone)
R13	40	**^49**	40	**^61**
R14	40	**^49**	40	**^64**
R15	40	**^52**	**^41**	**^64**
School	551	50	40	**^58**
Church	551	**^56**	41	**^58**
Preschool	551	**^58**	38	**^57**

* Equipment is grouped into Category 1: up to 110 dB(A) sound power; Category 2: up to 115 dB(A) sound power; Category 3: up to 120 dB(A) sound power. ^Bold indicates exceedance.

Sensitive receiver	Daytime construction noise management level	Modelled noise source – highway construction Category 3*	Concrete batch plant (alone)	Vibratory piling (alone)
R1	40	**^59**	28	**^63**
R2	40	**^54**	**^44**	**^61**
R3	40	**^52**	**^45**	**^61**
R4	40	**^50**	**^46**	**^60**
R5	40	**^49**	**^46**	**^59**
R6	40	**^47**	**^48**	**^57**
R7	40	**^49**	**^46**	**^58**
R8	40	**^50**	**^45**	**^59**
R9	40	**^51**	**^45**	**^58**
R10	40	**^51**	**^45**	**^59**
R11	40	**^53**	**^44**	**^60**
R12	40	**^55**	**^43**	**^56**
R13	40	**^54**	40	**^61**
R14	40	**^54**	40	**^64**
R15	40	**^57**	**^41**	**^64**
School	551	55	40	**^58**
Church	551	**^61**	41	**^58**
Preschool	551	**^63**	38	**^57**

* Equipment is grouped into Category 1: up to 110 dB(A) sound power; Category 2: up to 115 dB(A) sound power; Category 3: up to 120 dB(A) sound power. ^Bold indicates exceedance.

The increase in truck movements on Tabulam Road was also modelled using CadnaA noise modelling software (see Table 6-11). Predictions indicate that construction truck movements would increase traffic noise levels by up to 5 dB(A) at residences along Tabulam Road. Overall traffic noise levels are expected to remain below the Road Noise Policy (DECCW, 2011) daytime criteria.

Table 6-11 Estimated construction traffic noise – Tabulam Road, dB(A)

Receiver	Existing traffic noise LAeq (15 hr)	Existing traffic noise LAeq (1 hr)	Estimated noise from construction truck movements LAeq (1 hr)	Overall traffic noise LAeq (1 hr)	Overall increase in traffic noise LAeq (1 hr)
R1	51	53	49	54	1
R2	47	49	50	52	3
R3	47	49	50	52	3
R4	43	45	41	47	2
R5	46	48	51	53	5
R6	44	46	48	50	4
R7	45	47	50	52	5
R8	45	47	50	52	5
R9	42	44	44	47	3
R10	45	47	50	52	5
R11	47	49	50	52	3
R12	47	49	49	52	3

Vibration

Vibration criteria have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006). British Standard BS 6472-1:2008, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) is recognised by the guideline as the preferred standard for assessing 'human comfort criteria'.

The predicted ground vibrations at various distances are shown in Table 6-12 for typical equipment that may be used during construction. Vibration levels are based on data from the *Environmental Noise Management Manual* (RTA, 2001).

The nearest sensitive receivers to construction activities are located about 30 metres from the existing or proposed road. The majority of sensitive receivers are located over 50 metres from the construction area and are not expected to be impacted by vibration from construction works. Vibration is potentially perceptible at the closest receivers for pavement breaking, rolling and compacting activities. These activities would typically be intermittent in nature and likely to be tolerated if prior warning is given to the resident.

Based on the distances involved from the equipment to the sensitive receivers, the expected magnitude of ground vibrations at the nearest sensitive receivers is not expected to exceed the building damage vibration criteria.

Table 6-12 Typical vibration levels at distances (mm/s peak)

Plant item	10 m Distance from source	20 m Distance from source	50 m Distance from source	100 m Distance from source
Roller (15 tonne)	7 to 8	3.8	1.5	0.8
Compactor (7 tonne)	5 to 7	3.0	1.2	0.6
Dozer	2.5 to 4	1.6	0.7	0.3
Backhoe	1.0	0.5	0.2	0.1
Pavement breaker	4.5 to 6	2.6	1.1	0.5

Operation

Noise

The potential impacts of the proposal during operation were assessed against the criteria outlined in the Road Noise Policy (DECCW, 2011). The Road Noise Policy provides a literature review for the assessment of sleep arousal due to traffic noise, however does not set a sleep disturbance assessment criterion. Sleep disturbance was therefore reviewed against recommendations in the Environmental Noise Management Manual (RTA, 2001).

No residential receivers are predicted to exceed the road traffic noise assessment criteria. Additionally, no residential receivers are predicted to exceed the relative increase criteria or the acute noise levels.

Receivers on the southern side of the Bruxner Highway (R13, R14, R15, see Figure 6-4) are predicted to experience a slight increase in traffic noise levels, due to the road alignment moving closer to these properties. However, the received noise levels remain well below the road traffic noise criteria.

Traffic noise levels at the school are predicted to marginally increase during operation of the proposal. The church is also predicted to experience a marginal increase in road traffic noise.

Vibration

There would be no additional vibration impacts during proposal operation. It is most likely that vibration rates would reduce as travel over the new bridge surface would create less vibration than the existing bridge surface.

6.5.4 Safeguards and management measures

The measures described in Table 6-13 would be implemented to avoid or minimise potential noise and vibration impacts.

Table 6-13 Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Potential construction noise and vibration impacts	Project planning and design would consider: • Construction compounds would be laid-out in such a way that the primary noise sources are at a maximum distance from residences, with solid structures (sheds, containers) placed between residences and noise sources (and as close to the noise sources as is practical) • Compressors, generators, pumps and any other fixed plant would be located as far away from residences as possible and behind site structures • Material dumps, loading and unloading areas would be located as far as practical from the nearest residences.	Construction contactor	Pre-construction
Potential construction noise and vibration impacts	• The final selection and design of noise management measures would consider best management and economically achievable practice.	Construction contactor	Pre-construction
Potential construction noise and vibration impacts	• A noise and vibration management plan would be prepared as a sub-plan to the CEMP. It would include measures to avoid and mitigate noise and vibration impacts during construction in accordance with the Environmental Noise Management Manual (RTA 2011) and RTA's Environmental fact sheet No. 2- Noise management and Night Works.	Construction contactor	Pre-construction
Potential construction noise and vibration impacts	• Site inductions would address the potential for noise and vibration impacts on local residents and inform workers of practical and reasonable measures to minimise the impact during the course of their activities.	Construction contactor	Construction
Potential construction noise and vibration impacts	• All equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made.	Construction contactor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Potential construction noise and vibration impacts	• To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) would be considered for all site equipment where health and safety is not compromised.	Construction contactor	Construction
Potential construction noise and vibration impacts	• General construction activities would be limited to the recommended construction hours where feasible and reasonable. This includes truck movements before 7:00 am to or from the concrete batching plant on Tabulam Road.	Construction contactor	Construction
Potential construction noise and vibration impacts	• A temporary barrier would be considered to shield the concrete batching plant from receivers on Tabulam Road. The barrier would be located as close as possible to the batch plant and would be of sufficient height to block the line-of-sight to residential receivers. A range of materials could be used to form an acoustic barrier, for example, a shipping container or other materials with sufficient density (at least 15 kg/m2).	Construction contactor	Construction
Potential construction noise and vibration impacts	• The community would be informed if all noise and vibration works prior to works commencing. This is particularly the case for the church and receivers R1 and R12, R14 and R15 and residences within 100 metres of piling activities. Complaints received would be recorded and attended to promptly in accordance with the Roads and Maritime Community Involvement Practice Notes and Resource Manual.	Construction contactor	Construction
Potential construction noise and vibration impacts	• Attended compliance noise monitoring would be undertaken upon receipt of a complaint. Monitoring would be undertaken and reported as soon as possible. In the case that exceedances are detected, the CEMP would be reviewed in order to identify means to minimise the impacts to residences.	Construction contactor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Potential sleep disturbance due to construction noise	• An out of hours works procedure would be prepared as part of the noise and vibration management plan. The Environmental Noise Management Manual Practice Note (vii) requires that out of hours work should not affect residences on more than two consecutive nights, or on more than a total of six nights over a period of one calendar month. When night work is programmed in stages to comply with this requirement, the periods of work should be separated by not less than one week.	Construction contactor	Construction
Potential construction traffic noise impacts	• Internal traffic noise levels within classrooms and the church would be confirmed through compliance noise monitoring.	Construction contactor	Construction

6.6 Air quality

6.6.1 Existing environment

Ambient air quality monitoring data representative of the study area for particulate matter (PM_{10}) has been obtained from the only regional monitoring station representing the north-west slopes at Tamworth. The long-term average PM_{10} 24-hour concentration at Tamworth is 15 micrograms per cubic metre ($\mu g/m^3$). This is well below the EPA guideline of 50 $\mu g/m^3$.

A review of the National Pollutant Inventory revealed that there are no scheduled industries operating within the study area. The nearest scheduled industries are approximately 30 kilometres east in Casino. Since the study area is remote from any major 'airshed'-sized sources of air pollution, ambient air quality pollution levels can safely be assumed to be low (zero, at below detection limits or negligible).

The transport and dispersion of air emissions from the proposal would be influenced by the climate experienced within the study area. Meteorological records from the Bureau of Meteorology's automatic weather station at Casino Airport are considered characteristic of the local meteorological conditions. Generally, prevailing winds are from the south and north. Winter westerlies also dominate and most often with the strongest winds. The lightest winds at other times of the year (most often associated with stable weather and least dispersion of ground based pollutant sources such as traffic emissions) are from the west.

Worst case meteorological conditions for near road air quality impacts are calm and light breezes associated with stable conditions, which are likely to be associated with early morning katabatic drainage flows, running down the river valley (from north to south). These conditions may coincide with the 'peak' hour morning traffic of local traffic movements (such as school runs) superimposed on the regional through traffic of the highway. Therefore, receptors down-wind (south) of the drainage flows would be most exposed to emissions from the road. Throughout the day, wind speeds would typically increase, mixing heights become higher, and atmospheric conditions become less stable. These conditions would lead to increased dispersion of emissions and lower concentrations at near road receptors.

6.6.2 Potential impacts

Construction

Dust

The potential for dust emissions is dependent on the intensity of construction work (the amount of dust generated), duration and frequency of the operations in any given locality and the relative location of nearby sensitive receptors.

Dust emission sources are likely to include:

- Material handling during earthworks
- Temporary concrete batching plant
- Loading, transport and dumping of material
- Levelling, grading and compacting of disturbed soil surfaces
- Wind erosion of exposed unstable soil surfaces and localised stockpiles

There is the potential for short-term dust impacts for residential receptors located east of the study area, particularly in winter due to the prevailing westerly wind. The level of impact would decrease with increasing distance from the construction activity.

The temporary concrete batching plant has the potential to affect local ambient air quality and the nearest sensitive receivers. Batching plant operation would be between 7am to 6pm Monday to Friday and 7am to 1pm on Saturdays. No work would take place outside these hours or on public holidays without prior discussion with and/or notification of local residents and the Office of Environment and Heritage. Typically, concrete batching plants operate at maximum capacity only during the morning hours. Later in the day many of the processes have usually ceased.

Emissions from concrete batching plants are predominantly particulate matter emissions in the form of total suspended particulates (TSP) and particles with an aerodynamic diameter less than 10 microns (PM_{10}). Relatively small quantities of combustion pollutants (carbon monoxide, oxides of nitrogen, oxides of sulphur and hydrocarbons) can also be emitted. Mitigation measures would be implemented while the batching plant is operating, to reduce emissions arising from the concrete batching plant and minimise potential air quality impacts.

Other emissions

Vehicle exhaust emissions during the construction phase have the potential to impact on air quality. However the impact is likely to be negligible given the limited amount of equipment, distance to receptors and the short-term construction period.

Operation

Air quality impacts associated with the operation of the bridge after construction are primarily dependent on vehicle volumes, vehicle types, vehicle speeds, fuel types and the number of sensitive receptors within a short distance from the road. Vehicle types, vehicle speeds and fuel types would remain relatively constant. Vehicle volumes are also not likely to increase significantly. Therefore the only variable that may increase air quality impacts during operation of the new Tabulam bridge is the distance of the receptors to the bridge.

The distance of the nearest most sensitive receptors to the bridge would remain approximately the same during operation of the new bridge. Therefore it is not expected that there would be an increase in air quality impacts during bridge operation. Air quality may improve slightly due to the more efficient flow of traffic across the bridge. In addition, the two way flow of traffic across the new bridge would eliminate the need for traffic (especially trucks) to stop, give way and accelerate, which would reduce emissions during idling.

6.6.3 Safeguards and management measures

The measures described in Table 6-14 would be implemented to avoid or minimise potential air quality impacts.

Table 6-14 Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General air quality impacts	The CEMP would include a procedure for effective dust control, including watering or covering exposed areas, dust monitoring and reporting procedures.	Construction contractor	Pre-construction
Dust emissions	Dust suppression measures would be implemented in accordance with the CEMP.	Construction contractor	Construction
Dust emissions	Stockpiled materials would be managed in accordance with the *Stockpile Management Guideline* (RTA, 2011k).	Construction contractor	Construction
Dust emissions	All trucks would be covered when transporting dust generating material to and from the site.	Construction contractor	Construction
Dust emissions	Works (including the spraying of paint and other materials) would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Concrete batching plant	Dust control measures would be incorporated into the design of the concrete batching plant. These could include the following: • A partially enclosed load hopper (on three sides) when truck loading/delivery is in progress • The three-sided storage hoppers would be at least 0.5 metres higher than the stockpiles with the sides extending beyond the limit of the material; or use other measures such as screening or roofing to minimise dust emissions • Continual wetting operations to reduce emissions during all materials handling • Bulk cement and fly-ash would be stored in silos with overfill protection and filter components on the vents • Filling operations will not generate dust visible above the container • A dry batch dust collector to extract dust during the transfer of the concrete product to the trucks and any emissions from the loading of the weigh hoppers • A fully enclosed conveyor • Surface wetting along all exposed surfaces and stockpiles during unfavourable meteorological conditions (i.e. windy and dry conditions) • Use of water carts along haul roads and access points as required to minimise generation of dust	Construction contractor	Construction
Exhaust and other emissions	Construction plant and equipment would be maintained in a good working condition in order to limit impacts on air quality.	Construction contractor	Construction
Exhaust and other emissions	Plant and machinery would be turned off when not in use.	Construction contractor	Construction
Exhaust and other emissions	Vegetation or other materials would not be burnt on site.	Construction contractor	Construction
Impacts on sensitive receivers	Local residents would be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Construction contractor	Construction
Hazardous emissions to air during demolition	A full building inspection should be conducted of the house and structures to be demolished by a qualified building asbestos inspector to determine if any asbestos materials are present before demolition.	Roads and Maritime	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	Water sprays or alternative dust suppression methods would be employed during demolition in the event that significant dust is generated.	Contractor	Construction

6.7 Traffic and access

6.7.1 Existing environment

The existing road network is described in Section 2.3. The proposal site encompasses the Bruxner Highway but the proposal would also impact on local roads, in particular Tabulam Road, Clarence Street and Clarence River Road. These roads are shown on Figure 1-1 and described further below.

Tabulam Road

Tabulam Road, formally known as Bottle Creek Road, is a rural local road that provides access to several residential properties in Tabulam and services the localities of Jacksons Flat and Lower Bottle Creek to the north of Tabulam. It provides access to several farming properties and Wrenbrook Retreat.

Clarence Street

Clarence Street is a local road that provides access to residential properties, the post office, shops and the racecourse. The intersection of Clarence Street and the Bruxner Highway is a give-way T intersection with no sign control.

Clarence River Road

Clarence River Road is a local road with a narrow sealed surface in poor condition. It intersects the Bruxner Highway approximately midway between the Tabulam Bridge and the Clarence River Overflow Bridge No. 2 and provides access for several rural properties. Clarence River Road meets the highway at an acute angle, forming a large poorly delineated and partially sealed intersection.

Traffic data

Traffic count surveys were carried out on the Bruxner Highway on the eastern approach to Tabulam bridge in 2013, and on Overflow Bridge No. 2, Clarence Street and Tabulam Road in July 2014. The majority of daily traffic occurs consistently between the hours of 8am and 4pm. There were approximately 50 light vehicles and seven heavy vehicles per hour during these hours. Night time traffic volumes are negligible.

The seven day average traffic volume was used to determine the average annual daily traffic (AADT). Assuming no adjustment for seasonal traffic flows, the AADT, percentage of heavy vehicles (%HV) and the highest measured hourly volume of traffic for selected roads (peak hour flow, vehicles per hour (veh/hr)) is shown in Table 6-15.

Table 6-15 2014 AADT

Count location	AADT	% HV	Peak hour flow (veh/hr)
Bruxner Highway at Overflow Bridge No. 2	1245	9.1	84
Clarence Street	467	8.1	42
Tabulam Road at Tabulam Rivulet Bridge	144	15.1	15

Public transport and pedestrians

The current bus route, serviced by Northern Rivers Buslines, provides a service through Tabulam twice a day, and on Mondays, Wednesdays and Fridays, between Tenterfield and Lismore. There is also a school bus that operates twice a day on

school days.

Site observations in August 2013 noted very few pedestrians and only one cyclist travelling on the highway. Movement of school children at drop-off /pick-up locations near Clarence Street was controlled. There were very few pedestrians observed crossing the highway.

Crash statistics

In the five year period to the end of 2012, there were two crashes within the study area. Both crashes occurred on Tabulam Bridge. One crash was a single vehicle incident involving an injury and was caused by a vehicle out of control in wet conditions in daylight. The other crash was a head-on collision in dry conditions in daylight between two vehicles and there were no injuries.

6.7.2 Potential impacts

Construction

The Bruxner Highway, Tabulam Road, Clarence Street and Clarence River Road would be most affected by construction traffic associated with the proposal. Increased traffic would be generated through the delivery of machinery, equipment and materials.

The Bruxner Highway would provide the route for all deliveries of machinery, equipment and materials. Tabulam Road would cater for all traffic movements associated with the establishment and operation of the temporary concrete batching plant, whilst Clarence Street would be utilised for convenience items, lunches and town supplies be construction staff. The cumulative impact of construction traffic on roads in the study area is summarised in Table 6-16.

.

Table 6-16 Cumulative construction traffic impact – Existing traffic

Vehicle type	Bruxner Highway at Overflow Bridge No. 2	Tabulam Road at Tabulam Rivulet Bridge	Clarence Street
Light	76	12	32
Heavy	8	3	10
Total	84	15	42
% Heavy vehicles	10	20	24

Table 6-17 Cumulative construction traffic impact –construction traffic

Vehicle type	Bruxner Highway at Overflow Bridge No. 2	Tabulam Road at Tabulam Rivulet Bridge	Clarence Street
Light	50	10	10
Heavy	7	10	0
% Heavy vehicles	11	37	19
% Increase	40	57	19

Increased traffic during construction could result in the following impacts:

- Road surface damage
- Access restrictions and traffic delays due to construction vehicles entering the compound site, concrete batching plant and during proposed intersection upgrades of the Bruxner Highway intersections with Clarence River Road, Tabulam Road and Clarence Street
- Delays or inconvenience to pedestrians and cyclists. However current use of the road network by pedestrians or cyclists is limited.

Potential impacts from loss of access to public Crown reserves are discussed in Section 6.15.

Operation

The impact of the proposal during operation would be positive. The intersection of the highway and Clarence River Road, which is currently substandard, would be constructed to comply with the Guide to Road Design (Austroads 2006-2009). The highway intersections at Tabulam Road and Clarence Street would also be upgraded, improving traffic flow and safety.

Importantly, the proposal would provide two traffic lanes on the new bridge. This would improve traffic flow and safety.

A two metre wide designated pedestrian and cycle access would also be provided on the northern side of the bridge as part of the proposal. This would improve access and safety for vulnerable road users.

Potential impacts from loss of access to public Crown reserves are discussed in Section 6.15.

6.7.3 Safeguards and management measures

The measures described in Table 6-18 would be implemented to avoid or minimise potential traffic and access impacts.

Table 6-18 Traffic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Potential traffic impacts	A traffic management plan would be prepared in accordance with in accordance with the RTA (2010) *Traffic Control and Work sites Manual* and RTA Specification G10-Control of Traffic prior to works commencing. Consultation would be undertaken with council as required. Pedestrians and cyclists requirements are to be considered in the traffic management plan. Current traffic movements would be maintained wherever possible.	Construction contractor	Pre-construction
Potential traffic impacts	A suitable haulage route for oversized materials would be determined prior to construction commencing.	Construction contractor	Pre-construction
Potential traffic impacts	Construction staging would allow two way access at intersections and private properties.	Construction contractor	Pre-construction
Potential traffic impacts	Project planning would allow continuous movement of vehicles along the Bruxner Highway and across the Clarence River.	Construction contractor	Pre-construction
Potential traffic impacts	Inductions would be undertaken for all personnel and contractors, specifically to include adherence to all road rules.	Construction contractor	Construction
Potential traffic impacts	The condition of existing roads used for haulage would be regularly monitored for damage.	Construction contractor	Construction
Potential traffic impacts	Safe speed limits would be implemented on the approach to the site compound and concrete batching plant.	Construction contractor	Construction
Potential traffic impacts	Access to the site compound and the concrete batching plant would be restricted during construction hours and secured outside of construction hours.	Construction contractor	Construction
Potential property access impacts	Where possible, current property accesses would be maintained during the works. Any disturbance would be minimised.	Construction contractor	Construction

6.8 Hydrology and flooding

6.8.1 Existing environment

Hydrology

Catchment

Tabulam is located within the Clarence River catchment, which has an area of approximately 4,550 square kilometres and the following characteristics:

- The confluence of the Clarence River and the Timbarra River is located approximately two kilometres downstream of the current bridge crossing at Tabulam
- The upstream catchment areas of the Clarence and Timbarra Rivers are largely heavily vegetated or rural in character
- Between Tabulam and the confluence with the Timbarra River there is a broad floodplain area which acts as a large and relatively still moving body of water in large floods

Rainfall

Table 6-19 provides a summary of the annual and monthly rainfall statistics for the three gauging locations in proximity to Tabulam. Maximum rainfall events occurred in the late 1890s and 1928, which corresponds to the large recorded flood events (further discussed below). The maximum annual and monthly rainfall recorded at Drake exceeds that at the other two stations.

An analysis of the Tabulam monthly rainfall statistics indicates the average monthly rainfall varies from a low of approximately 33 millimetres in August to a high of approximately 144 millimetres in February.

Table 6-19 Rainfall statistics

Station	Mean annual rainfall (mm)	Median annual rainfall (mm)	Maximum monthly rainfall (mm)	Month/year of maximum monthly rainfall
Tabulam Post Office	984.9	933.2	722.8	Feb 1893
Drake (Village Resource Centre)	1083.9	1025.4	897.9	Feb 1893
Old Bonalbo (Alcheringa)	1055.8	1078.2	547.6	Feb 1928

Topography

The key topographic features of the study area include:

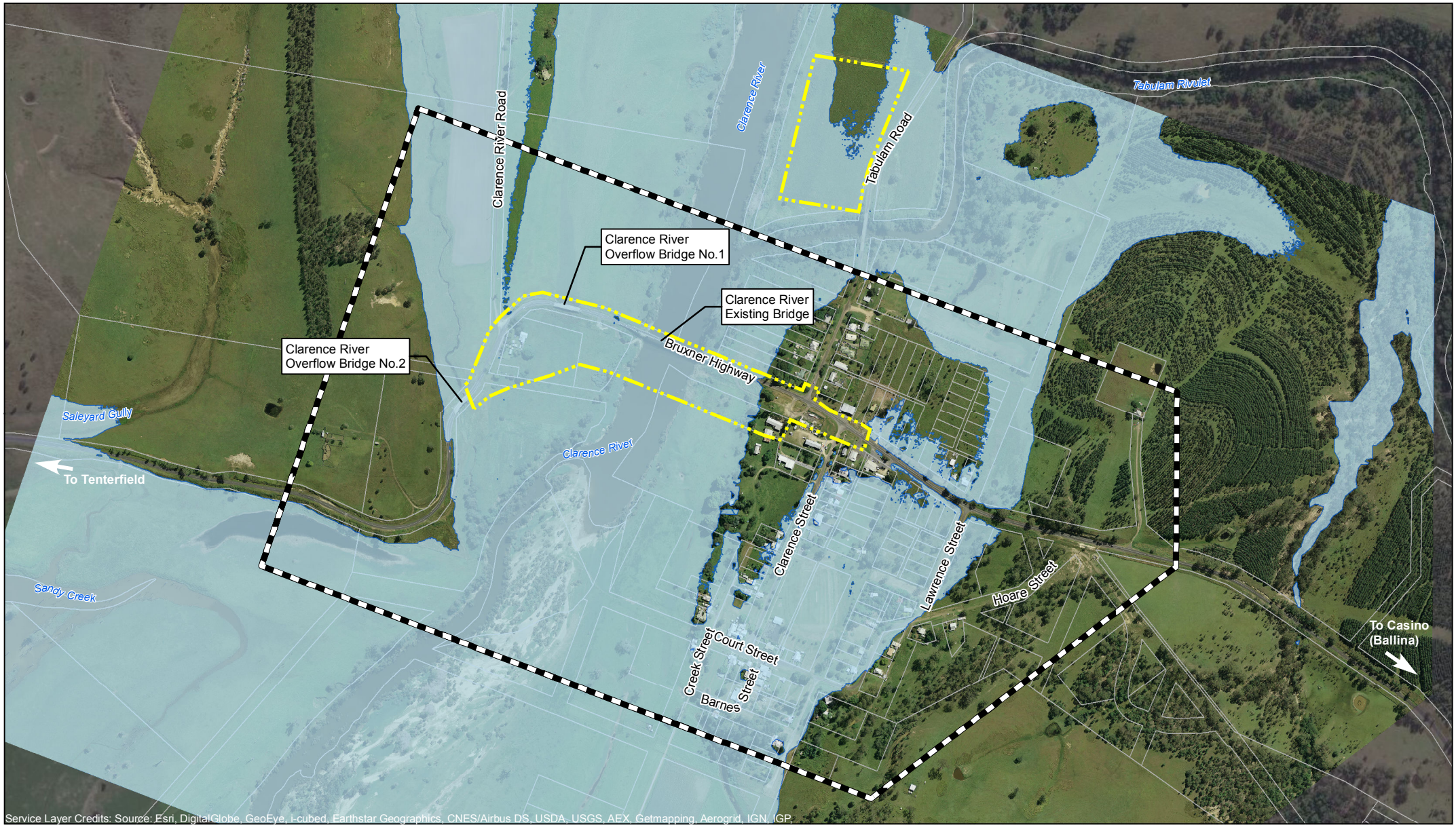
- The Bruxner Highway crosses the Clarence River floodplain approximately perpendicular to the main flow direction. At the western edge of the floodplain the Bruxner Highway bends and is aligned to deviate around a ridge
- To both the east and west of Tabulam the floodplain is restricted in width by a ridge line
- The Tabulam bridge sits at a level between approximately 125 and 130 metres Australian height datum (AHD)
- The ground level at the overflow bridges is approximately 119 metres AHD
- The Tabulam Rivulet joins the Clarence River, from the east, approximately 200 metres upstream of the existing bridge
- Overflow paths exist from the Clarence River onto the western floodplain at a location approximately 400 metres upstream of the existing Tabulam bridge. A review of imagery for the floodplain upstream of Tabulam reveals the existence of additional overflow paths further upstream from the existing bridge location
- The Clarence River water level in 2013 was approximately 115 metres AHD at the existing bridge

Flooding

Tabulam has a history of significant floods including:

- 1863 – significant rains were reported over the northern NSW ranges leading to significant flows in the Clarence River. This event reportedly led to at least one death and the police station was washed away
- 1867 – significant rain was reported in the region around Glenn Innes leading to a flood in the Timbarra River and the Clarence River at Tabulam
- 1890s – huge floods were reported with a rise in the river level at Tabulam of approximately 12.8 metres
- 1976 – flood heights of 129 metres AHD
- 2011 – peak flood level of 127.3 metres AHD with a rate of flood level rise of approximately 1200 millimetres per hour.

For flooding extents at Tabulam for the 1 in 100 year flood event refer to Figure 6-5.



Paper Size A4

0 35 70 140 210 280

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Study area
- Proposal site
- Cadastre
- 100 year Flood Level (Approximate)

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Flooding 100yr ARI

Figure 6-5

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF014_100yrFlood_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012; ESRI: Imagery 2014. Created by: tmorton, fmackay

Groundwater

There are two groundwater bores within proximity of the proposal site (refer Figure 6-6). These are registered for domestic and general use respectively. Both of the bores are located on the eastern side of the Clarence River in Tabulam village and have relatively low reported yields.

6.8.2 Potential impacts

Construction

Hydrology and drainage

The Clarence River at Tabulam has a mobile bed. An estimate of the potential erosion created by the proposal has been assessed as being minimal over and above the existing bed mobility. Some additional local erosion around the piers is likely to occur during large flood events but most probably would recover on infill during later stages of flood hydrographs.

Construction activities have the potential to result in local changes to overland flow regimes and the obstruction of drainage inlets resulting in temporary localised flooding. The design of work platforms would need to consider the local hydrological conditions to ensure that this impact would be minimal .The implementation of the management measures provided in section 6.8.3 would minimise the potential for impacts.

Flooding

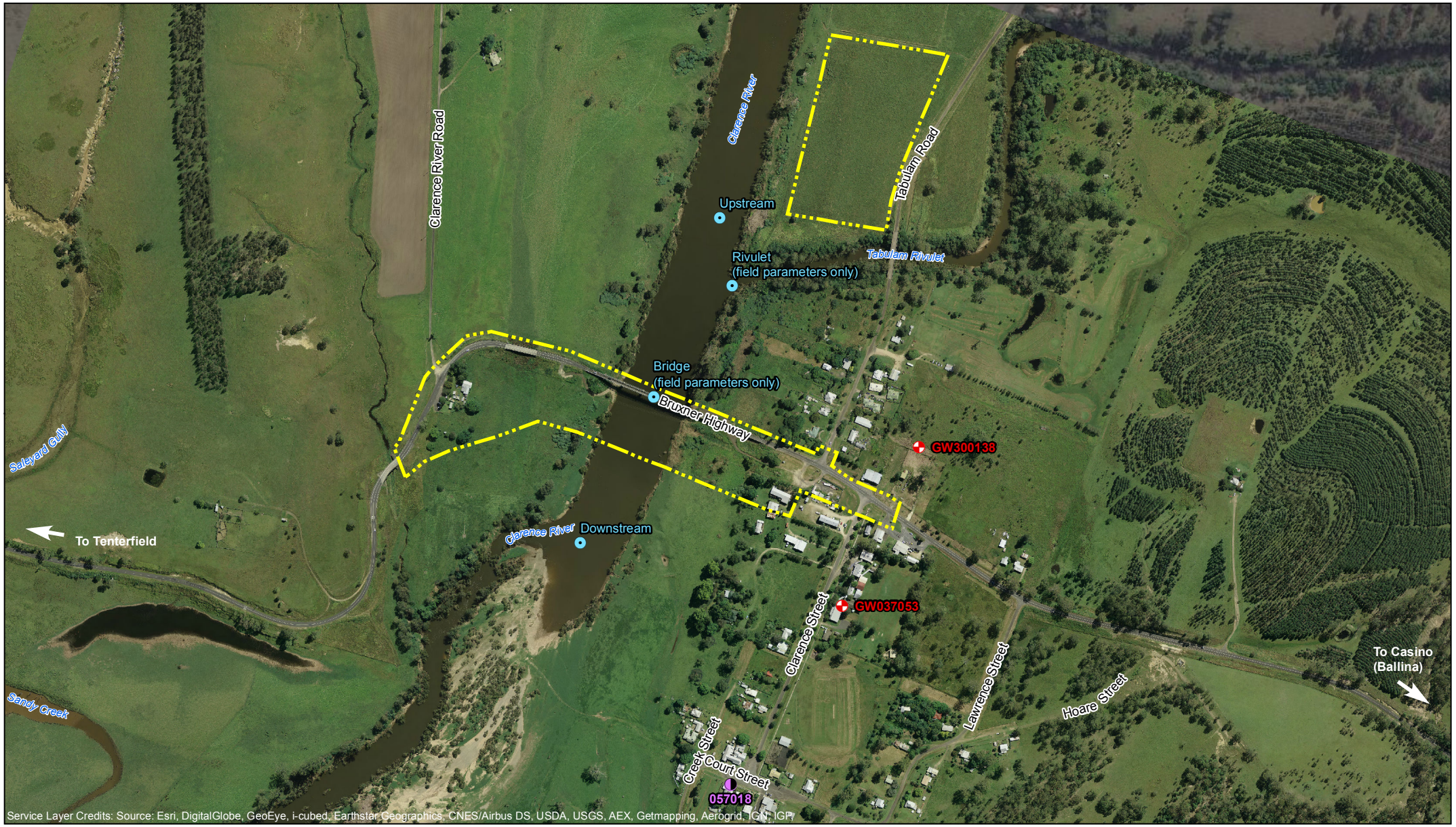
Construction activities are not expected to impact on flooding behaviour in the area. The storage of materials and compound areas would be placed in areas that are not subject to regular flooding events.

The proposed construction works and local access roads are likely to be impacted by flood in the event of a significant rain event in the wettest summer months of the year. Construction planning would need to consider the potential impacts of flood upon works and a contingency plan developed.

Ancillary facilities including the proposed construction compound and temporary concrete batching plant have been located on land above the 1 in 100 year flood event and therefore are unlikely to result in any impact on the current flooding regime in Tabulam.

Groundwater

A bore search only located the existence of two nearby bores. The proposed construction works are unlikely to have any impact on the availability of water that can be extracted from the bores.



Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Groundwater bore
- Rainfall guage
- Water quality monitoring location

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Groundwater Bores, rainfall gauges and water quality monitoring locations

Figure 6-6

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF010_WaterQualityMonitoring_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012; NSW Natural Resources Atlas: Groundwater Bores, 2014; ESRI: Imagery 2014. Created by: tmorton, fmackay

Operation

Hydrology and drainage

The proposed location of the new bridge would require earthworks and imported fill along the banks of the Clarence River which would result in modifications within the riparian zone of the river. The construction of the piers would also present a new obstruction within the waterway. The detailed bridge design would consider the potential for scour and other hydrological modifications upon the waterway flows to ensure there would not be any adverse impacts upon the local hydrology.

The proposal would involve upgrading the existing road drainage and stormwater management system. Stormwater run-off from the new sections of road pavement would be managed by new or upgraded pavement drainage systems, which would likely reduce the risk of hydrology and water quality impacts.

Flooding

Flood impact modelling was initially carried out for the five, 20 and 100 year annual recurrence interval (ARI) events and also an extreme event approximately equal in flow rate to three times the 100 year ARI flow rate. Overall, the proposal would have a minimal impact on the flood level, flood velocities and minimal changes to the existing flooding regime at Tabulam.

Groundwater

There are no expected impacts on groundwater from operation of the proposal.

6.8.3 Safeguards and management measures

The measures described in Table 6-20 would be implemented to avoid or minimise potential impacts on hydrology and flooding so as to ensure it remains as similar as possible to the existing condition.

Table 6-20 Hydrology and flooding safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Drainage design	Consultation with Kyogle Council would be undertaken during detailed design to ensure appropriate integration with council's stormwater network.	Roads and Maritime	Detailed design
Flooding	Further flood modelling would be undertaken to ensure that the proposal does not alter existing flood conditions at private properties in the vicinity of the proposal.	Roads and Maritime	Detailed design
Hydrological changes due to the bridge design and temporary instream accesses	Proposal design would consider the *NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation (2013)* The Proposal design would ensure that the hydrological flows of the waterways are not altered causing scouring of banks or obstruction of flows	Roads and Maritime	Detailed design
Flooding during construction	• A Flood Management Plan should be prepared as part of the CEMP and implemented during construction. At minimum this plan should include: – Project-specific emergency response and evacuation controls during flooding – Measures to ensure that equipment, site-offices, ablution facilities, vehicles, materials, buoyant items and machinery are secured against flood or able to be removed off-site when a flood warning is issued – Reporting requirements – A regular weather monitoring regime.	Construction Contractor	Construction

6.9 Geology and soils

6.9.1 Existing environment

Geology

The Warwick-Tweed Heads 1:250,000 Metallogenic Sheet, Sheet No. SH/56-02 and SH/56-03 (2007) shows the Tabulam area is underlain by Quaternary alluvium along the Clarence River, and the Gatton Sandstone unit of the Marburg Subgroup. Details of these units are as follows:

- 'Quaternary alluvium (Qa): undifferentiated alluvial deposits of sand, silt, clay and gravel; some residual and colluvial deposits
- Gatton Sandstone (Jbgs): thin to thick bedded, coarse to medium grained feldspathic to lithic feldspathic sandstone with clay matrix; subordinate intervals of granule, pebble and minor cobble polymictic conglomerate with abundant ferruginised fossil wood logs and fragments.'

Soils

The geotechnical investigations completed for the proposal (2014) have identified the subsurface conditions in the study area as typical of an alluvial deposition environment, comprising relatively discrete bedded units of sands, clays, and gravels.

A total of nine boreholes and four test pits were completed across the eastern and western banks of the river within the area covered by the four shortlisted options. The boreholes indicated coarse to medium grained sandstone at depths of 7.7 metres to 14 metres. Layers of clay, sandy clay, sand, gravel and pockets of organic material were encountered above the sandstone layer.

Acid sulphate soils

No acid sulphate soil risk maps are available for the study area. However the potential for acid sulphate soils is considered negligible, considering that the elevation of the study area is in the order of 130 metres AHD and acid sulphate soils are usually located in coastal areas at an elevation of less than 10 metres AHD.

Contamination

A search of the online record of notices and list of sites notified to the EPA under the CLM Act found that there are no recorded contaminated sites within the Tenterfield and Kyogle LGAs. One cattle tick dip site is recorded on the online dip site register (DPI) within Lot 7007 DP 1068757. The dip site is approximately 160 metres from the proposal site, at its closest point, and would not be disturbed by proposed works.

The structure, currently used by the preschool at Lot 102 DP752398, which is to be demolished for the design refinement to the western alignment is likely to contain asbestos due to its age, which would require removal and disposal by an appropriately licenced contractor before its demolition.

6.9.2 Potential impacts

Construction

Geology and soils

The proposal would involve earthworks, including establishment of working platforms and/ or wharves within and adjacent to the river, construction of bridge approaches, filling for the road pavements, minor cutting generally limited to table drains and reinstatement of work areas following completion of construction.

As discussed in section 3.3.4, about 9,200 cubic metres of material would be imported for earthworks. Fill material imported from off-site would be sourced from certified suppliers to avoid the potential for contaminated fill. Though not expected, surplus or unsuitable material that cannot be used on-site (for example as part of reinstatement and landscaping) would be classified in accordance with the *Waste Classification Guidelines* (DECCW, 2009) and disposed of appropriately.

Erosion and sedimentation

The proposal would involve excavations and stockpiling of spoil during construction. About 11.12 hectares would be disturbed by the proposal. If not adequately managed, excavation, stockpiling and transportation of spoil could potentially have the following impacts:

- Erosion of exposed soil and stockpiled materials
- An increase in sediment loads entering the river.

With the implementation of erosion and sedimentation controls outlined in Section 6.9.3, including the preparation of a detailed site-specific soil and water management plan, potential construction related erosion and sedimentation impacts would be appropriately managed and are not expected to be significant.

Contamination

Although there is considered to be minimal potential for widespread contamination to occur in the proposal site, there is always the potential to encounter previously unknown contamination during construction. An approach to managing any unexpected contaminated material that may be uncovered would be specified in the CEMP.

Soil contamination could occur as a result of any accidental spills or leaks of fuels, oils and other chemicals from equipment and vehicles during construction. To avoid this potential impact, fuels and chemicals would be managed in accordance with the management measures provided in Section 6.8.3.

The proposal site, including the construction compound and temporary concrete batching plant, encompasses about 11.12 hectares of vegetation. Approximately half of this, would be cleared, mulched and used where possible on site. Stockpiling of mulched material has the potential to result in tannin runoff that may potentially impact on soil or water acidity. To avoid this potential impact, stockpiled mulch would be managed in accordance with the management measures provided in section 6.9.3.

Operation

Operation of the proposal is not likely to result in any significant impacts on geology and soils. 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.

6.9.3 Safeguards and management measures

The measures described in Table 6-21 would be implemented to avoid or minimise potential impacts on native flora and fauna.

Table 6-21 Geology and soils safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Acid sulfate soils	Should detailed design indicate that excavations may encounter acid sulfate soils further assessment would be undertaken. This may include additional sampling and testing and if required, preparation of an acid sulfate soil contingency plan and/or acid sulfate soil management plan in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998). Acid sulfate soils would be managed in accordance with the Guidance for the Management of Acid Sulphate Materials (RTA 2005).	Construction contractor	Pre-construction
Tannins	As part of the CEMP measures for the management of mulch and tannin would be prepared in accordance with the Roads and Maritime Management of Tannins from Vegetation Mulch (2012).	Construction contractor	Pre-construction
Erosion and sedimentation	A soil and water management plan would be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime Services contract specification G38 prior to the commencement of construction. The soil and water management plan would include a progressive erosion and sediment control plan and also address the following: • Roads and Maritime Code of Practice for Water Management • Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008). • Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction (2011) • Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering (2011).	Construction contractor	Pre-construction
Erosion and sedimentation	Erosion and sediment controls would be implemented in accordance with the soil and water management plan before any construction starts and inspected regularly, particularly after a rainfall event. Maintenance work would be undertaken as needed.	Construction contractor	Construction
Erosion and sedimentation	Site stabilisation of disturbed areas would be undertaken progressively as stages are completed. Controls would not be removed until areas are stabilised.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Erosion and sedimentation	All stockpiles would be designed, established, operated and decommissioned in accordance with Roads and Maritime *Stockpile Management Guideline* (RTA, 2011).	Construction contractor	Construction
Erosion and sedimentation	Controls would be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces.	Construction contractor	Construction
Erosion and sedimentation	Any material transported onto pavement surfaces would be swept and removed at the end of each working day.	Construction contractor	Construction
Excess spoil	Excess spoil not required or able to be used for backfilling would be stockpiled in a suitable location before being reused or removed from the site, and disposed of appropriately.	Construction contractor	Construction
Contamination of soil	The CEMP is to include contaminated land management procedures, which must comply with the CLM Act, Roads and Maritime Contaminated Land Management Guideline (2011l), Roads and Maritime Environmental Incident Classification and Reporting Procedure, and relevant EPA guidelines on contaminated land management. The procedures would provide for dealing with: • Areas of known contamination (if any) • Unexpected contamination finds • Any land contamination caused during construction.	Construction contractor	Pre-construction
Contamination of soil	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area would cease until advice on the need for remediation or other action is obtained from an environmental consultant.	Construction contractor	Construction
Contamination of soil	A fully equipped emergency spill kit would be kept on-site at all times.	Construction contractor	Construction

6.10 Water quality

6.10.1 Methodology

Data collection

Water quality monitoring data was collected along the Clarence River on 17 July 2014. The monitoring locations were accessed by water craft, with locations extending approximately 300 metres upstream (sample location 'upstream') and 250 metres downstream (sample location 'downstream') of the existing Tabulam bridge. Monitoring locations are shown in Figure 6-6.

At the time of monitoring, the water was observed to be clear with relatively high visibility. A moderate to strong south-westerly breeze was present, preventing estimation of flow conditions.

The following data were collected:

- Measurements of pH, electrical conductivity (EC), dissolved oxygen (DO) and oxidation-reduction potential at four locations ('upstream', 'rivulet', 'bridge' and 'downstream'), using a calibrated water quality meter. Readings were taken at a depth of approximately 0.25 metres below the water surface
- Samples for laboratory analysis were collected from two locations ('upstream' and 'downstream') by immersion of clean unpreserved sample containers to a depth of approximately 0.25 metres below the water surface. Containers faced upstream during filling. Collected water was then poured into appropriately preserved sample containers. The analytical schedule included:
  - Oil and grease
  - Total suspended solids (TSS)
  - Turbidity
  - Nutrients (including nitrogen and phosphorus)
  - Total heavy metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).
- Water samples were placed into laboratory prepared bottles, suitable for the required analyses. The sample containers were labelled with the job number, sample identification, date and time
- One duplicate sample was collected (from monitoring location 'downstream') during the sampling program
- Sample bottles were immediately transferred to ice filled coolers, for preservation prior to and during transportation to the contract laboratory (ALS). Samples were accompanied with chain of custody documentation to the National Association of Testing Authorities (NATA) certified laboratory.

All fieldwork was conducted in accordance with Roads and Maritime's standard field operating procedures, which are designed to facilitate collection of environmental samples using uniform and systematic methods as required by Roads and Maritime's quality assurance system.

Assessment criteria

Surface water quality data was assessed with reference to the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC/ARMCANZ, 2000) default trigger values for toxicants for the protection of aquatic ecosystems at the 95 per cent level of protection. The relevant criteria are summarised in the below tables.

Table 6-22 Water quality assessment criteria – Heavy metals

Parameter	Units	Recommended criteria[a]
pH	pH units	6.5 – 8.0 [b]
TSS	mg/L	50[b]
Arsenic (As)	mg/L	0.013[c]
Cadmium (Cd)	mg/L	0.0002
Chromium (Cr III+VI)	mg/L	0.001[d]
Copper (Cu)	mg/L	0.0014
Lead (Pb)	mg/L	0.0034
Mercury (Hg)	mg/L	0.00006[e]
Nickel (Ni)	mg/L	0.011
Zinc (Zn)	mg/L	0.008

a) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000), 95 per cent protection level for freshwater

b) ANZECC/ARMCANZ (2000) trigger value for physical/chemical stressors for lowland rivers, slightly disturbed ecosystems – section 3.3.2

c) Trigger value for As(V)

d) Trigger value for Cr(VI)

e) 99 per cent level of protection

f) Equivalent to 0.7 mg/l Nitrate as NO_3 as specified in ANZECC/ARMCANZ (2000).

Table 6-23 Water quality assessment criteria - inorganics

Parameter	Units	Recommended criteria[a]
pH	pH units	6.5 – 8.0 [b]
TSS	mg/L	50[b]
Ammonia as N (NH^3)	mg/L	0.9
Nitrate as N (NO^3)	mg/L	0.16[f]
Nitrite as N (NO^2)	mg/L	0.01
Nitrogen as N – total oxidised (NO_x)	mg/L	0.04[b]
Nitrogen (total; N)	mg/L	0.1
Total Nitrogen (TKN)	mg/L	0.5[b]
Total Phosphorus (P)	mg/L	0.05[b]
Reactive Phosphorus	mg/L	0.02

a) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000), 95 per cent protection level for freshwater

b) ANZECC/ARMCANZ (2000) trigger value for physical/chemical stressors for lowland rivers, slightly disturbed ecosystems – section 3.3.2

c) Trigger value for As(V)

d) Trigger value for Cr(VI)

e) 99 per cent level of protection

f) Equivalent to 0.7 mg/l Nitrate as NO_3 as specified in ANZECC/ARMCANZ (2000).

6.10.2 Existing environment

Analytical results are summarised in Table 6-24. All monitoring locations reported results below the nominated assessment criteria, with the exception of pH values at all locations, which were slightly above the range for the physical/chemical stressor value for lowland rivers, slightly disturbed ecosystems. Both upstream and downstream sampling locations recorded elevated pH values. However this minor exceedance is considered to be within likely natural variance. Dissolved oxygen was not able to be measured due to the low water temperature. Quality assurance procedures confirmed that the monitoring data was acceptable.

Table 6-24 Water quality results –Monitoring location

Paramete	Assessment Criteria Units	Assessment Criteria LOR[a]	Assessment Criteria ANZECC[b]	Monitoring location Bridge	Monitoring location Downstream	Monitoring location Downstream (duplicate)	Monitoring location Rivulet	Monitoring location Upstream
DO	ppm	1	-	-	-	-	-	-
EC	µS/cm	1	-	290	297	-	301	262
pH	pH_Units	0.01	6.5-8.0	8.4	8.62	-	8.79	8.99
Temp.	^{o}C	0.1	-	13.7	13.7	-	14.9	14
Oil & grease	mg/L	5	-	-	<5	<5	-	<5
TSS	mg/L	5	50	-	<5	<5	-	<5
Turbidity	NTU	0.1	-	-	0.7	1.3	-	1.7
NH^3	mg/L	0.01	0.9	-	<0.01	<0.01	-	<0.01
TKN	mg/L	0.1		-	0.3	0.3	-	0.2
NO^3	mg/L	0.01	0.16	-	<0.01	<0.01	-	<0.01
NO^2	mg/L	0.01	-	-	<0.01	<0.01	-	<0.01
NO_x	mg/L	0.01	0.04	-	<0.01	<0.01	-	<0.01
N	mg/L	0.1	0.5	-	0.3	0.3	-	0.2
P	mg/L	0.01	0.05	-	<0.01	<0.01	-	<0.01
Reactive P	mg/L	0.01	0.02	-	<0.01	<0.01	-	<0.01
As	mg/L	0.001	0.013	-	<0.001	0.001	-	0.001
Cd	mg/L	0.0001	0.0002	-	<0.0001	<0.0001	-	<0.0001
Cr III+VI	mg/L	0.001	0.001	-	<0.001	<0.001	-	<0.001
Cu	mg/L	0.001	0.0014	-	<0.001	<0.001	-	<0.001
Pb	mg/L	0.001	0.0034	-	<0.001	<0.001	-	<0.001
Hg	mg/L	0.0001	0.00006	-	<0.0001	<0.0001	-	<0.0001
Ni	mg/L	0.001	0.011	-	<0.001	<0.001	-	<0.001
Zn	mg/L	0.005	0.008	-	<0.005	<0.005	-	<0.005

a) Limit of reporting = the lowest concentration at which an analyte can be detected in a sample

b) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000), 95 per cent protection level for freshwater.

In general, the water at the time of monitoring was considered to be of good quality for this slightly disturbed system. Natural variance in water quality, which can result from weather events such as storm or flooding, is not represented by this single monitoring event.

6.10.3 Potential impacts

Construction

Construction activities have the potential to impact on water quality within local receiving waters. The main potential impacts relate to soil disturbance, which represents a risk to surface water quality, and run-off during construction. Pollutants such as sediment, soil nutrients, concrete, grout and construction waste have the potential to mobilise and enter the river, particularly during high rainfall events.

Water quality impacts could also potentially occur during construction as a result of contamination by fuel or chemical spills from construction vehicles.

The potential also exists for wastewater including contaminated and 'dirty' water from the temporary concrete batching plant to enter waterways if not adequately managed. Contaminated water in the concrete batching industry, refers to water that has contacted alkaline materials used in batching, or originated from alkaline areas, and become alkaline (pH greater than 8.5). Examples of alkaline areas include cement and fly ash storage and loading, agitator truck loading, slumping and washing points, recycled water pits, slurry agitator pits, 'first-flush' collection pits and concrete waste drying and storage. 'Dirty water' from concrete batch plants refers to water that has contacted particulate materials such as sand and gravels and become laden with suspended solids. Dirty water originates from aggregate storage areas not affected by cementitious materials and sediment settling traps.

As discussed in section 6.8, the impact of construction activities on the quality of runoff discharging to the receiving drainage lines would be minimised by implementing an effective soil and water management plan.

A storm and waste water management plan would be prepared to for the operation of the temporary concrete batching plant.

The likelihood of adverse impacts on water quality would be further reduced by the implementation of management measures in sections 6.8.3 and 6.9.3.

Operation

Operation of the proposal is not likely to result in any significant impacts on water quality. 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.

The risk of fuel or chemical spill would be no greater than that currently experienced on the existing bridge.

6.10.4 Safeguards and management measures

The measures described in Table 6-25 would be implemented to avoid or minimise potential impacts on water quality.

Table 6-25 Water quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Sedimentation and contamination of surface water	Erosion, sedimentation and contamination measures identified in section 6.9.3 would be implemented.	Roads and Maritime and construction contractor	Pre-construction and construction
Disturbance of bed and banks	Bed and bank disturbance would be minimised in design and construction methodology. Appropriate measures from the Office of Water Guidelines for Watercourse Crossings and Guidelines for Riparian Corridors on Waterfront Lands would be incorporated into proposal design and the CEMP.	Roads and Maritime and construction contractor	Pre-construction and construction
Disturbance of bed and banks	All surfaces disturbed should be stabilised and restored as soon as practicable and in a progressive manner as works are completed. Environmental Work Method Statements (EWMS) would be prepared in accordance with Section 4.13 of the Roads and Maritime QA Specification G36 for all high risk activities including all works to be undertaken within the Clarence River and any access works on the river banks. The EWMS would be prepared considering the *NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation (2013)* and any requirements for dredging and reclamation activities as advised by DPI (Fisheries). All temporary access points installed for construction access to the waterway (including constructed pads or temporary jetties) would be established in a manner such to minimise disturbance on the banks For all works likely to impact on the waterway (including all temporary access works and piling), a sediment / silt curtain and hydrocarbon boom would be placed in Clarence River, weighted to the bed and secured to accommodate flow. The hydrocarbon boom should be installed inside of the silt curtain when both are in operation. This would remain in place until the completion of drilling and removal of temporary access platforms.	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Contamination of surface water	All fuels, chemicals, and liquids would be stored at least 50 metres away from the river or drainage lines, flooded or poorly drained area or slopes above 10 per cent. They would be stored in an impervious bunded area within the compound site. Amounts stored on site would be minimised. For storage within 50 m, these would be, double-bunded or stored as approved by the Roads and Maritime Environment Officer. Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 m from drainage lines or waterways. Refuelling of plant and equipment over the waterway is to occur within a double-bunded area. Compounds and storage locations would be located as far as practicable outside areas subject to flooding. Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) would be undertaken on a regular basis to identify potential spills or the effects of sediment-laden runoff. Vehicles and plant would be properly maintained and regularly inspected for fluid leaks. Vehicle wash down would occur in a designated bunded area or at a dedicated location off-site. A facility for collecting, treating and disposing of concrete wastes generated during construction would be installed on site. An emergency spill kit would be kept on site at all times. All staff would be made aware of the location of the spill kit and trained in its use. Work areas would be screened or netted to avoid loss of material into the river. This would include netting/ encapsulating the entire underside of the bridge over the river during removal.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Dewatering	Low lying areas of construction formations and excavations that collect stormwater would be dewatered (if required) in accordance with the soil and water management plan (as part of the CEMP) and Roads and Maritime Services' Technical Guideline for Dewatering.	Construction contractor	Construction
Temporary batch plant storm and wastewater management	A storm and waste water management plan would be prepared to for the operation of the temporary concrete batching plant as a sub-plan to the temporary concrete batching plant CEMP. This plan would include measures to address the following as a minimum: Collection ground pits or tanks for first flush of contaminated water from areas such as cement and fly ash storage, concrete loading, agitator bowl washing and slumping, concrete wash out storage and truck washing areas. The required first flush capture capacity is equivalent to 0.02 metres (20 mm) multiplied by the area of the 'contaminated area' – that is 0.02 metres x length x breadth) i.e. a first flush capacity able to hold a 20 mm rain event Within 24 hours of a 20mm rainfall event, capacity is to be restored Design the batching plant so that it is segregated into contaminated (alkaline), dirty (sand and aggregate storage) and hardstand / sealed areas to assist with water management. Divert clean stormwater away from contaminated and dirty operational areas. Reuse water captured water for slumping and dust suppression.	-	-

6.11 Landscape and visual amenity

This section addresses the landscape and visual amenity impacts associated with the proposal and details the management measures proposed to mitigate these impacts.

The information presented in this section is drawn from the relevant sections of the Urban Design Strategy (refer to Appendix I).

6.11.1 Existing environment

Local context and setting

Tabulam is a rural village with the main part of the village located east of the Clarence River and located within the Kyogle Council LGA. Tabulam has a range of services including a public school, post office, grocery store, police station and community facilities. There are also a number of recreation/open space areas within the village and adjoining the Clarence River. The village is bordered by the Clarence River to the west, Tabulam Rivulet to the north and gentle rolling hills to the south-east.

The built form is generally single storey dwellings located on the river floodplain. Existing buildings are scattered throughout the village separated by areas of undeveloped blocks. Vegetation is present throughout the village as there are large areas of undeveloped land. Tabulam bridge defines the western entry to the village.

There are several areas and sites of Aboriginal and non-Aboriginal heritage significance within and surrounding Tabulam. This includes the existing bridge, which is listed as being of state and local heritage significance. This is further discussed in Sections 6.3 and 6.4.

Landscape character zones

A series of landscape character zones (LCZ) are identified in the Urban Design Strategy that reflect a similar combination of urban and landscape features that include landform, built form, vegetation and land use for the study area. The LCZs are depicted on Figure 6-7 and include:

- LCZ 1 - Existing bridge and curtilage
- LCZ 2 - Tabulam village
- LCZ 3 - Lower river flood plain
- LCZ 4 - Upper river reach
- LCZ 5 - Saleyards/rural west
- LCZ 6 - Golf course/rural transition
- LCZ 7 - Rural east
- LCZ 8 - Currabubula Hill/rural lands.

Six key viewpoints have also been identified for the proposal. These are depicted on Figure 6-7.

Paper Size A4

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

Viewpoint

Proposal site

Visual Landscape Zones

- LCZ 1 - Existing bridge and curtilage
- LCZ 2 - Tabulam village
- LCZ 3 - Lower river flood plain
- LCZ 4 - Upper river reach
- LCZ 5 - Saleyards / rural west
- LCZ 6 - Golf course / rural transition
- LCZ 7 - Rural east
- LCZ 8 - Currabubula Hill / rural

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Landscape character zones and viewpoints

Figure 6-7

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF008_LandscapeZones_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012; ESRI: Imagery 2014. Created by: tmorton, fmackay

6.11.2 Potential impacts

Construction

The proposal would require earthworks and the removal of some vegetation within the boundaries of the proposal site. Some of this vegetation, though exotic, contributes to the amenity and character of the local area. The removal of this vegetation and exposure of subsoil would have temporary visual impacts during construction until the works are complete and disturbed areas rehabilitated.

During construction positioning of plant and equipment, including the temporary concrete batching plant, within the view of neighbouring properties and existing road users would result in minor, temporary visual impacts. There would also be a short period of time during the construction of the new bridge and before the removal of the existing bridge, where the landscape would be dominated by two large structures across the Clarence River together with associated plant and equipment. These impacts would be progressive but temporary until the existing bridge is removed.

Aside from the heritage impacts detailed in the Section 6.4 and Appendix G, the removal of the existing bridge would result in a significant change to the views and landscape character of the existing environment. The existing bridge is an imposing bridge with 18 spans, about 300 metres in length and 20 metres high, and is the largest De Burgh truss bridge ever built. The timber trusses are intrinsic to the rural environment.

These impacts would be largely offset by the construction of the new bridge and the incorporation of features or elements of the existing bridge into its design.

The use of lighting towers during any night work may result in light spill impacting adjoining properties and residents.

Operation

An assessment of the impact of the proposal on the LCZs is provided in the Urban Design Strategy (refer to Appendix I). The assessment found that LCZ 1 and LCZ 5 (see Figure 6-7) would be highly impacted by the proposal. All other zones had a low or no impact.

The impact to LCZ 1 results from the contrast of the asymmetrical bridge alignment with the existing east-west alignment. The new bridge crosses the river bank at an oblique angle and is a much larger structure. LCZ 5 impacts arise from the new bridge being located on the agricultural terraces of the western bank which divides the zone. However the existing bridge and its approach already separate this zone further to the north.

A visual impact assessment has also been completed in the Urban Design Strategy. The impact of the proposal at the six key viewpoints (see Figure 6-7) are summarised in Table 6-26.

Table 6-26 Visual impacts of the proposal at key viewpoints

Viewpoint (see Figure 6-7)	Overall impact	Comment
Viewpoint 1	Low	The view of the proposed new bridge and approaches would be similar to the existing view.
Viewpoint 2	High-moderate	The proposal would be located between the existing highway alignment and the Clarence River interrupting views of the agricultural terraces to the east.
Viewpoint 3	Moderate	Whilst the new bridge would be at a similar height at its highest point to the existing bridge, it would be on a different alignment.
Viewpoint 4	Moderate-high	The new bridge and approaches would be visible from the downstream recreational area and buildings adjoining the Clarence River. However, It the buildings are orientated to the east onto Court Street and Clarence Street and do not face the river. Some areas are undeveloped.
Viewpoint 5	Moderate	This view is of open agricultural lands and towards the bridge. The new approach and bridge would impact on this viewpoint as it would change the character of the open agricultural lands.
Viewpoint 6	Low	The view of the new bridge and its approaches may be marginally larger. However the distance reduces the impact.

6.11.3 Safeguards and management measures

The measures described in Table 6-27 would be implemented to avoid or minimise potential impacts on visual amenity.

Table 6-27 Visual amenity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Visual impact	Bridge works are to be managed in accordance with the Roads and Maritime Bridge Aesthetics Guidelines (RTA 2003).	Roads and Maritime	Detailed design
Visual impact	The bridge design would consider: • The bridge would be kept to a simple, clean structure with a slender profile with any services appropriately concealed in the design of the bridge • The heritage of the existing bridge would be reflected in the pier shapes and pier spacings in the new structure including aligning the new piers with the existing bridge • The bridge would be a horizontal structure to acknowledge the general horizontal nature of the surrounding landscape • The design to include spill through abutments to provide a more open appearance and enhance the slenderness of the bridge • Treatment of abutments to consider pedestrian safety and potential for graffiti attack • Lighting would be well placed and architecturally designed • Detailing of the parapet and balustrade to allow views from the bridge • Appropriate interpretation of the existing bridge to be incorporated into the new bridge design. This would be determined in consultation with relevant stakeholders and the community.	Roads and Maritime	Detailed design
Visual impact	The work site would be tidied and all rubbish removed at the end of each day.	Construction contractor	Construction
Visual impact	Work areas would be restored progressively and maintained until established.	Construction contractor	Construction
Landscape impacts	Landscaping would be managed in accordance with the Roads and Maritime Landscape Guideline (RTA 2008).	Roads and Maritime	Detailed design

Impact	Environmental safeguards	Responsibility	Timing
Landscape impacts	The landscape design/ plan would consider: • Minimising the loss of existing vegetation wherever possible • Where possible, flatter slopes of 3 in 1 to enable more effective planting, particularly on smaller batters where the impact on the overall footprint would be less significant • Requiring minimal maintenance • Use of native species in keeping with the character of the area and its identified ecological values. The landscape plan would enhance and augment existing native vegetation. • Existing cultural plantings would also be considered • Improved connectivity for pedestrians and cyclists • Improved connectivity between the bridge and the river • Pedestrian safety and potential for graffiti attack • A picnic area on the eastern river bank • New signage and landscape treatment at Clarence Street intersection to assist in way finding to Tabulam village centre • Minimising the visual intrusiveness of any fences required for safety purposes by setting back and using fences appropriate to a rural setting.	Roads and Maritime	Detailed design
Landscape impacts	A gateway treatment for both bridge approaches would be considered in the landscape design. It would: Eastern approach: • Continue the 'forested' bushland descent from the Bruxner Highway into Tabulam • Enhanced 'cultural' avenue planting on both sides of the bridge approaches, signifying proximity to Tabulam village Western approach: • Include formal planting of Forest Redgum to assist in identifying the Tenterfield Shire.	Roads and Maritime	Detailed design

6.12 Climate change

6.12.1 Existing environment

Rainfall

Daily rainfall data for Tabulam Post Office (station number 57018), located approximately 600 metres south-east of the existing bridge (see Figure 6-6), is available for the period of 1889 to 2013. The median annual rainfall for this period is 933 millimetres, with the minimum of 439 millimetres recorded in 1918 and the maximum of 1,811 millimetres recorded in 1893. The average monthly rainfall was observed to vary from approximately 33 millimetres in August to approximately 144 millimetres in February. There is a significant variation in the maximum monthly rainfall ranging from approximately 139 millimetres in August to approximately 723 millimetres in February.

The average number of non-rainfall days (less than 0.1 millimetres) per year is approximately 270, which is 74 per cent of the days in a year. A total of 12 per cent of days per year (or 45 days) were found to receive between 0.1 and five millimetres of rainfall. Daily rainfall depths are greater than 10 millimetres approximately eight per cent of the time (or 31 days per year) on average, with approximately three per cent of days in the year (or 10 days) receiving greater than 25 millimetres of rain.

Wind

The study area experiences predominantly light to moderate winds (between 0.5 metres per second (m/s) and four m/s), with the prevailing wind direction from the north-west. Calm wind conditions (wind speed less than 0.5 m/s) occur approximately 9.5 per cent of the time. Summer winds are light to moderate (two to eight m/s) and predominantly from the south-east. Westerlies dominate in winter most often, with the strongest winds from two to 10 m/s.

Frost

Potential frost days (taken from Tabulam (Muirne) Station (number 57095)) occur from late autumn to the middle of spring, with ten days the maximum number of potential frost days for July and August.

Temperature

The average minimum temperature at the Tabulam (Muirne) Station is approximately 7.2 degrees Celsius (°C) in July and 17.1 °C in January. The lowest minimum temperature ranges between 0.0 °C in July and August and 11.6 °C in January. The highest minimum temperature recorded is between 15.1 °C in July and 26.2 °C in January.

The average maximum temperature at the Tabulam (Muirne) Station is approximately 16.3 °C in July and 27.0 °C in January. The lowest maximum temperature ranges between 5.3 °C in June and 16.7 °C in February. The highest maximum temperature recorded varied between 24.2 °C in July and 39.8 °C in January.

Fog

Fog occurs due to water droplets suspended in the air causing a visibility of less than one kilometre. The formation of fog is affected by several factors including temperature, humidity, wind, cloud coverage, topography and location. There is no regional information on fog for Tabulam.

Predicated climate change

The NSW Climate Impact Profile (DECCW, 2010a) provides regional climate projections for NSW in 2050 based on preliminary analyses of global modelling data. The projections have been developed for NSW regions, with the proposal site located in the North Coast region. A summary of the climate change impacts predicted by DECCW (2010) for the North Coast region is provided in Table 6-28.

Table 6-28 Climate change predictions for the North Coast region 2050

Period	Minimum temperatures	Maximum temperatures	Precipitation	Runoff depths	Magnitude of high flows
Spring	2.0–3.0 °C warmer	1.5–2.0 °C warmer	No change	–13% to +4%	Substantial decrease
Summer	2.0–3.0 °C warmer	1.0–1.5 °C warmer	5–20% increase	+5% to +18%	Substantial increase
Autumn	2.0–3.0 °C warmer	1.5–2.0 °C warmer	5–10% increase	–11% to +18%	Slight increase
Winter	2.0–3.0 °C warmer	2.0–3.0 °C warmer	5–10% decrease	–17% to +18%	Slight decrease
Spring	2.0–3.0 °C warmer	1.5–2.0 °C warmer	No change	–13% to +4%	Substantial decrease

6.12.2 Potential impacts

Construction

The potential impacts of the proposal on predicted climate change for the region would occur as a result of greenhouse gas emissions. This is specifically addressed in Section 6.16. There would be no other climate change impacts from the proposal during construction.

Operation

There would be no impacts on climate change during proposal operation.

6.12.3 Safeguards and management measures

The proposal would not significantly impact on predicted climate change during either construction or operation. Potential impacts due to emissions of greenhouse gases during proposal construction and operation are addressed in Section 6.16.

The measures described in Table 6-29 would be implemented to avoid or minimise potential impacts to the proposal from predicted climate change in the North Coast region.

Table 6-29 Climate change safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Increased temperature	Design and material selection would consider temperature, for example use non-conductive materials, and incorporate shade provision in open space.	Roads and Maritime	Detailed design
Increases in runoff depths and the magnitude of high flow events	Road grades (longitudinal and cross-section) would account for increased drainage requirements.	Roads and Maritime	Detailed design
Increases in rainfall intensity	Road grades (longitudinal and cross-section) would account for increased drainage requirements.	Roads and Maritime	Detailed design
Other climatic changes (e.g. frost, fog, wind)	Design and material selection would consider frost, fog and wind. Signage to provide warnings if necessary.	Roads and Maritime	Detailed design

6.13 Socio-economic

6.13.1 Methodology

A desktop review of Australian Bureau of Statistics (ABS) 2011 and 2006 Census data, relevant documents from Kyogle Council and Tenterfield Shire Council, outcomes of consultation with the community and key stakeholders, and other information available online was carried out to describe the socio-economic environment. A site visit was also carried out by a social planner on 22 July 2014.

The study area encompasses the Tabulam village centre and surrounding areas, which is considered to be the community that would most likely experience the direct impacts of the proposal. The study area includes the ABS statistical areas (level 1, SA1) of Tabulam Town, Tabulam West, Jubullum Village and Tabulam South West (refer Figure 6-8). Changes to census collection boundaries have prevented meaningful analysis of population or socio-economic changes in Tabulam between 2006 and 2011. Where relevant, comparative information has been reviewed for the Kyogle and Tenterfield LGAs.

6.13.2 Existing environment

Overview of Tabulam

Tabulam is a rural area and a small town in the Northern Tablelands region of NSW, where the Bruxner Highway crosses the Clarence River between Tenterfield and Casino.

Traditionally the land of the Bundjalung Aboriginal people, the region is culturally significant. The Koori place name of Tabulam means 'the originals'. European settlement of Tabulam resulted in the forced relocation of many of the Bundjalung people from areas in and around Tabulam to a nearby Aboriginal reserve, which later became a mission. This area is now known as the Jubullum Village, located approximately three kilometres south of the Tabulam township. The Jubullum Flat Camp Aboriginal Area (managed by OEH is approximately 0.5 kilometres north of Tabulam village) is also a culturally significant site for Bundjalung people.

Population characteristics

The total population of Tabulam in 2011 (which includes the four ABS statistical areas depicted on Figure 6-8) was 644 people living in 241 dwellings. More than one third of the population (224 people) lived in the Tabulam Town area, within the Kyogle LGA. Just over 20 per cent of the population lived in the Jubullum Village.

In 2011, residents of Tabulam West were older than other parts of Tabulam, with a median age of 49 years. There were also more single parent families and smaller households. In contrast, the population of Tabulam South West was younger, with a median age of 45 years, with 31 per cent of the population aged under 18 years. Tabulam South West also had significantly more lone person households (37.5 per cent) than the LGA and other areas of Tabulam. Jubullum Village was almost exclusively Aboriginal, and had a much younger population than other parts of Tabulam. With a median age of only 28 years, more than one third of the population (34.5 per cent) was under the age of 18. Single parent families were also common, representing almost three quarters (74.2 per cent) of all families.

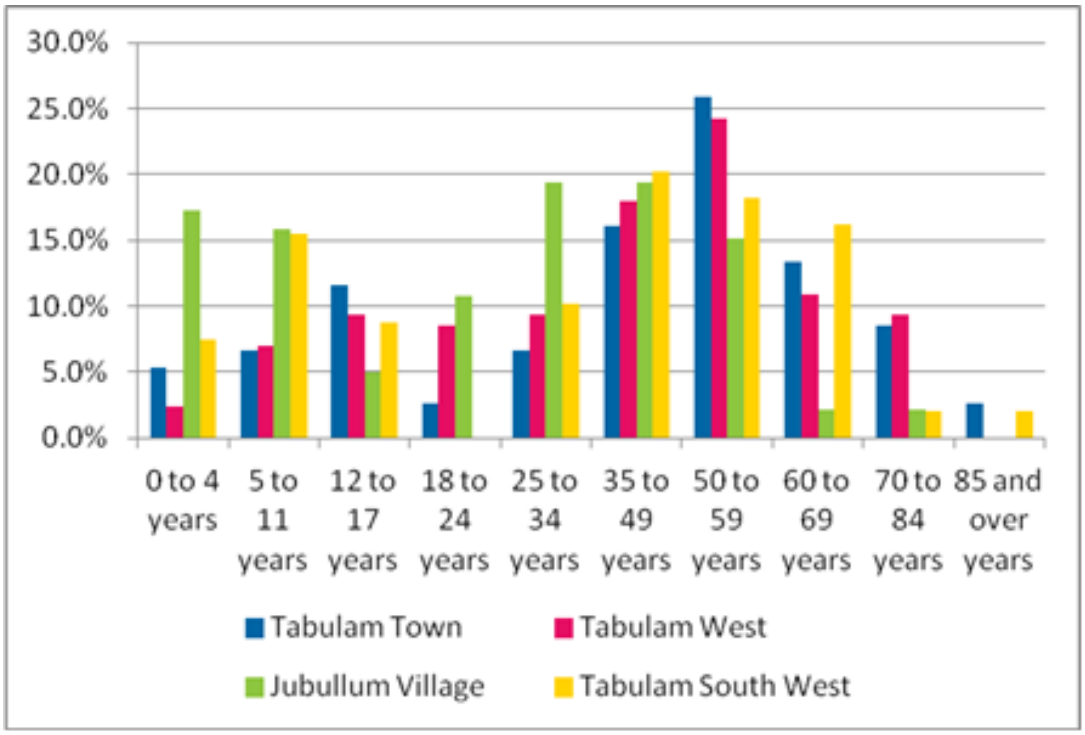


Figure 6-8 Social characteristics and ABS statistical areas of Tabulam

The age profiles for each of the ABS statistical areas are shown in Figure 6-8 Jubullum Village had a much younger population compared to all other areas.

The socio-economic indexes for areas (SEIFA) scores for Tabulam indicate that all statistical areas had higher levels of disadvantage than both Kyogle and Tenterfield LGAs. In particular, Tabulam West displays a higher level of disadvantage.

Local economy

The key industries of employment for residents of Tabulam in 2011 were agriculture, forestry and fishing, representing between 30 and 50 per cent of workers, compared with closer to 20 per cent for both Kyogle and Tenterfield LGAs. The next most common industries were accommodation and food services, pubic administration and safety, retail trade and construction. The key industries of employment for Tabulam Town, Tabulam West and Tabulam South West are depicted in Figure 6-9.

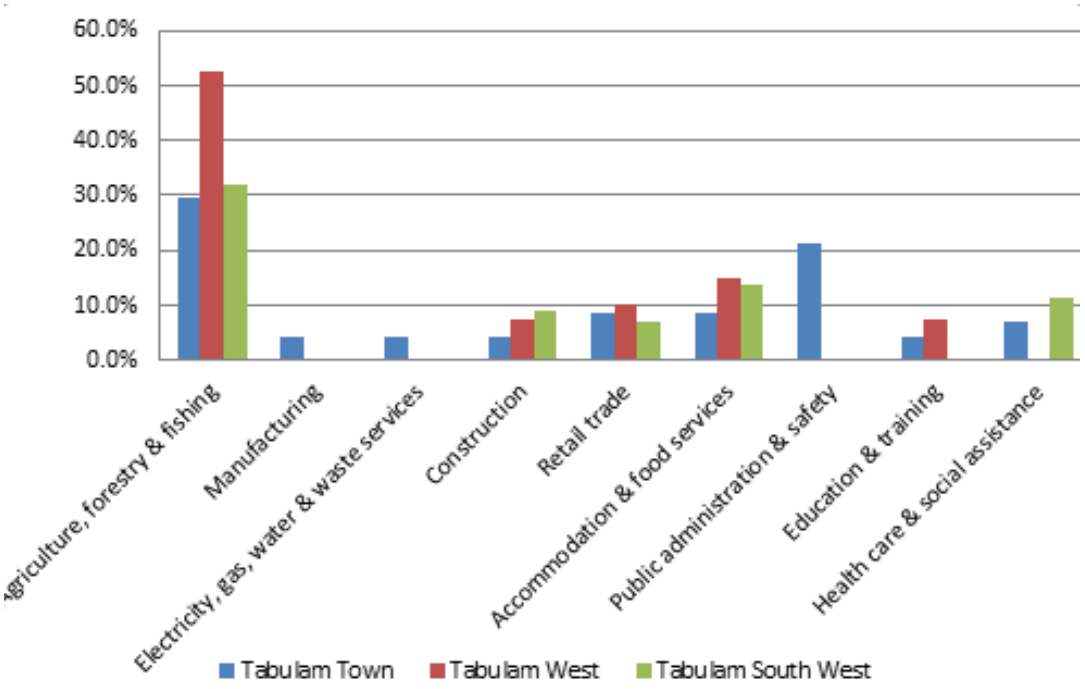


Figure 6-9 Key industries of employment for ABS statistical areas of Tabulam

Unemployment levels vary across the ABS statistical areas of Tabulam. Unemployment rates in Tabulam Town and Tabulam South West in 2011 are comparable to the averages for the Kyogle and Tenterfield LGAs, with rates between six and nine per cent. The unemployment rates for Tabulam West were higher than average for Tenterfield LGA, at 15 per cent compared to 6.8 per cent. Labour force participation was also lower across Tabulam statistical areas (from 40.1 to 44.4 per cent) than the LGA averages (50 per cent). The Jubullum Village area had a labour force participation rate of 16.3 per cent, and unemployment of 35.7 per cent.

Agriculture in the area is also known to create some seasonal demand for labour, with a nearby berry grower bringing in picking staff by bus during harvest periods.

Tourism is a key element of the local economy, with Tabulam promoted for its bridge (the longest single span truss bridge in the southern hemisphere), the value of the river for canoeing and rafting, as a place to commence a road trip to the Upper Clarence Valley and for its historical values. The former homestead of local historical figure Captain Chauvel now operates as a rural bed and breakfast (located in town opposite the primary school). Old tank traps, remnants of the Brisbane Line fortifications from World War II – the second line of defence in case of an invasion from the north, are also visible nearby at Paddy's Flat, in Tabulam West. These remnants were more exposed after extensive flooding in 2011.

Social infrastructure and businesses

As shown in Figure 6-10 there is limited social infrastructure in Tabulam, including:

- Tabulam Public School – a small primary school with 61 enrolments in 2013
- Tabulam and District Community Preschool – located on the Bruxner Highway, the preschool operates a bus to pick up children from town and Jubullum Village. It is understood from discussions with the preschool during proposal development that it would be relocating into the village in 2016.
- Sports field, playground and community hall with a basketball court, located next to the primary school

- Small town centre with a post office, hotel, café, a small food store and a whole foods store
- Three church halls
- Police station
- State Emergency Services and fire facility located next to the general store
- Rural supplies business located on the Bruxner Highway.

The nearest high school is the Bonalbo Central School, located approximately 26 kilometres away at Bonalbo, which in 2013 had a total of 160 enrolments. The nearest hospital is also located at Bonalbo, and includes a community health centre. Tertiary technical studies are available through Technical and Further Education (TAFE) campuses at Casino and Tenterfield.

The local Tabulam Bus Service operates a school service which picks up children from local homes to be transported to Tabulam Public School and Bonalbo Central School. Northern Rivers Bus Lines provides two services daily during week days, from Tabulam to Tenterfield and Casino/Lismore, and a school bus service linking Tabulam with surrounding areas. Northern Rivers Community Transport provides transport for home and community care patients, a regular bus service two days a week to Lismore/Casino, and a service for young people to access recreational activities.

Located on a property approximately 10 kilometres from Tabulam, the Balund-a Program is an innovative residential diversionary program for male and female offenders between 18 and 40 years of age. The program aims to reduce re-offending and enhance skills within a cultural and supportive community environment.

Community values

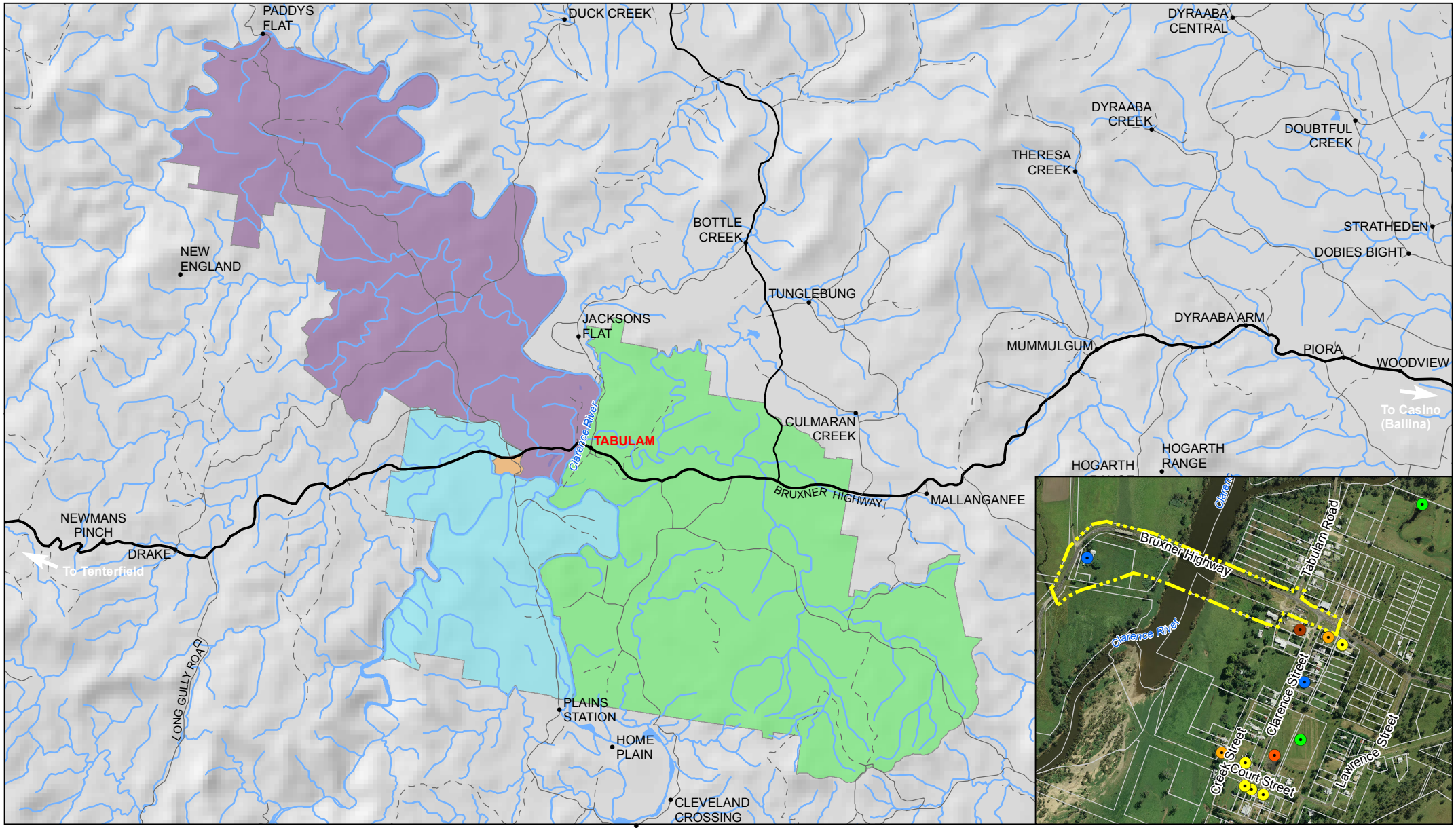
The values of the Tabulam community are demonstrated by the number and diversity of activities and events undertaken by the community. Social cohesion and inclusion in the area appears strong. The Uniting Aboriginal and Islander Christian Congress operates regular Sunday school, gospel meetings and a Boogilmar Market Garden (community garden) in Tabulam. The nearby Peace Circle Carvings are a community project of large wooden carvings made by residents of Tabulam and surrounding communities as an expression of peace and unity in the communities west of the ranges. Visitors are invited to carve the visitors block.

Aboriginal culture has a strong presence in the town, with many community facilities, including the primary school, preschool and community building at the basketball court, painted with Aboriginal images and designs.

Roads and Maritime have implemented a detailed consultation strategy with the community and key stakeholders in relation to the proposal (refer Section 5). Overall, the key issues and values highlighted during this consultation include:

- The importance of safety for motorists and pedestrians
- Historical value of the bridge and the need to recognise this
- Accessibility for residents through the village and across the bridge
- Natural amenity and importance of the river to the community
- Safe access to the preschool
- Residential amenity including safety, traffic, noise and loss of green spaces

Consultation was also carried out in 2012 to inform the *Timber Truss Bridge Conservation Strategy*. The 2012 consultation showed that community interest for the recognition of the historical significance of the bridge was balanced with valuing safe and efficient travel.



Paper Size A4

0 800 1,600 3,200 4,800 6,400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Cadastre
- Jubullum Village
- Tabulam South West
- Tabulam Town
- Tabulam West

Social Infrastructure

- Emergency services
- Shops and services
- Sports field
- Community building and basketball court
- Education
- Rural business

Roads and Maritime Services
Tabulam New Bridge
Review of Environmenal Factors

Job Number 22-16888
Revision 0
Date 09 Feb 2015

Social characteristics of the study area

Figure 6-10

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF009_Social_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012; ESRI: Imagery 2014; ABS: 2014 Created by: tmorton, fmackay

6.13.3 Potential impacts

Impacts related to air quality and dust, traffic and access, land use, noise and vibration, Aboriginal heritage, and non-Aboriginal heritage have consequential socio-economic impacts on the local community and road users throughout construction and operation of the new bridge.

These potential impacts have been addressed in other sections of this REF, as follows:

- Air quality (refer Section 6.6)
- Traffic and access (refer Section 6.7)
- Land use (refer Section 6.15)
- Noise and vibration (refer Section 6.5)
- Aboriginal heritage (refer Section 6.3)
- Non-Aboriginal heritage (refer Section 6.4).

The key socio-economic impacts that may occur during construction and operation of the proposal are described in the following sections.

Construction

Property acquisition impacts

Land acquisition is yet to be finalised for the proposal but would include private and Crown land (see Section 3.6). This includes:

- Land to the west of the bridge – including the preschool site (owned by the Uniting Church) and adjacent Crown land
- Land to the east of the bridge – including private land used for commercial (rural supply business) and agricultural use.

The area of private land acquisition is considered a minor negative impact on the owners, as the land loss is not expected to impact on the viability of the existing or any future use of the properties affected.

Access

The construction of the new bridge would lead to changed traffic conditions and delays. This would have a minor impact on motorists, including local residents, transport providers (such as school buses, community transport), freight and livestock companies, and others. The impact on travel to and from the preschool and public school, as buses currently travel over the bridge to pick up children each day, would lead to minor delays in travel time.

Effective communication of anticipated access changes to the local community would minimise the inconvenience of such impacts.

Amenity

Properties closest to the proposal site (including private and commercial properties in town) are likely to experience temporary amenity impacts resulting from construction activities including:

- Increase in noise and vibration from construction activities and traffic
- Visual impacts
- Increase in construction traffic and probably delays
- Potential dust disturbance.

These issues have been assessed and appropriate management provided in other sections of the REF as described above.

Economic impacts

It is anticipated that a workforce of around 30 construction and site management personnel would be required on-site each day during construction, which is anticipated to take place over 18 months. This number would vary depending on the stages of construction and is likely to peak at approximately 50. Given the relatively high unemployment and low labour force participation in parts of Tabulam, the proposal presents the opportunity for short term employment benefits for local labour. The construction workforce has the potential for the following impacts on local businesses:

- Construction workers not local to the area may require accommodation during the construction period, which could be provided by nearby tourist parks or rental accommodation in the Tabulam area
- Food outlets (including the café, food stores, hotel) and service stations may experience a small increase in trade from construction workers.

These impacts on local businesses are expected to be minor, short term and positive. Any locally generated employment during construction would also be a positive short term benefit. It would also contribute to providing an enhanced local sense of place and ownership of the new bridge.

Operation

Access

During operation of the new Tabulam bridge, vehicle access between the town and properties located to the west of the Tabulam bridge, including Jubullum Village would be maintained. Additionally, access would be safer and more efficient due to the introduction of two lanes, which would remove the need to give way to vehicles approaching from the opposite direction over the bridge. This would be a positive, long term impact for motorists travelling over Tabulam bridge.

Pedestrian and cyclist access would be improved due to the inclusion of a dedicated pathway in the new bridge design.

Amenity

There would be no long term amenity impacts, such as increased noise, vibration or dust, from the proposal.

The existing bridge is valued by the local and broader community for its heritage and aesthetic appeal and is a feature of the town. This value would be lost when the bridge is replaced. Other facilities in Tabulam (such as the community building, primary school and preschool) have been artistically embellished by the local community and reflect their local Aboriginal culture.

Business impacts

The replacement of the existing bridge is likely to have a positive impact on freight, livestock and other companies travelling over the bridge from east to west due to improved travel efficiency.

Economic impacts

Replacement of the existing bridge would result in significant reduced maintenance costs for Roads and Maritime Services. Construction of the new bridge would result in a higher value asset that would deliver greater function, safety and performance than the existing bridge. This would be a long term positive impact. Loss of the existing timber bridge is not expected to significantly impact on tourism in the area.

The new bridge would provide HML capacity for semi-trailers. Semi-trailer operators would be able to increase their total mass limits from 42.5 tonnes to 45.5 tonnes. This would have a positive impact on businesses such as freight and livestock operators.

Community values

Community consultation regarding the proposal has revealed that some groups in the community particularly value the heritage of the bridge and want to see it retained. Bridge replacement would alter the character of the proposal site and could have negative impacts on the heritage experience of the area for the community and visitors.

Summary of socio-economic impacts

Overall, the adverse socio-economic impacts resulting from the replacement of Tabulam bridge are considered to be minor and localised to individual properties.

Due to the proposed construction approach, which would retain the existing bridge until the new bridge is operational, traffic and access impacts would be minimised. In addition, few residences, businesses and community facilities are located within close proximity to the bridge. This would minimise amenity impacts during construction due to noise and vibration, dust and visual issues.

The key adverse socio-economic impact during operation of the proposal is considered to be loss of connection to the heritage and aesthetic appeal of the bridge itself. A number of safeguards and management measures are recommended to mitigate this and other potential negative impacts, while increasing potential opportunities for the Tabulam community.

The proposal would have a significant positive socio-economic impact due to the improvement of road safety and efficiency during operation. Short term positive impacts during construction would include potential increased employment opportunities and economic benefits for local businesses

6.13.4 Safeguards and management measures

The measures described in Table 6-30 would be implemented to avoid or minimise potential socio-economic impacts.

Table 6-30 Socio-economic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Construction related amenity impacts and traffic changes	Communication with residents, businesses and organisations located within Tabulam would be carried out in advance of construction to ascertain any specific times/events that would be considered in construction programming (e.g. school or cultural events).	Roads and Maritime	Pre-construction
Construction related amenity impacts and traffic changes	Residents living near the bridge and the local community would be provided with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust and noise impacts and access changes.	Roads and Maritime	Pre-construction
Construction related amenity impacts and traffic changes	Roads and Maritime would work with local community organisations or Council to coordinate appropriate communication methods, including ensuring any vulnerable community members are appropriately engaged during the consultation period.	Roads and Maritime	Pre-construction
Construction related amenity impacts and traffic changes	Communications would include roadside signage, letterbox dropped newsletters, newspaper advertisements, Roads and Maritime web based information, a complaints line, and advice to specific service providers such as community transport and seniors organisations.	Roads and Maritime	Pre-construction
Operational heritage and cultural impacts	Design of the new bridge would be undertaken in consultation with the local community, particularly the Aboriginal community and heritage stakeholders to include appropriate ways to remember the existing bridge and to enhance acceptance and ownership of the new bridge. This could include public art or other cultural opportunities.	Roads and Maritime	Detailed design

6.14 Hazard and risk

6.14.1 Existing environment

Existing hazards and risks in the vicinity of the proposal site are generally associated with operation of the road network.

6.14.2 Potential impacts

Construction

Hazards and risks associated with construction include:

- Spills or leakage of contaminants such as fuels, chemicals and hazardous substances entering surface and groundwater or contaminating soils
- Discharge of turbid run-off, resulting in pollution of waterways
- Discharge of waste from temporary concrete batching plant
- Encountering utilities or contaminated material during earthwork including asbestos
- Spread of noxious weed material
- Flooding of the area during extreme rain events
- Changed traffic conditions leading to incidents.

These potential impacts have been addressed in other sections of this REF, as follows:

- Geology and soils (refer Section 6.9)
- Hydrology and flooding (refer Section 6.8)
- Land use (refer Section 6.15)
- Biodiversity (refer Section 6.1 and 6.2)
- Resource consumption and waste management (refer Section 6.17).

Construction risks would be temporary and appropriately managed with the relevant safeguards provided in the above referenced sections. Hazards and risks to the local area are unlikely to be impacted by construction, as impacts would be localised and limited to areas immediately adjacent to the proposal site.

Additional safeguards are listed in Section 6.14.3.

Operation

Operational hazards and risks relating to the proposal could include:

- Fuel and oil spills during maintenance activities polluting the natural environment
- Vehicle incidents.

Vehicle crashes are an inherent aspect of the operation of any road. During design of the proposal, Roads and Maritime has applied the requirements of the *Guide to Road Design* (Austroads 2006-2009) to meet appropriate safety standards. Similarly, uncontrolled pedestrian access is a risk that Roads and Maritime has endeavoured to control and the proposal includes dedicated pedestrian and cyclist movement.

6.14.3 Safeguards and management measures

The measures described in Table 6-31 would be implemented to avoid or minimise potential hazards and risks

.

Table 6-31 Hazard and risk safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Risk Management	Emergency response plans would be incorporated into the CEMP.	Construction contractor	Pre-construction and construction
Risk Management	A pollution incident response management plan would be developed and implemented in accordance with the POEO Act requirements and Roads and Maritime *Environmental Incident Classification and Management Procedure*. The plan would form a sub-plan within the CEMP.	Construction contractor	Pre-construction and construction
Risk Management	An emergency spill kit would be kept on site at all times. All staff would be made aware of the location of the spill kit and trained in its use.	Construction contractor	Construction

6.15 Land use

6.15.1 Existing environment

Land use

The village of Tabulam supports a range of land uses typical of most rural villages of similar size. Beside residential dwellings, the town supports a public primary school and playground, preschool, church, State Emergency Service and Rural Fire Services facility and a licensed post office. Retail outlets include a newsagent which provides local tourist information, petrol station, general store, café and a hotel. A number of commercial/agricultural services are also located in Tabulam.

Surrounding land use is predominately agricultural and forestry. Agricultural pursuits are identified as sheep, cattle and grain farming in the Australian Bureau of Statistics data for Tabulam. There is a sand and gravel quarry across the river approximately five kilometres to the south west of Tabulam.

Public utilities

There are Essential Energy and Telstra assets within the study area.

Essential Energy assets are dispersed throughout the study area. The assets are generally confined to the township extents and road reserves. An overhead 11kV transmission line crosses the Clarence River just south of the existing bridge.

Telstra plans indicate underground utilities dispersed throughout the study area. In general, the utilities follow the alignment of roads within the immediate township area and are confined to the road reserve. Optic fibre cables are present within the study area crossing the Clarence River. The alignment extends from the south of the village to near the current preschool site on the western bridge abutment, before continuing further west beyond the study area.

Tenterfield Shire Council and Kyogle Council have indicated that there are no reticulated water or sewer assets at Tabulam.

Crown reserves

The proposal would impact on some areas of Crown land, including land set aside for 'public recreation'. The details of the various Crown reserves affected by the proposal are provided in section 3.6 and shown on Figure 3-9. In summary, Crown reserves impacted by the proposal include:

- Lot 7006 DP1068757 – R88164 for public recreation devolved to Tenterfield Shire Council
- Lot 7347 DP1178935 – Crown land
- Crown waterway and road.

6.15.2 Potential impacts

Construction

Direct impacts on land use as a result of the proposal would mainly relate to the short term presence of construction work within the proposal site. Construction may temporarily impact on vehicular and pedestrian access in the immediate vicinity of the work site. Potential traffic and access impacts are considered in section 6.7.

Current property acquisition or adjustments required are summarised in Table 3.3. Roads and Maritime would continue to consult with affected landholders before and during construction to minimise the potential for impacts on land use.

The need for utility adjustments is still being investigated and would be further refined during the detailed design phase. Current environmental assessments for the proposal have considered the impacts of utility adjustments and relocation within the proposal site. Should any utility adjustments be required outside the proposal site, additional environmental approvals would be required. Roads and Maritime would continue to consult with public utilities and affected landholders before and during construction to minimise the potential for impacts on service provision and land use.

Access to Crown reserve R88164 for recreational activities would be impacted by the proposal. However impacts would be short term during construction only and would be reinstated on completion. Access to the river can be achieved either north or south of this area during the construction period. Therefore this impact is not expected to be significant.

Impacts to the other area of Crown land would be negligible, from a land use perspective. Hover public access to the waterway would be maintained wherever possible.

Construction activities have the potential to impact on existing utilities and services in Tabulam, in particular power and telecommunications. The proposed strategies for adjustment and/or protection of each utility would be discussed in detail with relevant providers during detailed design. Discussion would identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions, which have the potential to impact on existing land use.

Operation

The proposal would not result in significant long term land use impacts. It would require a change of land use for a small area of land on the western side of the river that is currently used for agricultural purposes. Additionally, the land where the preschool is currently located will be converted partly to road, with the remainder of the land remaining as rural use. Elsewhere the proposal is located on vacant land in close proximity to the existing bridge. Crown land would revert to its pre-existing use.

6.15.3 Safeguards and management measures

The measures described in Table 6-32 would be implemented to avoid or minimise potential impacts on land use.

Table 6-32 Land use safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Adjacent land use impacts	Roads and Maritime would consult with potentially affected landholders before and during construction to minimise the potential for impacts on land use.	Roads and Maritime	Detailed design
Utility impacts	Roads and Maritime would consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use. Additional environmental approvals would be required for utility adjustments inconsistent with this REF.	Roads and Maritime	Detailed design
Crown reserve impacts	Roads and Maritime would consult with relevant reserve managers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.	Roads and Maritime	Detailed design

6.16 Energy and greenhouse gas

6.16.1 Policy setting

The Commonwealth Department of the Environment estimates annual greenhouse gas emissions for Australia to fulfil the reporting requirements of the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The latest breakdown of Australia's greenhouse gas emissions by state and territory was published on the Commonwealth Department of Environment website for 2011/12.

Australia's and NSW's total greenhouse gas for 2011/12 were estimated as 554.6 million tonnes of carbon dioxide equivalent (Mt CO_2-e) and 154.7 Mt CO_2-e respectively. The major emission sources for NSW were fuel combustion for stationary energy purposes and fuel combustion for transport purposes. In 2010, global greenhouse gas emissions for Annex 1 Parties to the United Nations Framework Convention on Climate Change were 23 gigatons of carbon dioxide equivalent (Gt CO2-e).

Key Commonwealth legislation relevant to the proposal includes:

- *National Greenhouse and Energy Reporting Act 2007*. The National Greenhouse and Energy Reporting Scheme (NGERS) applies to facilities that emit over 25,000 tonnes CO_2-e per year or consume more than 100 terajoules (TJ) of energy or corporations that emit over 50,000 tonnes CO_2-e per year or consume more than 200 TJ of energy. These thresholds relate to Scope 1 and Scope 2 emissions
- *Carbon Credits (Carbon Farming Initiative) Act 2011*. The Carbon Farming Initiative has been developed to give farmers, forest growers and landholders the ability to generate accredited domestic offsets for access to domestic voluntary and international carbon markets.

The implications of the above legislation would be assessed during detailed design when the resource extraction schedule has been determined.

6.16.2 Methodology

The following emissions sources are relevant to the proposal:

- Fuel consumed during removal of the existing bridge
- Fuel consumed during construction of the new bridge and associated infrastructure
- Electricity consumption during construction and removal
- Vegetation removal.

Scope 1 and Scope 2 greenhouse gas emissions from the construction of the new bridge were estimated using the VicRoads Greenhouse Gas Assessment Calculator for Road Projects Version 0.1.111215 (Carbon Gauge). Emissions from fuel consumed during removal of the existing bridge were calculated by multiplying the estimated fuel consumption by the relevant emission factor in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*. Scope 3 emissions associated with fuel combustion and electricity consumption were also assessed. All other Scope 3 emissions were excluded from the assessment. Emissions associated with operation and maintenance were also excluded from the assessment as it is assumed that any changes, when compared to the existing operating conditions, would be minimal.

The assessment was based on the variables listed in Table 6-34.

Table 6-33 Greenhouse gas and energy use assessment variables

Variable	Value
Duration of proposal	18 to 24 months
Fuel consumed during removal	20 kilolitres
Bridge length	300 metres
Bridge width	15 metres
Pavement area	6,300 m^2 (700 m x 9 m)
Length of Upright kerb and gutter	700 metres
Length of W-beam barrier	600 metres
Volume of cut and fill	2,000 m^2
Area of grassland cleared	22,000 m^2
Average annual rainfall	1,268.7 millimetres

6.16.3 Potential impacts

Construction

Scope 1, 2 and 3 emissions for the removal of the existing bridge and construction of the new bridge are summarised in Table 6-34. Total emissions for removal and construction were estimated as 2,297 tonnes CO_2-e.

All electricity generation for the proposal was assumed to be from diesel generators. Hence there are zero Scope 2 emissions from electricity imported from the grid.

Table 6-34 Greenhouse gas and energy use emissions

Emission source	Scope 1 emissions (tonnes CO_2-e)	Scope 2 emissions (tonnes CO_2-e)	Scope 3 emissions (tonnes CO_2-e)	Total emissions (tonnes CO_2-e)
Diesel consumed during bridge removal	54	0	4	58
Diesel consumed during construction	810	0	61	871
Vegetation clearance	1,368	0	0	1368
Total	2,232	0	65	2,297

The proposal emissions are insignificant compared with Australia's and NSW's total greenhouse gas emissions (refer section 6.16.1). The proposal emissions per annum would be approximately 0.0015 per cent of NSW's total greenhouse gas emissions and 0.0004 per cent of Australia's total greenhouse gas emissions in 2011/12.

Emissions from vegetation removal would be partially offset by revegetation of areas cleared for construction. Revegetation would occur on approximately 70 per cent of the cleared area.

Operation

There would not be any significant additional greenhouse gas and energy impacts during operation of the proposal.

6.16.4 Safeguards and management measures

The measures described in Table 6-35 would be implemented to avoid or minimise potential greenhouse gas and energy use impacts.

Table 6-35 Energy use and greenhouse gas safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Fuel consumption	Fuel use would be reduced whenever possible. This could include: • Carpooling of workers to site • Turning vehicles, machinery and equipment off when not in use • Planning movements of personnel, equipment and materials to minimise trips • Ordering equipment and material to minimise trips to site.	Construction contractor	Construction
Fuel consumption	Modern vehicles, equipment and machinery only would be used. These are more fuel efficient and have better emission controls than older models.	Construction contractor	Construction
Fuel consumption	All vehicles, machinery and equipment would be adequately maintained.	Construction contractor	Construction
Fuel consumption	Use of biodiesel for proposal vehicles, equipment and machinery would be investigated.	Construction contractor	Construction

6.17 Resource consumption and waste generation

6.17.1 Policy setting

Roads and Maritime is committed to ensuring responsible management of unavoidable waste and to promoting the reuse of such waste through appropriate measures in accordance with the resource management hierarchy principles embodied in the *Waste Avoidance and Resource Recovery Act 2001*. The resource management hierarchy principles in order of priority, as outlined in the Act, are:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

By adopting the above principles, Roads and Maritime encourages the most efficient use of resources and reduces cost and environmental harm in accordance with the principles of ecologically sustainable development.

6.17.2 Potential impacts

Construction

Resource use

Construction of the proposal would require the use of a number of resources, including:

- Resources associated with the operation of construction machinery and motor vehicles (this includes the use of diesel and petrol)
- Material required for road surface and pavements (road base, asphalt, spray seal, sand, concrete, aggregate)
- Fill required to meet design levels. The initial estimated quantities of these materials that would be required for the proposal are provided in Section 3.3.4
- Materials required for road signage, street lighting and traffic signals
- Construction water (for concrete mixing and dust suppression).

The materials required for construction of the proposal are not currently limited in availability. However, materials such as metal and fuel are non-renewable and would be used conservatively. Excess spoil, not suitable for reuse, (although not likely) would be disposed of in accordance with safeguards and management measures outlined in Section 6.16.3.

The management measures outlined in Section 6.16.3 to reuse waste on-site would assist in minimising the amount of resources required for construction.

Waste generation

The proposal has the potential to generate waste from the following activities:

- Vegetation (predominantly exotic and noxious) to be removed as part of the proposal
- Excess spoil from earthworks
- Utility adjustments
- Waste from the removal of the existing bridge including trusses, girders and piers.

Waste streams likely to be generated during construction of the proposal include:

- Excess spoil
- Green waste as a result of vegetation clearing
- Roadside materials (fencing, guide posts, guard rails)
- Packaging and general waste from staff (lunch packaging, portable toilets)
- Chemicals and oils
- Waste water from wash-down and bunded areas and concrete batch plant
- Excess concrete
- Redundant erosion and sediment controls.

The potential to reuse materials, particularly from the existing bridge, would be investigated during detailed design. Unsuitable fill material that cannot be used on-site (though not considered likely) would be classified in accordance with the *Waste Classification Guidelines* (DECCW, 2009) and disposed of at an approved materials recycling or waste disposal facility.

Operation

The proposal would not result in a noticeable increase in waste generation during operation.

6.17.3 Safeguards and management measures

The measures described in Table 6-36 would be implemented to avoid or minimise potential resource consumption and water generation impacts.

Table 6-36 Resource consumption and water generation safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Demand on resources	Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Construction contractor	Pre-construction and construction
Demand on resources	Excavated material would be reused on-site for fill where feasible to reduce demand on resources.	Construction contractor	Construction
Demand on resources	Any additional fill material required would be sourced from appropriate local sources and/or other Roads and Maritime projects.	Construction contractor	Construction
Waste minimisation	The following resource management hierarchy principles would be followed: • Avoid unnecessary resource consumption as a priority • Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) • Disposal would be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*). • Excess materials must be disposed of according to the following (in order): – All bridge timbers are to be assessed in accordance with RMS Environmental Direction No 10 Disposal/Recycling of replaced bridge timbers – Where timber and other bridge members cannot be reused, disposal via approved contractors (including the bridge timbers). • Transfer to a Roads and Maritime approved site for reuse on concurrent private/local government proposal • Disposal at an approved materials recycling or waste disposal facility.	Construction contractor and Roads and Maritime	Construction
Management of green waste	Cleared weed-free vegetation would be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Spoil management	Excess excavated material would be disposed of at an appropriate facility or reused appropriately for fill on the proposal site.	Construction contractor	Construction
Spoil management	Excess soil requiring waste disposal would first be assessed against the Waste Classification Guidelines (DECCW, 2009). Waste would be disposed of appropriately with supporting waste classification documentation.	Construction contractor	Construction
Waste management	A waste management plan would be prepared and included in the CEMP in accordance with Roads and Maritime Specification G36 Environmental Protection and relevant EPA guidelines.	Construction contractor	Pre-construction
Waste management	Garbage receptacles would be provided and recycling of materials encouraged. Rubbish would be transported to an appropriate waste disposal facility.	Construction contractor	Construction
Waste management	There would be no disposal or re-use of construction waste on to other land.	Construction contractor	Construction
Waste management	Waste would not be burnt on site.	Construction contractor	Construction
Waste management	Waste material, other than vegetation and tree mulch, would be removed form site once the works have been completed.	Construction contractor	Construction
Waste management	Portable toilets would be provided for construction workers and would be managed by the service provider to ensure the appropriate disposal of sewage.	Construction contractor	Construction
Waste management	Noxious weeds removed during work would be managed in accordance with the DPI requirements that relate to its classification status under the NW Act.	Construction contractor	Construction
Waste management	Site inductions would occur and be recorded by a Site Supervisor to ensure staff are aware of waste disposal protocols.	Construction contractor	Construction
Waste management	A facility for collecting, treating and disposing of concrete waste generated in the construction of the development would be installed on site.	Construction contractor	Construction
Waste management	All working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.	Construction contractor	Construction
Waste management	Lead paint materials would be managed in accordance with the Australian Standard AS4361.1 ‘Guide to Lead Paint Management – Part 1 Industrial Applications 1995’.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Waste management	Bulk project waste (eg. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal would have prior formal written approval from the landowner, in accordance with RTA Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes.	Construction contractor	Construction
Waste management	If coal tar asphalt is identified and is to be removed, it would be disposed of to landfill in accordance with RTA Environmental Direction No.21 – Coal Tar Asphalt Handling and Disposal. Any hazardous waste material stockpiles are to be fenced and signed for public safety.	Construction contractor	Construction
Wastewater contamination of soils and water	A dedicated concrete washout facility would be provided during construction so that run-off from the washing of concrete machinery and equipment can be collected and disposed of at an appropriate waste facility.	Construction contractor	Construction

6.18 Cumulative effects

6.18.1 Existing environment

Cumulative impacts arise from the interaction of individual elements within the proposal and the additive effects of other external projects. Roads and Maritime is required under Clause 228 (2) of the EP&A Act, to take into account potential cumulative impacts as a result of the proposal.

6.18.2 Potential impacts

Construction

Potential cumulative impacts would occur as a result of construction of the proposal occurring simultaneously with the construction of other projects. There are no other major projects known in the study area. Potential short term and local amenity impacts may arise if other major projects, such as large subdivision developments, occur simultaneously with the proposal.

Cumulative impacts are not expected and would be minimised through the application of individual proposal specific environmental safeguards and management measures as summarised in Section 7.2. Consultation with relevant stakeholders, such as councils, would be carried out during construction planning to ensure that potential cumulative impacts are minimised. Any additional management measures from that consultation would be included in the CEMP for the proposal.

Operation

The long term effect of the proposal would be a positive cumulative impact on travel times, road safety and efficiency. The proposal would result in an improved transport corridor in the region.

6.18.3 Safeguards and management measures

The measures described in Table 6-37 would be implemented to avoid or minimise potential cumulative effects.

Table 6-37 Cumulative effects safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Cumulative impacts	Ongoing coordination and consultation would be undertaken with other proponents to ensure cumulative noise and traffic impacts are appropriately assessed and managed.	Construction contractor	Detailed design and construction
Cumulative impacts	The CEMP would be revised to consider potential cumulative impacts from surrounding development activities if and as they become known.	Construction contractor	Pre-construction
Cumulative traffic and access impacts	The traffic management plan would be prepared in consultation with Tenterfield Sire Council and Kyogle Council to minimise potential cumulative impacts on traffic and access.	Construction contractor	Pre-construction
Night work	An 'out of hours work procedure' would be prepared as part of the noise and vibration management plan for the proposal in accordance with the requirements of the Interim Construction Noise Guideline (DECC, 2009) and the Roads and Maritime Services' Environmental Noise Management Manual Practice (RTA, 2001). The plan would consider the cumulative impact from other construction activities occurring in the vicinity of the proposal.	Construction contractor	Construction

6.19 Summary of beneficial effects

The beneficial effects of the proposal would include:

- Reduced travel times and congestion
- Improved road safety for all road users
- Improved provision of pedestrian and cyclist facilities
- Improved transport efficiency
- Savings in bridge maintenance expenditure.

6.20 Summary of adverse effects

The key potential adverse effects of the proposal would generally be short term and localised during the construction period and would include:

- Removal of the existing bridge will have a detrimental impact on the heritage significance of the item
- Construction phase traffic impacts, due to bridge restrictions and increased heavy vehicle movements on the existing road network
- Amenity impacts, such as noise, traffic, visual, dust, during construction to properties adjacent to the proposal site
- Minor vegetation removal
- Noise, vibration and other amenity impacts for microbats
- Aquatic habitat disturbance
- Minor changes to the flooding regime

7. Environmental management

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified 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 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 safeguards and management measures identified. This plan would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation. The CEMP would include the following sub-plans:

- Traffic management plan
- Vegetation management plan
- Microbat management plan
- Temporary concrete batching plant management plan
- Noise and vibration management plan
- Soil and water management plan
- Pollution incident response management plan
- Waste management plan.

The CEMP would be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environmental Officer, Northern Region, 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), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

7.2 Summary of safeguards and management measures

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

Table 7-1 Summary of site specific safeguards – General safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
1	General	All environmental safeguards must be incorporated within the following: • Detailed design stage. • Contract specifications for the proposal. • CEMP.	Project manager	Pre-construction
2	General	A risk assessment must be carried out on the Proposal in accordance with the Roads and Maritime Project Pack and PMS risk assessment procedures to determine an audit and inspection program for the work. The recommendations of the risk assessment are to be implemented. A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate is the level of risk chosen for the proposal is appropriate. Any works resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction After first audit
3	General	The environmental contract specification must be forwarded to the Roads and Maritime Senior Environmental Officer for review at least 10 working days prior to the tender stage. A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.	Project manager	Pre-construction
4	General	The Roads and Maritime Project Manager must notify the Roads and Maritime Environmental Officer [Northern Region] at least five days prior to work starting.	Project manager	Pre-construction
5	General	All businesses and residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	Project manager	Pre-construction
6	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required.
7	General	If the scope of the works changes at any time, review under the Roads and Maritime Services Environmental assessment procedure for routine and minor works (EIA-PO5-1) to determine any new measures to take.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
8	General	Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.	Contractor	Construction
9	Waterway access	The Roads and Maritime Project Manager must liaise with the Maritime Division prior to work staring and provide: • A navigational aids plan • A waterway traffic management plan. Once approved, plans would be implemented during construction.	Project manager	Pre-construction and construction
10	Waterway access	Detailed design would incorporate appropriate navigational aids and requirements for waterway traffic in consultation with the Maritime Division.	Project manager	Detailed design

Table 7-2 Summary of site specific safeguards – Terrestrial biodiversity safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
11	Potential for direct impacts on native fauna species	A microbat management plan (2014b) Appendix D has been developed and would be implemented during construction. The microbat management plan includes measures around: • Timing of works • Ecologist involvement • Pre-removal survey • Roost exclusion • Work methods statements • Daily inspections • Removal of individuals • Monitoring of bridge removal • Protection of roost sites • Creation of additional roost habitat • inductions Fauna handling and care of injured or captured animals.	Construction contractor	Construction
12	Potential for direct impacts on native fauna species	A pre-clearance procedure would be developed and implemented in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 1: Pre-clearing process) (RTA 2011a).	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
13	Potential for direct impacts on native fauna species	Fauna handling would be conducted in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 9: Fauna handling) (RTA 2011g). Any unexpected threatened species finds would be dealt with in accordance with the Biodiversity Guidelines (Guide 1: Unexpected threatened species finds procedure (RTA, 2011).	Construction contractor	Construction
14	Direct impacts to vegetation	A vegetation management plan would be prepared for the proposal and include: Relevant measures from the Office of Water Guidelines for Riparian Corridors on Waterfront Lands and Guidelines for Vegetation Management Plans.	Construction contractor	Pre-construction
15	Direct impacts to vegetation	Exclusion zones to be identified and demarcated in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 2: Exclusion zones) (RTA 2011b).	Construction contractor	Construction
16	Direct impacts to vegetation	Protocols for clearing of vegetation to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 4: Clearing of vegetation and removal of bushrock) (RTA 2011d).	Construction contractor	Construction
17	Direct impacts to vegetation	Protocols for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 7: Pathogen Management) (RTA 2011f).	Construction contractor	Construction
18	Direct impacts to vegetation	Protocols for preventing or minimising the spread of noxious and environmental weeds to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management) (RTA 2011e).	Construction contractor	Construction
19	Direct impacts to vegetation	Protocols for the re-establishment of native vegetation to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 3: Re-establishment of native vegetation) (RTA 2011c).	Construction contractor	Post - construction
20	Potential for artificial lighting impacts on native fauna	Down-lights and motion sensor lighting would be used to reduce light spill and the associated secondary impact on nocturnal fauna species potentially utilising the adjoining vegetation, bridge and overflow structures.	Construction contractor	Construction

Table 7-3 Summary of site specific safeguards – Aquatic biodiversity safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
21	Aquatic habitat removal or disturbance	• The following are recommended to address issues associated with habitat disturbance and would be incorporated into the vegetation management plan: – Disturbance of aquatic fauna, habitat and riparian zones would be minimised in accordance with Roads and Maritime Biodiversity Guidelines – Guide 10: Aquatic habitat and riparian zones (2011) • Riparian vegetation disturbance/removal would be kept to a minimum and any riparian vegetation disturbance/removal as a result of the proposal would be rehabilitated to pre-construction (or better) condition by: – Placement of matching soil types, contouring and stabilisation of banks subjected to earthworks – Targeted planting of riparian natives such as Callistemon and Lomandra – Exclusion of cattle from regeneration areas and / or protection of individual plantings. • In-stream work areas would be kept to a minimum • In-stream work pads would be fully contained by sufficient means prior to construction in order to minimise the work platform footprint, reduce sediment loads and limit turbid run-off • The design and construction of in-stream structures would comply with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013) Disturbance of large woody debris would be avoided where possible Any large woody debris disturbed would be relocated in accordance with DPI (Fisheries) requirements and sufficiently secured in close proximity to provide comparative habitat value.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
22	Disturbance of aquatic fauna	The following measures are recommended for issues associated with fauna disturbance and would be incorporated into the CEMP: • Banks within the direct footprint of works would be inspected for platypus dens by a qualified ecologist immediately prior to and during breaking ground along the banks and any rock revetment work • Fauna handling is to be conducted in accordance with the RTA Biodiversity Guidelines (Guide 9: Fauna handling) (RTA, 2011) • The river bank works footprint would be minimised to reduce the potential for encountering platypus or turtles • Initial excavation and fill of the affected banks would be gradual to allow resident fish and other fauna to move to safety.	Construction contractor	Construction
23	Potential barrier to movement of aquatic fauna	The proposal would be carried out that at least 20% of stream width remains as natural open channel at any one time. Whilst this width may be higher than in required for hydraulic connectivity (i.e. to ensure that flow velocities are not limiting), this width is considered necessary to ensure that behavioural affects due to avoidance of noise/vibration/habitat edge effects are also minimised.	Construction contractor	Construction
24	Potential alteration to stream flow	A minimum of 20% of the river channel (in accordance with the fauna passage criteria) is to remain unrestricted during construction to ensure that river flows through the site are maintained and not significantly affected.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
25	Potential impacts to water quality	In addition to the measures provided, the following measures would be implemented. • Screening or netting around and/or under work areas to contain debris, litter and other materials • Use of grit blasting and painting enclosures • Minimising volumes of fuels, lubricants and other fluids within the in-stream work site and ensuring all fluids are stored within containment bunds and that hydrocarbon booms are utilised as required to minimise risk of spills to the waterway • Ensuring that all work platforms, access roads and bank clearing areas associated with the project would be subject to strict runoff and turbidity controls to reduce water quality risks to the downstream environment This will require a suite of standard environmental protection measures including erosion and sediment controls designed, installed and maintained in accordance the Blue Book requirements and RMS QA Specification G38	Construction contractor	Construction
26	Potential introduction and/ or spread of aquatic weeds	• Ensure that imported fill materials (particularly from riverine sources) are weed free. • Equipment brought to site would be inspected and if necessary washed before entering the site to ensure they are free of excess soil and material that may contain weed material or seeds. Protocols for preventing or minimising the spread of noxious and environmental weeds are to be developed in accordance with the Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management) (RTA 2011e).	Construction contractor	Construction

Table 7-4 Summary of site specific safeguards – Aboriginal heritage safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
27	Potential for direct impact on cultural objects and sites	A cultural heritage site induction for personnel undertaking initial ground disturbance would be undertaken by an appropriate person from the Jubullum Local Aboriginal Land Council. The induction would cover: • Basic legislative requirements, including fines for the destruction of Aboriginal cultural heritage • A discussion on traditional Aboriginal culture, and why the management of Aboriginal cultural heritage is important to Aboriginal peoples • An introduction on how to identify Aboriginal objects • A description of proposal areas considered likely to contain Aboriginal Objects and to be avoided • A review of the management measures for the proposal.	Construction contractor	Construction
28	Potential for direct impact on cultural objects and sites	The CEMP would include an unexpected finds procedure in accordance with the Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds (2012b) that would incorporate: • Work in the surrounding area is to stop immediately • A temporary fence is to be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site • The Roads and Maritime Aboriginal Cultural Heritage Officer and Environment Manager, Northern Region would be contacted immediately. Work would not recommence until advised.	Construction contractor	Construction
29	Potential for direct impact on cultural objects and sites	The CEMP would include a procedure for the discovery of human remains that would incorporate: • All works must halt in the immediate area to prevent any further impacts to the remains • The location where remains were found would be cordoned off and the remains themselves would be left untouched • The Roads and Maritime Aboriginal Cultural Heritage Officer and Environment Manager, Northern Region would be contacted immediately. Work would not recommence until advised.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
30	Potential for direct impact on cultural objects and sites	If Aboriginal cultural materials are uncovered as a result of proposal activities, the site would be registered as a site in the AHIMS. Any management outcomes for the site would also be provided to the AHIMS.	Construction contractor	Construction

Table 7-5 Summary of site specific safeguards – Non-Aboriginal heritage safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
31	Potential impact to St Pius Catholic Church or Lasseter's monument	An exclusion zone would be established around the church during construction, if required, to avoid any accidental impact. The exclusion zone would be identified with temporary fencing or the like.	Construction contractor	Construction
32	Potential impact to St Pius Catholic Church or Lasseter's monument	The monument would be removed during construction and re-erected in the car park on completion of works. The location would be identified in consultation with council and the property owners.	Construction contractor	Construction
33	Potential impact to St Pius Catholic Church or Lasseter's monument	Site induction would include information on the heritage significance of the bridge, church and monument and workers' responsibilities during works.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
34	Unexpected finds	The CEMP would include an unexpected finds procedure in accordance with the Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds (2012b) that would incorporate: • Work in the surrounding area is to stop immediately • A temporary fence would be erected around the site, with a buffer zone of at least 10 metres around the known edge of the site • The Roads and Maritime Project Manager and Environment Manager, Northern Region would be contacted immediately. Work would not recommence until advised	Construction contractor	Construction
35	Offset the heritage impacts	Photographic archival recording (and measured drawings) prior to demolition in line with NSW Heritage Branch guidelines How to Prepare Archival Records of Heritage Items, and this will further offset the loss of the item	Roads and Maritime	Pre-construction
36		Interpretation strategies to maintain a link between the bridge and the heritage values of Tabulam are to be developed.	Roads and Maritime	Pre-construction
37		Roads and Maritime to update s.170 Register to reflect changes to the bridge portfolio and to monitor heritage safeguards for other timber truss bridges	Roads and Maritime	Pre-construction
38		Elements of existing bridge fabric (DeBurgh trusses) are to be retained to use as gateway elements for the new bridge	Roads and Maritime	Pre-construction
39	Irreparable loss of the longest De Burgh truss bridge in Australia	Interpretation including Timber Truss Bridges book; travelling exhibition; interpretation signs and heritage markers in the proposed Rest Area on the eastern side of the bridge are to be implemented.	Roads and Maritime	On-going
40	Further loss of De Burgh bridges in NSW	Cobram (a De Burgh truss) Bridge to be upgraded to State Heritage Register	Roads and Maritime	On-going

No.	Impact	Environmental safeguards	Responsibility	Timing
41	Irreparable loss of constructional elements, additions and details	Investigate conserving fabric elements in local history museums of other regional towns	Roads and Maritime	On-going
42	Irreparable loss of the bridge as a landscape element	Landscaping elements are to be installed including small park on the eastern approach with retaining wall/terrace and marker trees on western approach providing landscape references	Construction contractor	Post construction
43	Irreparable loss of the bridge as a landscape element	Bi-annual reporting to the Heritage Council of NSW on the progress of the Strategy and its associated conservation actions	Roads and Maritime	On-going

Table 7-6 Summary of site specific safeguards – Noise and vibration safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
44	Potential construction noise and vibration impacts	Project planning and design would consider: • Construction compounds would be laid-out in such a way that the primary noise sources are at a maximum distance from residences, with solid structures (sheds, containers) placed between residences and noise sources (and as close to the noise sources as is practical). • Compressors, generators, pumps and any other fixed plant would be located as far away from residences as possible and behind site structures. Material dumps, loading and unloading areas would be located as far as practical from the nearest residences	Construction contactor	Pre-construction
45	Potential construction noise and vibration impacts	The final selection and design of noise management measures would consider best management and economically achievable practice.	Construction contactor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
46	Potential construction noise and vibration impacts	A noise and vibration management plan would be prepared as a sub-plan to the CEMP. It would include measures to avoid and mitigate noise and vibration impacts during construction in accordance with the Environmental Noise Management Manual (RTA 2011) and RTA's Environmental fact sheet No. 2- Noise management and Night Works.	Construction contactor	Pre-construction
47	Potential construction noise and vibration impacts	Site inductions would address the potential for noise and vibration impacts on local residents and inform workers of practical and reasonable measures to minimise the impact during the course of their activities.	Construction contactor	Construction
48	Potential construction noise and vibration impacts	All equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made.	Construction contactor	Construction
49	Potential construction noise and vibration impacts	To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) would be considered for all site equipment where health and safety is not compromised.	Construction contactor	Construction
50	Potential construction noise and vibration impacts	General construction activities would be limited to the recommended construction hours where feasible and reasonable. This includes truck movements before 7:00 am to or from the concrete batching plant on Tabulam Road.	Construction contactor	Construction
51	Potential construction noise and vibration impacts	A temporary barrier would be considered to shield the concrete batching plant from receivers on Tabulam Road. The barrier would be located as close as possible to the batch plant and would be of sufficient height to block the line-of-sight to residential receivers. A range of materials could be used to form an acoustic barrier, for example, a shipping container or other materials with sufficient density (at least 15 kg/m2).	Construction contactor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
52	Potential construction noise and vibration impacts	The community would be informed if all noise and vibration works prior to works commencing. This is particularly the case for the church and receivers R1 and R12, R14 and R15 And residences within 100 metres of piling activities. Complaints received would be recorded and attended to promptly in accordance with the Roads and Maritime Community Involvement Practice Notes and Resource Manual.	Construction contactor	Construction
52	Potential construction noise and vibration impacts	Attended compliance noise monitoring would be undertaken upon receipt of a complaint. Monitoring would be undertaken and reported as soon as possible. In the case that exceedances are detected, the CEMP would be reviewed in order to identify means to minimise the impacts to residences.	Construction contactor	Construction
53	Potential sleep disturbance due to construction noise	An out of hours works procedure would be prepared as part of the noise and vibration management plan. The Environmental Noise Management Manual Practice Note (vii) requires that out of hours work should not affect residences on more than two consecutive nights, or on more than a total of six nights over a period of one calendar month. When night work is programmed in stages to comply with this requirement, the periods of work should be separated by not less than one week.	Construction contactor	Construction
54	Potential construction traffic noise impacts	Internal traffic noise levels within classrooms and the church would be confirmed through compliance noise monitoring.	Construction contactor	Construction

Table 7-7 Summary of site specific safeguards – Air quality safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
55	General air quality impacts	The CEMP would include a procedure for effective dust control, including watering or covering exposed areas, dust monitoring and reporting procedures.	Construction contractor	Pre-construction
56	Dust emissions	Dust suppression measures would be implemented in accordance with the CEMP.	Construction contractor	Construction
57	Dust emissions	Stockpiled materials would be managed in accordance with the Stockpile Management Guideline (RTA, 2011k).	Construction contractor	Construction
58	Dust emissions	All trucks would be covered when transporting dust generating material to and from the site.	Construction contractor	Construction
59	Dust emissions	Works (including the spraying of paint and other materials) would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
60	Dust emissions	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust	Construction contractor	Construction
61	Concrete batching plant	Dust control measures would be incorporated into the design of the concrete batching plant. These could include the following: • A partially enclosed load hopper (on three sides) when truck loading/delivery is in progress • The three-sided storage hoppers would be at least 0.5 metres higher than the stockpiles with the sides extending beyond the limit of the material; or use other measures such as screening or roofing to minimise dust emissions. • Continual wetting operations to reduce emissions during all materials handling • Bulk cement and fly-ash would be stored in silos with overfill protection and filter components on the vents. • Filling operations will not generate dust visible above the container • A dry batch dust collector to extract □dus product to the trucks and any emissions from the loading of the weigh hoppers (dust during the transfer of the concrete product to the trucks and any emissions from the loading of the weigh hoppers) • A fully enclosed conveyor • Surface wetting along all exposed surfaces and stockpiles during unfavourable meteorological conditions (i.e. windy and dry conditions) • Use of water carts along haul roads and access points as required to minimise generation of dust.	Construction contractor	Construction
62	Exhaust and other emissions	Construction plant and equipment would be maintained in a good working condition in order to limit impacts on air quality.	Construction contractor	Construction
63	Exhaust and other emissions	Plant and machinery would be turned off when not in use.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
64	Exhaust and other emissions	Vegetation or other materials would not be burnt on site.	Construction contractor	Construction
65	Impacts on sensitive receivers	Local residents would be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Construction contractor	Construction
66	Hazardous emissions to air during demolition	A full building inspection should be conducted of the house and structures to be demolished by a qualified building asbestos inspector to determine if any asbestos materials are present before demolition.	Construction contractor	Pre-construction
67	Hazardous emissions to air during demolition	Water sprays or alternative dust suppression methods would be employed during demolition in the event that significant dust is generated.	Contractor	Construction

Table 7-8 Summary of site specific safeguards – Traffic safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
68	Potential traffic impacts	A traffic management plan would be prepared in accordance with in accordance with the RTA (2010) Traffic Control and Work sites Manual and RTA Specification G10-Control of Traffic prior to works commencing. Consultation would be undertaken with council as required. Pedestrians and cyclists requirements are to be considered in the traffic management plan. Current traffic movements would be maintained wherever possible.	Construction contractor	Pre-construction
69	Potential traffic impacts	A suitable haulage route for oversized materials would be determined prior to construction sarting.	Construction contractor	Pre-construction
70	Potential traffic impacts	Construction staging would allow two way access at intersections and private properties.	Construction contractor	Pre-construction
71	Potential traffic impacts	Project planning would allow continuous movement of vehicles along the Bruxner Highway and across the Clarence River.	Construction contractor	Pre-construction
72	Potential traffic impacts	Inductions would be carried out for all personnel and contractors, specifically to include adherence to all road rules.	Construction contractor	Construction
73	Potential traffic impacts	The condition of existing roads used for haulage would be regularly monitored for damage.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
74	Potential traffic impacts	Safe speed limits would be implemented on the approach to the site compound and concrete batching plant.	Construction contractor	Construction
75	Potential traffic impacts	Access to the site compound and the concrete batching plant would be restricted during construction hours and secured outside of construction hours.	Construction contractor	Construction
76	Potential property access impacts	Where possible, current property accesses would be maintained during the works. Any disturbance would be minimised.	Construction contractor	Construction

Table 7-9 Summary of site specific safeguards – Hydrology and flooding safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
77	Drainage design	Consultation with Kyogle Council would be carried out during detailed design to ensure appropriate integration with council's stormwater network.	Roads and Maritime	Detailed design
78	Flooding	Further flood modelling would be undertaken to ensure that the proposal does not alter existing flood conditions at private properties in the vicinity of the proposal.	Roads and Maritime	Detailed design
79	Hydrological changes due to the bridge design and temporary instream accesses	Proposal design would consider the NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation (2013) The Proposal design would ensure that the hydrological flows of the waterways are not altered causing scouring of banks or obstruction of flows	Roads and Maritime	Detailed design
80	Hydrological changes due to the bridge design and temporary instream accesses	The Proposal design would ensure that the hydrological flows of the waterways are not altered causing scouring of banks or obstruction of flows	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
81	Flooding during construction	A Flood Management Plan should be prepared as part of the CEMP and implemented during construction. At minimum this plan should include: • Project-specific emergency response and evacuation controls during flooding • Measures to ensure that equipment, site-offices, ablution facilities, vehicles, materials, buoyant items and machinery are secured against flood or able to be removed off-site when a flood warning is issued • Reporting requirements. A regular weather monitoring regime	Construction Contractor	Construction

Table 7-10 Summary of site specific safeguards – Geology and soil safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
82	Acid sulfate soils	Should detailed design indicate that excavations may encounter acid sulfate soils further assessment would be undertaken. This may include additional sampling and testing and if required, preparation of an acid sulfate soil contingency plan and/or acid sulfate soil management plan in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998). Acid sulfate soils would be managed in accordance with the Guidance for the Management of Acid Sulphate Materials (RTA 2005).	Construction contractor	Pre-construction
83	Tannins	As part of the CEMP measures for the management of mulch and tannin would be prepared in accordance with the Roads and Maritime Management of Tannins from Vegetation Mulch (2012).	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
84	Erosion and sedimentation	A soil and water management plan would be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime Services contract specification G38 prior to the commencement of construction. The soil and water management plan would include a progressive erosion and sediment control plan and also address the following: • Roads and Maritime Code of Practice for Water Management • Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008) • Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction (2011). Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering (2011).	Construction contractor	Pre-construction
85	Erosion and sedimentation	Erosion and sediment controls would be implemented in accordance with the soil and water management plan before any construction starts and inspected regularly, particularly after a rainfall event. Maintenance work would be undertaken as needed.	Construction contractor	Construction
86	Erosion and sedimentation	Site stabilisation of disturbed areas would be undertaken progressively as stages are completed. Controls would not be removed until areas are stabilised.	Construction contractor	Construction
87	Erosion and sedimentation	All stockpiles would be designed, established, operated and decommissioned in accordance with Roads and Maritime Stockpile Management Guideline (RTA, 2011k).	Construction contractor	Construction
88	Erosion and sedimentation	Controls would be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces.	Construction contractor	Construction
89	Erosion and sedimentation	Any material transported onto pavement surfaces would be swept and removed at the end of each working day.	Construction contractor	Construction
90	Excess spoil	Excess spoil not required or able to be used for backfilling would be stockpiled in a suitable location before being reused or removed from the site, and disposed of appropriately.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
91	Contamination of soil	The CEMP is to include contaminated land management procedures, which must comply with the CLM Act, Roads and Maritime Contaminated Land Management Guideline (2011l), Roads and Maritime Environmental Incident Classification and Reporting Procedure, and relevant EPA guidelines on contaminated land management. The procedures would provide for dealing with: • Areas of known contamination (if any). • Unexpected contamination finds. Any land contamination caused during construction	Construction contractor	Pre-construction
92	Contamination of soil	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area would cease until advice on the need for remediation or other action is obtained from an environmental consultant.	Construction contractor	Construction
93	Contamination of soil	A fully equipped emergency spill kit would be kept on-site at all times.	Construction contractor	Construction

Table 7-11 Summary of site specific safeguards – water quality safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
94	Sedimentation and contamination of surface water	Erosion, sedimentation and contamination measures identified in section 6.9.3 would be implemented.	Roads and Maritime and construction contractor	Pre-construction and construction
95	Disturbance of bed and banks	Bed and bank disturbance would be minimised in design and construction methodology. Appropriate measures from the Office of Water Guidelines for Watercourse Crossings and Guidelines for Riparian Corridors on Waterfront Lands would be incorporated into proposal design and the CEMP.	Roads and Maritime and construction contractor	Pre-construction and construction
96	Disturbance of bed and banks	All surfaces disturbed should be stabilised and restored as soon as practicable and in a progressive manner as works are completed.	Contractor	Construction
97	Disturbance of bed and banks	An Environmental Work Method Statement (EWMS) would be prepared in accordance with Section 4.13 of the Roads and Maritime QA Specification G36 for all works to be undertaken within the Clarence River and any access works on the river banks.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
98	Disturbance of bed and banks	The EWMS would be prepared considering the NSW DPI (Fisheries) guidelines Policy and guidelines for fish habitat conservation (2013) and any requirements for dredging and reclamation activities as advised by DPI (Fisheries).	Contractor	Construction
99	Disturbance of bed and banks	All temporary access points installed for construction access to the waterway (including constructed pads or temporary jetties) would be established in a manner such to minimise disturbance on the banks	Contractor	Construction
100	Disturbance of bed and banks	For all works likely to impact on the waterway (including all temporary access works and piling), a sediment / silt curtain and hydrocarbon boom would be placed in Sportsmans Creek, weighted to the bed and secured to accommodate tidal flow. The hydrocarbon boom should be installed inside of the silt curtain when both are in operation. This would remain in place until the completion of drilling and removal of temporary access platforms.	Contractor	Construction
101	Contamination of surface water	All fuels, chemicals, and liquids would be stored at least 50 metres away from the river or drainage lines, flooded or poorly drained area or slopes above 10 per cent. They would be stored in an impervious bunded area within the compound site. Amounts stored on site would be minimised. For storage within 50 m, these would be, double-bunded or stored as approved by the Roads and Maritime Environment Officer.	Construction contractor	Construction
102	Contamination of surface water	Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 m from drainage lines or waterways. Refuelling of plant and equipment over the waterway is to occur within a double-bunded area	Construction contractor	Construction
103	Contamination of surface water	Compounds and storage locations would be located as far as practicable outside areas subject to flooding.	Construction contractor	Construction
104	Contamination of surface water	Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.	Construction contractor	Construction
105	Contamination of surface water	Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) would be undertaken on a regular basis to identify potential spills or the effects of sediment-laden runoff.	Construction contractor	Construction
106	Contamination of surface water	Vehicles and plant would be properly maintained and regularly inspected for fluid leaks.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
107	Contamination of surface water	Vehicle wash down would occur in a designated bunded area or at a dedicated location off-site.	Construction contractor	Construction
108	Contamination of surface water	A facility for collecting, treating and disposing of concrete wastes generated during construction would be installed on site.	Construction contractor	Construction
109	Contamination of surface water	An emergency spill kit would be kept on site at all times. All staff would be made aware of the location of the spill kit and trained in its use.	Construction contractor	Construction
110	Contamination of surface water	Work areas would be screened or netted to avoid loss of material into the river. This would include netting/ encapsulating the entire underside of the bridge over the river during demolition.	Construction contractor	Construction
111	Dewatering	Low lying areas of construction formations and excavations that collect stormwater would be dewatered (if required) in accordance with the soil and water management plan (as part of the CEMP) and Roads and Maritime Services' Technical Guideline for Dewatering.	Construction contractor	Construction
112	Concrete batching plant storm water and waste water management	A storm and waste water management plan would be prepared to for the operation of the temporary concrete batching plant as a sub-plan to the temporary concrete batching plant CEMP. This plan would include measures to address the following as a minimum: Collection ground pits or tanks for first flush of contaminated water from areas such as cement and fly ash storage, concrete loading, agitator bowl washing and slumping, concrete wash out storage and truck washing areas. The required first flush capture capacity is equivalent to 0.02 metres (20 mm) multiplied by the area of the 'contaminated area' – that is 0.02 metres x length x breadth) i.e. a first flush capacity able to hold a 20 mm rain event Within 24 hours of a 20mm rainfall event, capacity is to be restored Design the batching plant so that it is segregated into contaminated (alkaline), dirty (sand and aggregate storage) and hardstand / sealed areas to assist with water management. Divert clean stormwater away from contaminated and dirty operational areas. Reuse water captured water for slumping and dust suppression.	Construction contractor	Construction

Table 7-12 Summary of site specific safeguards – Visual amenity safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
113	Visual impact	Bridge works are to be managed in accordance with the Roads and Maritime Bridge Aesthetics Guidelines (RTA 2003).	Roads and Maritime	Detailed design
1114	Visual impact	The bridge design would consider: • The bridge would be kept to a simple, clean structure with a slender profile with any services appropriately concealed in the design of the bridge • The heritage of the existing bridge would be reflected in the pier shapes and pier spacing's in the new structure, including aligning the new piers with the existing bridge. • The bridge would be a horizontal structure to acknowledge the general horizontal nature of the surrounding landscape • The design to include spill through abutments to provide a more open appearance and enhance the slenderness of the bridge • Treatment of abutments to consider pedestrian safety and potential for graffiti attack • Lighting would be well placed and architecturally designed • Detailing of the parapet and balustrade to allow views from the bridge Appropriate interpretation of the existing bridge to be incorporated into the new bridge design. This would be determined in consultation with relevant stakeholders and the community	Roads and Maritime	Detailed design
115	Visual impact	The work site would be tidied and all rubbish removed at the end of each day.	Construction contractor	Construction
116	Visual impact	Work areas would be restored progressively and maintained until established.	Construction contractor	Construction
117	Landscape impacts	Landscaping would be managed in accordance with the Roads and Maritime Landscape Guideline (RTA 2008).	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
118	Landscape impacts	• Minimising the loss of existing vegetation wherever possible • Where possible, flatter slopes of 3 in 1 to enable more effective planting, particularly on smaller batters where the impact on the overall footprint would be less significant • Requiring minimal maintenance • Use of native species in keeping with the character of the area and its identified ecological values. The landscape plan would enhance and augment existing native vegetation. • Existing cultural plantings would also be considered • Improved connectivity for pedestrians and cyclists • Improved connectivity between the bridge and the river • Pedestrian safety and potential for graffiti attack • A picnic area on the eastern river bank • New signage and landscape treatment at Clarence Street intersection to assist in wayfinding to Tabulam village centre Minimising the visual intrusiveness of any fences required for safety purposes by setting back and using fences appropriate to a rural setting	Roads and Maritime	Detailed design
119	Landscape impacts	A gateway treatment for both bridge approaches would be considered in the landscape design. It would: • Eastern approach: – Continue the 'forested' bushland descent from the Bruxner Highway into Tabulam – Enhanced 'cultural' avenue planting on both sides of the bridge approaches, signifying proximity to Tabulam Village • Western approach: Include formal planting of Forest Redgum to assist in identifying the Tenterfield Shire.	Roads and Maritime	Detailed design

Table 7-13 Summary of site specific safeguards – Climate change safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
120	Increased temperature	Design and material selection would consider temperature, for example use non-conductive materials, and incorporate shade provision in open space.	Roads and Maritime	Detailed design
121	Increases in runoff depths and the magnitude of high flow events	Road grades (longitudinal and cross-section) would account for increased drainage requirements.	Roads and Maritime	Detailed design
122	Increases in rainfall intensity	Road grades (longitudinal and cross-section) would account for increased drainage requirements.	Roads and Maritime	Detailed design
123	Other climatic changes (e.g. frost, fog, wind)	Design and material selection would consider frost, fog and wind. Signage to provide warnings if necessary.	Roads and Maritime	Detailed design

Table 7-14 Summary of site specific safeguards – Socio-economics safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
124	Construction related amenity impacts and traffic changes	Communication with residents, businesses and organisations located within Tabulam would be undertaken in advance of construction to ascertain any specific times/events that would be considered in construction programming (e.g. school or cultural events).	Roads and Maritime	Pre-construction
125	Construction related amenity impacts and traffic changes	Residents living near the bridge and the local community would be provided with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust and noise impacts and access changes.	Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
126	Construction related amenity impacts and traffic changes	Roads and Maritime would work with local community organisations or Council to coordinate appropriate communication methods, including ensuring any vulnerable community members are appropriately engaged during the consultation period.	Roads and Maritime	Pre-construction
127	Construction related amenity impacts and traffic changes	Communications would include roadside signage, letterbox dropped newsletters, newspaper advertisements, Roads and Maritime web based information, a complaints line, and advice to specific service providers such as community transport and seniors organisations.	Roads and Maritime	Pre-construction
128	Economic opportunity	Construction workforce recruitment would give preference to local (Tabulam) labour. This would be included as a clause in the construction contractor's works contract.	Roads and Maritime	Pre-construction
129	Operational heritage and cultural impacts	Design of the new bridge would be undertaken in consultation with the local community, particularly the Aboriginal community and heritage stakeholders to include appropriate ways to remember the existing bridge and to enhance acceptance and ownership of the new bridge. This could include public art or other cultural opportunities.	Roads and Maritime	Detailed design

Table 7-15 Summary of site specific safeguards – Hazard and risk safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
130	Risk Management	Emergency response plans would be incorporated into the CEMP.	Construction contractor	Pre-construction and construction
131	Risk Management	A pollution incident response management plan would be developed and implemented in accordance with the POEO Act requirements and Roads and Maritime Environmental Incident Classification and Management Procedure. The plan would form a sub-plan within the CEMP.	Construction contractor	Pre-construction and construction
132	Risk Management	An emergency spill kit would be kept on site at all times. All staff would be made aware of the location of the spill kit and trained in its use.	Construction contractor	Construction

Table 7-16 Summary of site specific safeguards – Land use safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
133	Adjacent land use impacts	Roads and Maritime would consult with potentially affected landholders before and during construction to minimise the potential for impacts on land use.	Roads and Maritime	Detailed design
134	Utility impacts	Roads and Maritime would consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use. Additional environmental approvals would be required for utility adjustments inconsistent with this REF.	Roads and Maritime	Detailed design
135	Crown reserve impacts	Roads and Maritime would consult with relevant reserve managers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.	Roads and Maritime	Detailed design

Table 7-17 Summary of site specific safeguards – Hazard and risk safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Responsibility
136	Fuel consumption	Fuel use would be reduced whenever possible. This could include: • Carpooling of workers to site • Turning vehicles, machinery and equipment off when not in use • Planning movements of personnel, equipment and materials to minimise trips Ordering equipment and material to minimise trips to site	Construction contractor	Construction
137	Fuel consumption	Modern vehicles, equipment and machinery only would be used. These are more fuel efficient and have better emission controls than older models.	Construction contractor	Construction
138	Fuel consumption	All vehicles, machinery and equipment would be adequately maintained.	Construction contractor	Construction
139	Fuel consumption	Use of biodiesel for proposal vehicles, equipment and machinery would be investigated.	Construction contractor	Construction

Table 7-18 Summary of site specific safeguards – Resource consumption and water generation safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
140	Demand on resources	Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Construction contractor	Pre-construction and construction
141	Demand on resources	Excavated material would be reused on-site for fill where feasible to reduce demand on resources.	Construction contractor	Construction
142	Demand on resources	Any additional fill material required would be sourced from appropriate local sources and/or other Roads and Maritime projects.	Construction contractor	Construction
143	Waste minimisation	The following resource management hierarchy principles would be followed: • Avoid unnecessary resource consumption as a priority • Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) Disposal would be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*)	Construction contractor and Roads and Maritime	Construction
144	Waste minimisation	Excess materials must be disposed of according to the following (in order): • All bridge timbers are to be assessed in accordance with RMS Environmental Direction No 10 Disposal/Recycling of replaced bridge timbers. • Disposal via approved contractors (including the bridge timbers) • Transfer to an RMS approved site for reuse on concurrent private/local government project Disposal at an approved materials recycling or waste disposal facility.	Construction contractor and Roads and Maritime	Construction
145	Management of green waste	Cleared weed-free vegetation would be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible.	Construction contractor	Construction
146	Spoil management	Excess excavated material would be disposed of at an appropriate facility or reused appropriately for fill on the proposal site.	Construction contractor	Construction
147	Spoil management	Excess soil requiring waste disposal would first be assessed against the Waste Classification Guidelines (DECCW, 2009).	Construction contractor	Construction
148	Spoil management	Waste would be disposed of appropriately with supporting waste classification documentation.	Construction contractor	Construction
149	Waste management	A waste management plan would be prepared and included in the CEMP in accordance with Roads and Maritime Specification G36 Environmental Protection and relevant EPA guidelines.	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
150	Waste management	Garbage receptacles would be provided and recycling of materials encouraged. Rubbish would be transported to an appropriate waste disposal facility.	Construction contractor	Construction
151	Waste management	There would be no disposal or re-use of construction waste on to other land.	Construction contractor	Construction
152	Waste management	Waste would not be burnt on site.	Construction contractor	Construction
153	Waste management	Waste material, other than vegetation and tree mulch, would be removed form site once the works have been completed.	Construction contractor	Construction
154	Waste management	Portable toilets would be provided for construction workers and would be managed by the service provider to ensure the appropriate disposal of sewage.	Construction contractor	Construction
155	Waste management	Noxious weeds removed during work would be managed in accordance with the DPI requirements that relate to its classification status under the NW Act.	Construction contractor	Construction
156	Waste management	Site inductions would occur and be recorded by a Site Supervisor to ensure staff are aware of waste disposal protocols.	Construction contractor	Construction
157	Waste management	A facility for collecting, treating and disposing of concrete waste generated in the construction of the development would be installed on site.	Construction contractor	Construction
158	Waste management	All working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.	Construction contractor	Construction
159	Waste management	Lead paint materials would be managed in accordance with the Australian Standard AS4361.1 'Guide to Lead Paint Management – Part 1 Industrial Applications 1995'.	Construction contractor	Construction
160	Waste management	Bulk project waste (eg. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal would have prior formal written approval from the landowner, in accordance with RTA Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes.	Construction contractor	Construction
161	Waste management	If coal tar asphalt is identified and is to be removed, it would be disposed of to landfill in accordance with RTA Environmental Direction No.21 – Coal Tar Asphalt Handling and Disposal.	Construction contractor	Construction
162	Waste management	Any hazardous waste material Any hazardous waste material stockpiles are to be fenced and signed for public safety	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
163	Wastewater contamination of soils and water	A dedicated concrete washout facility would be provided during construction so that run-off from the washing of concrete machinery and equipment can be collected and disposed of at an appropriate waste facility.	Construction contractor	Construction

7.3 Licensing and approvals

Table 7-19 provides a summary of the licences, notifications and approvals required for the proposal.

Table 7-19 Summary of licensing and approval required

Requirement	Timing
In accordance with section 199 of the FM Act, Roads and Maritime would give the Minister written notice and would consider any matters raised by the Minister in order to carry out any dredging or reclamation work (i.e. construction of the working platform in the Clarence River).	Prior to construction commencing.
In accordance with section 34(1) of the *Crown Lands Act 1989* a licence is required for work on Crown land (i.e. Clarence River and adjoining land).	Prior to construction commencing.
Under the *Water Act 1912* a water licence is required to take water from a stream or river via a pump or other work for all purposes other than for basic landholder rights.	Prior to construction commencing.
A road occupancy permit would be required in accordance with section 138 of the *Roads Act 1993* for works within a classified road.	Prior to construction commencing.

8. Conclusion

8.1 Justification

The proposal is considered to be consistent with a number of state and local strategies and plans, including:

- NSW Long Term Transport Master Plan
- State Plan – NSW 2021
- State Infrastructure Strategy 2012-2032
- Ballina to Tenterfield Corridor Strategy
- Timber Truss Bridge Conservation Strategy
- Bridges for the Bush

The proposal is considered to be justified as it would:

- Address traffic and transport issues on the Bruxner Highway leading to improved efficiency and travel times
- Enhance road safety for all road users over the length of the proposal including improving safety for pedestrians and cyclists
- Improve road transport productivity and reliability
- Support regional and local economic development including improved opportunity for economic and tourism development for Tabulam

While there would be some environmental impacts as a consequence of the proposal, these would be avoided or minimised wherever possible through design and site-specific safeguards summarised in Section 7.2. The beneficial effects listed in Section 6.19 are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal (refer Section 6.20).

8.2 Objects of the Environmental Planning and Assessment Act

Table 8.1 provides a summary of the proposal against the objects of the Environmental Planning and Assessment Act (EP&A Act).

Table 8-1 Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal is needed to address efficiency and safety issues. A number of management measures would be implemented to minimise any environmental impacts associated with the proposal.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal would reduce travel times and improve transport efficiency. It would provide for future growth and development in the region.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Some utilities would need to be relocated or protected during construction. The management of utilities is considered in section 6.15.
5(a)(iv) To encourage the provision of land for public purposes.	The proposal involves work for the purpose of a road, which is a public purpose. It would also include improved provisions for pedestrians and cyclists.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal involves work for the purpose of a road and would not impact on any community services or facilities. During construction, potential noise impacts may be experienced at sensitive receivers. However these would be minimised through the implementation of safeguards and management measures outlined in section 6.5.4. The proposal would benefit the community by providing an upgraded road, reducing current congestion and improving travel times and safety.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	Construction of the proposal would require the clearing or permanent modification of existing exotic vegetation. The potential impacts on vegetation, threatened species, population and ecological communities are discussed in section 6.1 and 6.2.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in section 8.3.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the proposal.

Object	Comment
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Consultation with the community and relevant government agencies was undertaken during the development of the proposal. Details of this consultation can be found in section 5. Consultation would be ongoing during detailed design and construction.

8.3 Ecologically sustainable development

8.3.1 The precautionary principle

This principle states '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'.

Evaluation and assessment of alternative options has aimed to reduce the risk of serious and irreversible impacts on the environment. Stakeholder consultation considered issues raised by stakeholders and a range of specialist studies were undertaken for key issues to provide accurate and impartial information to assist in the development process.

The concept design has sought to minimise impacts on the amenity of the study area while maintaining engineering feasibility and safety for all road users. A number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of lack of scientific certainty.

A CEMP would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance. No management measures or mechanisms would be postponed as a result of a lack of information.

8.3.2 Intergenerational equity

This 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 proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by ensuring road safety is improved, which has a positive benefit for all road users.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with the existing bridge. Travel times, public safety and the environment would be affected as the bridge deteriorates.

8.3.3 Conservation of biological diversity and ecological integrity

This principle states 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'.

The environment in which the proposal would be undertaken is dominated by environmental and noxious weeds. A thorough assessment of the existing local environment was undertaken to identify and manage any potential impacts of the proposal on local biodiversity. Specific design efforts have been taken to minimise impacts upon locally significant habitats, provided in the overflow bridges and the river.

The proposal would not have a significant impact on biological diversity and ecological integrity. A biodiversity assessment and appropriate site-specific safeguards are provided in Section 6.1 and 6.2.

8.3.4 Improved valuation, pricing and incentive mechanisms

This principle requires 'costs to the environment should be factored into the economic costs of a proposal'.

The REF has examined the environmental consequences of the proposal and identified management measures to manage the potential for adverse impacts. The requirement to implement these management measures would result in an economic cost to Roads and Maritime. The implementation of management measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

The concept design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the proposal is being developed with an environmental objective in mind.

8.4 Conclusion

The proposed new bridge at Tabulam is subject to assessment under Part 5 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 of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

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 proposal objectives but would still result in some impacts on public amenity due to noise, traffic and visual impacts. Management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve safety and transport efficiency and reduce travel times. On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the TSC Act or FM Act and therefore a species impact statement is not required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

9. Certification

This REF 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.

Shaun Lawer

Senior Environmental Planner

GHD Pty Ltd

Date:

I have examined this REF and the certification by Shaun Lawer and GHD Pty Ltd and accept the REF on behalf of Roads and Maritime.

Vicky Sisson

Project Manager

Roads and Maritime, Northern Region

Date:

10. References

ANZECC/ARMCANZ (2000), *Australian Water Quality Guidelines for Fresh and Marine Waters*, ANZECC/ARMCANZ, Canberra

ASSMAC (1998), *Acid Sulfate Soils Assessment Guidelines*, ASSMAC, Canberra.

Austroads (2006-2009), *Guide to Road Design*, Austroads, Sydney.

Department of Environment and Conservation (DEC) (2006), *Assessing vibration: a technical guideline*, DEC, Sydney.

Department of Environment and Climate Change (DECC) (2009), *Interim Construction Noise Guideline*, DECC, Sydney.

Department of Environment, Climate Change and Water (DECCW) (2009), *Waste Classification Guidelines*, DECCW, Sydney.

DECCW (2010a), *NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales*, Department of Environment, Climate Change and Water, Sydney.

DECCW (2010b), *Plan of Management for Jubullum Flat Camp Aboriginal Area*, DECCW, Sydney.

DECCW (2011), *Road Noise Policy*, DECCW, Sydney.

Department of Premier and Cabinet (2012) *State Infrastructure Strategy*, Department of Premier and Cabinet, Sydney.

Department of Primary Industries (DPI) (2013), *Policy and Guidelines for Fish Habitat Conservation and Management*, DPI, Sydney.

Department of Urban Affairs and Planning (DUAP) (1996), *Roads and Related Facilities*, DUAP, Sydney.

DUAP (1999) *Is an EIS required?* DUAP, Sydney.

GeoLINK (2014), Tabulam Bridge Microbat Management Plan prepared for Roads and Maritime.

Landcom (2004) *Soils and Construction – Managing Urban Stormwater*, Landcom, Sydney.

Myers, T. (2014) Desktop Constructability Review: Tabulam New Bridge Project. TSM Civil.

NSW Government (2011), *NSW 2021: A plan to make NSW number one,* NSW Government, Sydney.

Roads and Maritime Services (2014), *Tabulam New Bridge for Bruxner Highway Preferred Route Option Report.*

Roads and Maritime Services (2013), *Tabulam New Bridge - Route Options Development Report*.

Roads and Maritime Services (2012) *Timber Truss Bridge Conservation Bridge Strategy*, Roads and Maritime Services, Sydney.

Roads and Maritime Services (2012), *Standard Management Procedure: Unexpected Archaeological Finds*, Roads and Maritime Services, Sydney.

Roads and Traffic Authority (RTA) (2001), *Environmental Noise Management Manual*, RTA Sydney.

RTA (2003), *Bridge Aesthetics Guidelines* , RTA, Sydney.

RTA (2005), *Guidance for the Management of Acid Sulphate Materials*, RTA, Sydney.

RTA (2008), *Landscape Guideline*, RTA, Sydney.

RTA (2009) *Bruxner Highway, Ballina to Tenterfield Corridor Strategy*, RTA, Sydney.

RTA (2011a), *Biodiversity Guidelines (Guide 1: Pre-clearing process)*, RTA, Sydney.

RTA (2011b), *Biodiversity Guidelines (Guide 2: Exclusion zones)*, RTA, Sydney.

RTA (2011c), *Biodiversity Guidelines (Guide 3: Re-establishment of native vegetation)*, RTA, Sydney.

RTA (2011d), *Biodiversity Guidelines (Guide 4: Clearing of vegetation and removal of bushrock)*, RTA, Sydney.

RTA (2011e), *Biodiversity Guidelines (Guide 6: Weed Management)*, RTA, Sydney.

RTA (2011f), *Biodiversity Guidelines (Guide 7: Pathogen Management)*, RTA, Sydney.

RTA (2011g), *Biodiversity Guidelines (Guide 9: Fauna handling*), RTA, Sydney.

RTA (2011h), *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*, RTA, Sydney.

RTA (2011i), *Technical Guideline: Temporary Stormwater Drainage for Road Construction*, RTA, Sydney.

RTA (2011j), *Technical Guideline: Environmental Management of Construction Site Dewatering*, RTA, Sydney.

RTA (2011k), *Technical Guideline: Stockpile Management*, RTA, Sydney.

RTA (2011l), *Technical Guideline: Contaminated Land Management*, RTA, Sydney.

RTA (2012) *Management of Tannins from Vegetation Mulch*, RTA, Sydney.

Serov P, Kuginis L, Williams J.P. (2012), *Risk assessment guidelines for groundwater dependent ecosystems, Volume 1 – The conceptual framework*, DPI, Office of Water, Sydney

The Heritage Group (2014), *Tabulam Bridge, Bruxner Highway, Tabulam, Statement Of Heritage Impact*, Government Architect's Office NSW Office of Finance and Services.

Transport for NSW (2012), *Long Term Transport Master Plan*, Transport for NSW, Sydney.

11. Terms and acronyms used in this REF

Acronym/term	Meaning
AADT	Average annual daily traffic. The total volume of vehicle traffic of a highway or road for a year divided by 365 days
ABS	Australian Bureau of Statistics
AHD	Australian height datum. This is the geodetic datum for altitude measurement in Australia.
AHIMS	Aboriginal Heritage Information Management System. AHIMS contains details of Aboriginal objects, places and other heritage values across NSW.
ANZECC	Australia and New Zealand Environment and Conservation Council (former)
ARI	Average recurrence interval. The average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration.
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand (former)
ASSMAC	Acid Sulfate Soil Management Advisory Committee
CadnaA	Computer Aided Noise Abatement. Software for calculation, presentation, assessment and prediction of environmental noise.
CCA	Copper, chromium, arsenic. Treatment applied to timber to prevent termite infestation.
CEMP	Construction environmental management plan
CLM Act	Contaminated Land Management Act 1997 (NSW). A process for investigating and remediating contaminated land.
CMA	Catchment Management Authority. Authorities managing resources in their catchments
CO2-e	Carbon dioxide equivalent. A measure for describing how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO2) as the reference.
dB(A)	A-weighted decibels. Commonly used curves defined in the International standard IEC 61672:2003 and various national standards relating to the measurement of sound pressure level.
DPI	NSW Department of Primary Industries
DECC	NSW Department of Environment and Climate Change (former)
DECCW	NSW Department of Environment, Climate Change and Water (former)

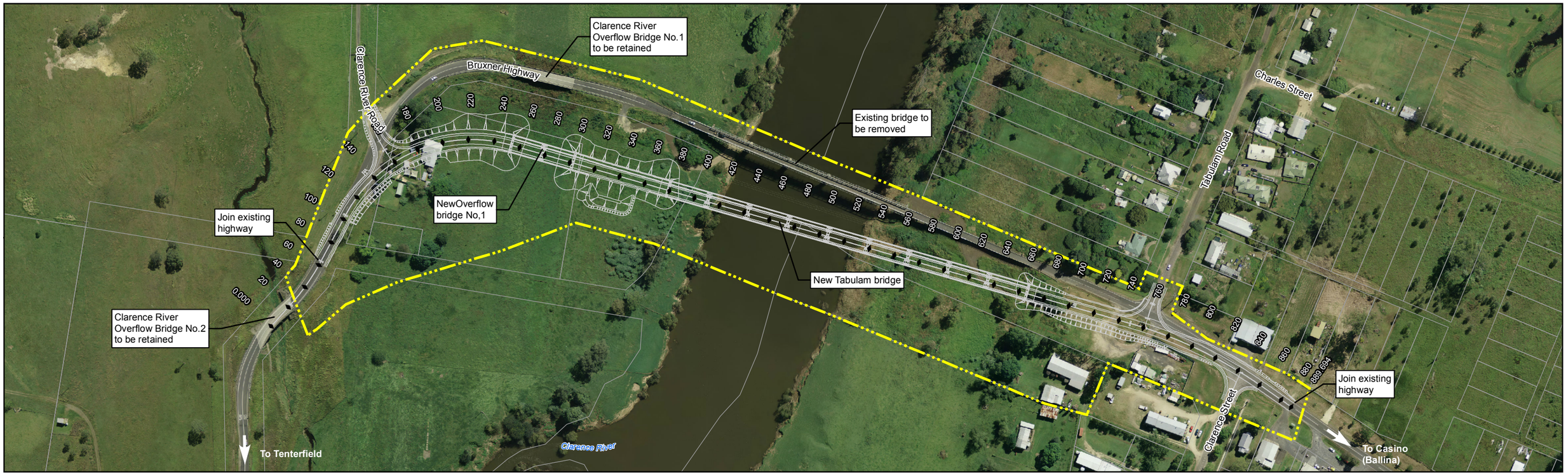
Acronym/term	Meaning
DO	Dissolved oxygen. A relative measure of the amount of oxygen that is dissolved or carried in a given medium.
DUAP	NSW Department of Urban Affairs and Planning (former)
EC	Electrical conductivity. The measure of a material's ability to accommodate the transport of an electric charge.
EEO	Energy Efficiencies Opportunity program. Former Australian government initiative to raise awareness of the potential savings achievable through energy efficiency activities for industry.
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
FM Act	Fisheries Management Act 1994 (NSW). Act to conserve, develop and share NSW fishery resources for the benefit of present and future generations.
GHD	GHD Pty Limited
Gt	Gigatonnes
HML	Higher mass limit. HML allows eligible vehicles to operate at increased mass limits compared to statutory limits.
ISEPP	State Environmental Planning Policy (Infrastructure) 2007. Aims to facilitate the effective delivery of infrastructure across the State.
kg	Kilograms
km/h	Kilometres per hour
KTP	Key threatening process listed under the TSC Act or FM Act. A process which adversely affects threatened species, populations or ecological communities or if it could cause species, populations or ecological communities that are not threatened to become threatened.
Kv	Kilovolt
LCZ	Landscape character zone. A zone that is representative of the existing landscape for visual analysis.
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local government area. The area that is governed by a local council.

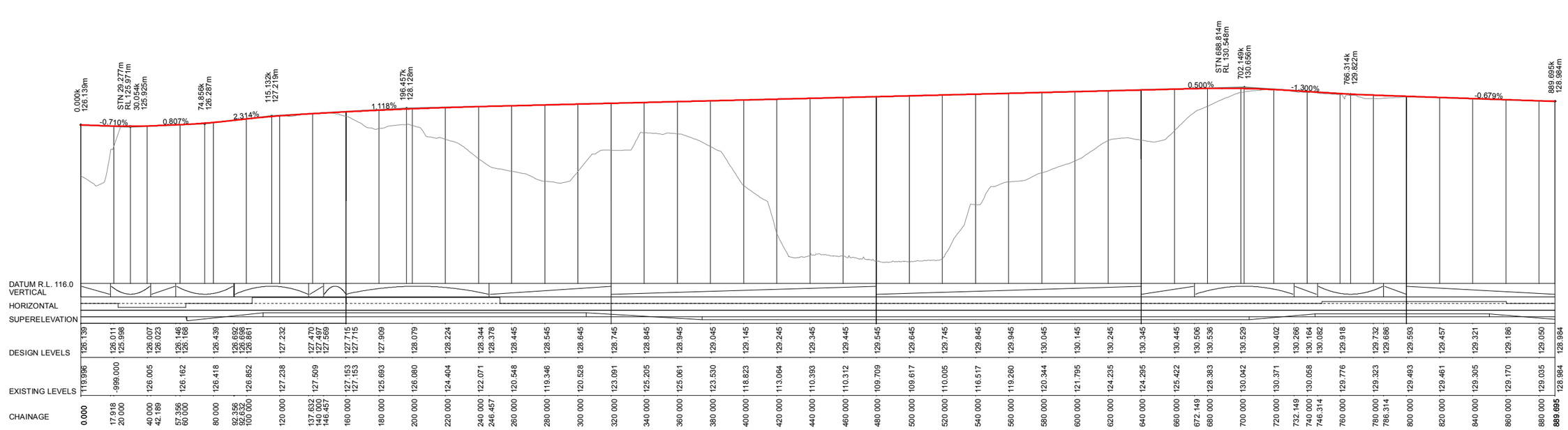
Acronym/term	Meaning
LLS	Local Land Services. Government department incorporating former CMA.
The Locality	Encompasses the village of Tabulam, which is the area surrounding the site.
m	Metres
m2	Square metres
m3	Cubic metres
mg/m3	Milligrams per cubic metre
Mt	Megatonnes
NGERS	National Greenhouse and Energy Reporting Scheme. Introduced in 2007 to provide data and accounting in relation to greenhouse gas emissions and energy consumption and production.
NW Act	Noxious Weeds Act 1993 (NSW). Reduces the negative impact of weeds on the economy, community and environment of this State by establishing control mechanisms, monitoring and reporting procedures.
NPW Act	National Parks and Wildlife Act 1974 (NSW). Act to conserve and manage the State's natural and cultural heritage in reserved lands.
NRRAP	Northern Rivers Regional Action Plan. Regional plan which addresses the growth of a strong and diversified regional economy.
NATA	National Association of Testing Authorities. Authority responsible for the accreditation of laboratories, inspection bodies, calibration services, producers of certified reference materials and proficiency-testing scheme-providers throughout Australia.
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation. Roads and Maritime procedure.
PJ	Picojoule. One million millionth of a joule.
PM10	Particulate matter with diameter of 10 micrometres or less.
POEO Act	Protection of the Environment Operations Act 1997 (NSW). Aims to protect, restore and enhance the environment through a range of objectives.
REF	Review of environmental factors. Assessment prepared under Part 5 of the EP&A Act.
REP	Regional environmental plan. NSW environmental planning instruments in, deemed SEPPs since 2009.

Acronym/term	Meaning
RTA	NSW Roads and Traffic Authority (former)
Roads and Maritime	NSW Roads and Maritime Services
SEIFA	Socio-economic indexes for areas. Ranks areas in Australia according to relative socio-economic advantage and disadvantage
SEPP 44	State Environmental Planning Policy no. 44 – Koala Habitat Protection. Aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas.
The Site	Refers to the area that would normally be directly impacted by the proposal
The Study Area	Encompasses the site and the area that may be indirectly impacted by the proposal. The study area may differ for each issue considered and is defined in the relevant specialist study reports.
The proposal	The activity subject to assessment under the REF.
TJ	Tetrajoule. A measure of energy, equal to one trillion joules.
TSC Act	Threatened Species Conservation Act 1995 (NSW). Provide for the conservation of threatened species, populations and ecological communities of animals and plants and promotes ecologically sustainable development.
TSS	Total suspended solids. A measure of the mass of fine inorganic particles suspended in the water.
Veh/hr	Vehicles per hour
WM Act	Water Management Act 2000 (NSW). Provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations.
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services.
%HV	Per cent heavy vehicle
0C	Degrees Celsius

Appendix A

Proposal design





LONGITUDINAL SECTION - TABULAM BRIDGE

Paper Size A3

0 15 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposal site
- Preferred Option
- Cadastre

Roads and Maritime Services
Tabulam New Bridge
Review of Environmental Factors

Job Number	22-16888
Revision	0
Date	09 Feb 2015

Proposal design

Figure A-1

G:\22\16888\GIS\Maps\Deliverables\REF\2216888_REF004_Proposal_Elevation_A3_0.mxd

Data source: LPI: DTDB, DCDB, 2012, RMS: Imagery, 2012. . Created by: fmackay

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Appendix B

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

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline 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
a. Any environmental impact on a community? Construction of the proposal would result in negative traffic and noise impacts to the local community for the duration of construction as discussed in section 6. Potential traffic impacts include an increase in the volume of heavy vehicles, disruptions to access and local traffic changes. Construction noise impacts would be managed by adopting feasible and reasonable noise management measures identified in the Interim Construction Noise Guideline (DECC, 2009) in order to reduce noise levels as much as practicable during construction. Long-term positive impacts would include improved safety and efficiency for all road users.	Short-term minor negative Long-term positive
b. Any transformation of a locality? The proposal is located adjacent to the existing bridge and would result in a minor transformation of the locality. Visual impacts of the proposal on the locality would be reduced through the implementation of safeguards and management measures outlined in section 6.9.3.	Neutral
c. Any environmental impact on the ecosystems of the locality? The proposal would remove and/or impact about 7.5.3 hectares of predominantly exotic vegetation. The study area comprises a highly modified environment with limited fauna habitat values. The proposal would have minimal impacts to flora and fauna during operation.	Long-term minor negative
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposal would result in a reduction in the aesthetic quality of the locality as a result of noise, visual impacts and increased traffic movements. These impacts would be minimised through implementation of the management measures and safeguards summarised in section 7.2.	Short-term minor negative

Factor	Impact
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? The proposal would not impact on any Aboriginal heritage items. The bridge would be delisted prior to its removal and appropriately remembered in the new bridge design. Management measures provided in section 6.2.3 and section 6.3.3 would be implemented to minimise potential impacts on heritage items.	Long-term - moderate negative
f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The proposal would remove and/or impact about 7.5.3 hectares of predominantly exotic vegetation. The proposal would not result in a significant impact to any protected species. Management measures provided in section 6.1.3 would be implemented to minimise potential impacts on biodiversity.	Long-term minor negative
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would remove and/or impact about 7.5.3 hectares of predominantly exotic vegetation. The proposal would not result in a significant impact to any protected species. Management measures provided in section 6.1.3 would be implemented to minimise potential impacts on biodiversity.	Long-term minor negative
h. Any long-term effects on the environment? The proposal would remove and/or impact about 7.5.3 hectares of predominantly exotic vegetation. The proposal would not result in a significant impact to any protected species. Management measures provided in section 6.1.3 would be implemented to minimise potential impacts on biodiversity. Long-term positive impacts would include improved safety and efficiency for all road users.	Long-term minor negative Long-term minor positive
i. Any degradation of the quality of the environment? Construction would result in potential traffic, noise and visual impacts. These impacts would be minimised through the implementation of safeguards summarised in section 7.2. Construction activities have the potential to result in impacts to water quality as a result of pollutants such as sediment, soil nutrients, waste, and fuels and chemicals entering the stormwater system. Potential impacts to water quality would be managed with the implementation of controls provided in sections 6.8.3 and 6.11.3.	Short-term minor negative Long-term nil

Factor	Impact
j. Any risk to the safety of the environment? There is potential for road safety to be decreased during construction due to altered traffic conditions. Traffic management safeguards including the preparation of a traffic management plan, would address safety risks (see section 6.6). The proposal would improve safety for road users during operation by improving efficiency and providing pedestrian and cyclist facilities.	Short-term potential negative Long-term positive
k. Any reduction in the range of beneficial uses of the environment? The proposal would not result in the reduction in the range of beneficial uses of any property. During construction, minor traffic impacts due to an increase in heavy vehicle movements and interruptions to traffic flow would temporarily reduce the beneficial use of the local road network.	Short-term minor negative
l. Any pollution of the environment? The proposal could potentially result in minor short-term water pollution from sediments, soil nutrients, waste, and spilt fuels and chemicals. Management of water quality impacts would be undertaken in accordance with the management measures outlined in sections 6.8.3 and 6.11.3. The proposal would result in minor short-term noise pollution from plant and machinery. Management of noise quality impacts would be undertaken in accordance with the management measures outlined in 6.4.3. Potential air and visual pollution are addressed in sections 6.5 ad 6.9.	Short-term minor negative
m. Any environmental problems associated with the disposal of waste? The proposal would involve the removal and disposal of waste which would be adequately managed in accordance with safeguards provided in section 6.16.3. All waste streams generated during construction are common and would pose no difficulty in their disposal. Waste would be recycled wherever possible.	Short-term minor negative
n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? All resources required for the proposal are readily available and are not in short supply.	Nil

Factor	Impact
o. Any cumulative environmental effect with other existing or likely future activities?	
Temporary potential cumulative impacts may occur as a result of construction activities occurring simultaneously with the proposal. No such projects are known at this time. However Roads and Maritime would continue to engage with relevant stakeholders to identify any potential for cumulative effects.	Short-term minor negative
The proposal would have a long-term positive cumulative impact on travel times, road safety and efficiency.	Long-term moderate positive
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Nil
The proposal site is not located in a coastal environment.	

Matters of National Environmental Significance

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

Factor	Impact
a. Any impact on a World Heritage property? No world heritage listed properties are located within a ten kilometre radius buffer of the proposal site.	Nil
b. Any impact on a National Heritage place? No national heritage places are located within a ten kilometre radius buffer of the proposal site.	Nil
c. Any impact on a wetland of international importance? No wetlands of international importance are located within a ten kilometre radius buffer of the proposal site.	Nil
d. Any impact on a listed threatened species or communities? The proposal would not result in significant impacts on any threatened species or communities.	Nil
e. Any impacts on listed migratory species? The proposal would not result in significant impacts on any threatened species or communities.	Nil
d. Any impact on a Commonwealth marine area? The proposal would not have any impact on a Commonwealth marine area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposal would not impact Commonwealth land.	Nil

Appendix C

Correspondence received

From:	Peter Baumann
To:	Shaun Lawer
Cc:	Scott.SMITH@rms.nsw.gov.au
Subject:	RE: Proposed New Tabulam Bridge
Date:	Tuesday, 12 August 2014 7:13:19 PM

Hi Shaun

Apologies for the delay.

No objections in principle to the preferred route identified in the New Tabulam Bridge for Bruxner Highway Preferred Route Option Report May 2014.

Crown Lands has provided RMS with a schedule of Crown lands & interests that may be subject to compulsory acquisition as part of the project.

The key areas of Crown land in the preferred route include;

(1) the bed of the river – Please note Reserve 84819 for Public Recreation & Access notified 26 march 1964 and comprising Lot 7308 DP 1152127, Lot 7310 DP 1152128 & Lots 7015 & 7016 DP 1026322 is immediately downstream of the bridge corridor and impacts on recreation values including noise, visual amenity & water quality must be considered. We are also aware of the "Tabulam Water Board" which is a local organisation that has traditionally pumped village water from the river downstream of the bridge. Contact NSW Water for further details.

(2) Lot 7006 DP 1068757 comprising Reserve 88164 for Public Recreation notified 12 March 1971. Please note former Permissive Occupancy 91794 held by the Uniting Church was terminated in March 2014. Management of the reserve now devolves on Tenterfield Shire Council pursuant to Section 48 – Local Government Act 1993. Council should be consulted in the first instance regarding inclusion of the reserve in the preferred route and as part of the acquisition process. If the old bridge is removed consideration could be given to option of adding any adjoining redundant area of Public road to this reserve in lieu of the acquired area pending resolution of any liabilities, site restoration or approaches etc. Adequate public access to the Public Recreation Reserve from the public road system must be provided. The impact of the new bridge on public recreation values of the reserve (existing and potential) must be considered and addressed accordingly.

(3) Lot 7007 DP 1068757 comprising Reserve 47692 for Camping & Water notified 3 April 1912. Management of the reserve is now the responsibility of Local land Services. However it is noted that "Tabulam Dip Site" is located within the reserve as indicated on the Mallanganee 1:25,000 Topo Map Sheet. Please note the dip site does not appear to identified on any Crown survey plan. Its chemical history is documented on the DPI Cattle Dip Site register and DPI should be contacted for further details. Similarly Adequate public access to the Camping & Water Reserve from the public road system must be provided including access considerations for travelling stock. The impact of the new bridge on public recreation and other multiple use & environmental values of the reserve (existing and potential) must also be considered and addressed accordingly.

Any areas of Crown public road within the new bridge corridor should be transferred to the appropriate Road Authority under the provisions of the Roads Act 1993.

RMS rights of access to Crown land during the investigation and construction phase pending acquisition are acknowledged. However it is requested that Crown Lands be kept advised of developments in the project and consulted further with respect to any potential works depot sites on Crown land.

Please contact me if you need any further assistance or clarification of the above.

Regards
Peter

Peter Baumann | Natural Resource Management Project Officer, Crown Lands
NSW Trade & Investment | Level 3, 49-51 Victoria Street GRAFTON 2460 | PO Box 2185 DANGAR NSW 2309
T: (02) 6640 3401 | F: (02) 6642 5375 | E: peter.baumann@crownland.nsw.gov.au
W: www.crownland.nsw.gov.au

From: Shaun Lawer [mailto:Shaun.Lawer@ghd.com]
Sent: Wednesday, 16 July 2014 4:04 PM
To: peter.baumann@crownland.nsw.gov.au
Cc: Graeme P (Robbo) Robinson
Subject: Proposed New Tabulam Bridge

Peter, further to our discussions this afternoon, please find attached the Preferred Route Report for the proposed New Tabulam Bridge over the Clarence River. The Department's comments on the proposal would be appreciated. Should you have any questions please don't hesitate to give me a call.

Regards

Shaun Lawer
Senior Environmental Planner

GHD
T: +61 2 6650 5605 | V: 225605 | M: 0402 092 310 | F: +61 2 6650 5601 | E: shaun_lawer@ghd.com
PO Box 1340 Coffs Harbour NSW 2450 | Level 1 230 Harbour Drive Coffs Harbour NSW 2450 Australia | www.ghd.com

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

From: Graeme Budd
To: Shaun Lawer
Cc: Robert Donohoe; Phillip Mitchell
Subject: RE: New Tabulam Bridge over the Clarence River
Date: Wednesday, 24 September 2014 3:19:05 PM

Hi Shaun

As discussed and outlined in your email:

- The EPA is the Appropriate Regulatory Authority for construction activities by Roads and Maritime Services.
- Bridge works of this kind are not scheduled activities under the Protection of the Environment Operations Act.
- The EPA there for does not provide formal input into the planning of such projects.
- The planning and carrying out of the project should be done in a manner that adopts best practice to control water, noise and air pollution and avoid disturbance or creation of land contamination.
- The work by RMS on the Pacific Highway provides some examples of the best practice measures that may be used to control environmental impacts of bridge construction activities.

Regards

Graeme Budd
Head Environmental Management Unit - North Coast l Environment Protection Authority l Phone 02 6640 2505 l Fax 02 6642 7743 l Mobile 0479034456 l 49 Victoria Street, Grafton l PO Box 498 Grafton NSW 2460

From: Shaun Lawer [mailto:Shaun.Lawer@ghd.com]
Sent: Wednesday, 24 September 2014 2:48 PM
To: Budd Graeme
Subject: New Tabulam Bridge over the Clarence River

Graeme, further to our conversation this afternoon, we accept that there is no formal requirement for consultation with EPA in relation to the construction of a new bridge at Tabulam, but acknowledge that in regard to EPA requirements:

- The relevant provisions of the *Protection of Environment Operations Act* are to be addressed as part of any environmental impact assessment and during construction of the project. This includes but is not limited to avoiding erosion and loss of sediment off the Construction Site to surrounding country, bodies of water, watercourses, wetlands and stormwater drainage systems. This includes the location of compound sites, access tracks, stockpile sites and temporary work areas plus staging of work to minimise the extent and duration of disturbance to vegetation.
- Comply with the *Contaminated Land Management Act 1997* and relevant EPA Guidelines in relation to disturbance or treatment of potentially contaminated land.
- Prepare a Construction Waste and Energy Management Plan as part of any CEMP by the following EPA publications.

Regards

Shaun Lawer
Senior Environmental Planner

GHD
T: +61 2 6650 5605 | V: 225605 | M: 0402 092 310 | F: +61 2 6650 5601 | E: shaun_lawer@ghd.com
PO Box 1340 Coffs Harbour NSW 2450 | Level 1 230 Harbour Drive Coffs Harbour NSW 2450 Australia | www.ghd.com

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Lisa King

From: Patrick Dwyer (InTouch)
Sent: Monday, 15 September 2014 5:16 PM
To: Lisa King
Subject: RE: Tabulam new bridge

Dear Lisa

Apologies for the delay in response. Fisheries NSW have considered the New Tabulam Bridge Bruxner HWY Preferred Options Report and have no objections to the recommended Option D .

Sincerely

PAT

Patrick Dwyer | Regional Assessment Officer (North)|
Aquaculture & Aquatic Environment **|** Primary Industries NSW
T 02 6626 1397 | F 02 6626 1377 | M 0407 264 391 | E patrick.dwyer@dpi.nsw.gov.au
W: www.industry.nsw.gov.au | www.dpi.nsw.gov.au
Postal Address: | 1243 Bruxner Hwy | Wollongbar NSW 2477 |

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/toolkit

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

NB from date of receipt of application please allow:
- 28 days for Permits, Consultations and Land Owner's Consent responses
- 40 days for Integrated Development Applications

From: Lisa King [mailto:Lisa.King@ghd.com]
Sent: Thursday, 4 September 2014 10:26 AM
To: patrick.dwyer@dpi.nsw.gov.au
Subject: Tabulam new bridge
Importance: High

Hi Pat
RMS has asked me to follow up on their request for a written response for the REF.
Would you be happy to provide a response, email is fine.
Alternatively please give me a ring to discuss (I tried to ring you this morning but didn't get you).
Thanks.

Kind Regards

Lisa King
Senior Environmental Planner
CEnvP, MPIA, MEIANZ, RABQSA

GHD
T: 61 2 4979 9995 | V: 229995 | M: 0479 091 904| E: Lisa.King@ghd.com
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 Australia | www.ghd.com
WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

All communications to be addressed to:
The General Manager
PO Box 11 KYOGLE
NSW 2474
AUSTRALIA

ADMINISTRATION OFFICE
Stratheden Street
Kyogle NSW 2474 AUSTRALIA
Phone 02 6632 1611
Fax 02 6632 2228
International Code (+61 2)
Website www.kyogle.nsw.gov.au

CONTACT: Janelle Mclennan
FOR FURTHER INFORMATION

Subject or file reference:
PLEASE QUOTE THIS REFERENCE

13 August 2014

Scott Smith
Project Manager Northern
Roads & Maritime Services
Locked Bag 928
North Sydney NSW 2059

Dear Mr Smith

RE: Consultation regarding proposed Tabulam New Bridge

I wish to advise that Council has been informed of this project from its inception.
I understand Kyogle Council's Executive Manager Urban and Assets Graham Kennett has communicated issues with regard to flooding. This applies to mapping and updating of Council's information. Kyogle Council has no issue with potential impacts of flood liable lands or local heritage.

Lisa King

To:	Shaun Lawer
Subject:	RE: New Tabulam Bridge
CompleteRepository:	2216888
Description:	Tabulam New Bridge - Contract No 13.2547.0314
JobNo:	16888
OperatingCentre:	22
RepoEmail:	2216888@ghd.com
RepoType:	Job

From: stephanie.haines@lls.nsw.gov.au [mailto:stephanie.haines@lls.nsw.gov.au] On Behalf Of Admin NorthCoast
Sent: Friday, 29 August 2014 3:58 PM
To: Shaun Lawer
Subject: Re: New Tabulam Bridge

Hello Shaun
As promised, a quick update.

Following review by our General Manager Bruce Brown, and relevant Team Leaders, please be advised that there are no submissions to this Invitation to Comment.

Thank you for extending the deadline and allowing us time to read and review.

Kind regards
Stephanie

Administration Officer

North Coast Local Land Services |

p: PO Box 618, Grafton NSW 2460

w: www.lls.nsw.gov.au/northcoast e: 1300 795 299

On 25 August 2014 14:29, Shaun Lawer <Shaun.Lawer@ghd.com> wrote:

Stephanie, if we can receive something by Friday that would be great. Thanks

Regards

Shaun Lawer

Transport
Roads & Maritime
NSW | Services

26 September 2014

your ref: obj.ID_qA1453782

Scott Smith
Project Development Manager
RMS Infrastructure Development
76 Victoria Street
GRAFTON NSW 2460.
Scott.smith@rms.nsw.gov.au

Dear Scott

Further to your email please find following NSW Maritime's requirements in relation to RMS- Maritime Division requirements for the demolition and construction of the Tabulam Bridges.I have also included navigational requirements for the Bridge on completion.

The proposed works has the potential to have an impact on the recreational vessel users on the Clarence River at Tabulam.Anecdotal evidence suggests that the area encounters limited boating activity, which could include small open runabouts and passive craft such as canoes and kayaks.

Notwithstanding this area is still classed as Navigable Waters pursuant to the *Marine Safety Act 1998* which states: ***navigable waters*** *means all waters (whether or not in the State) that are from time to time capable of navigation and are open to or used by the public for navigation, whether on payment of a fee or otherwise.*

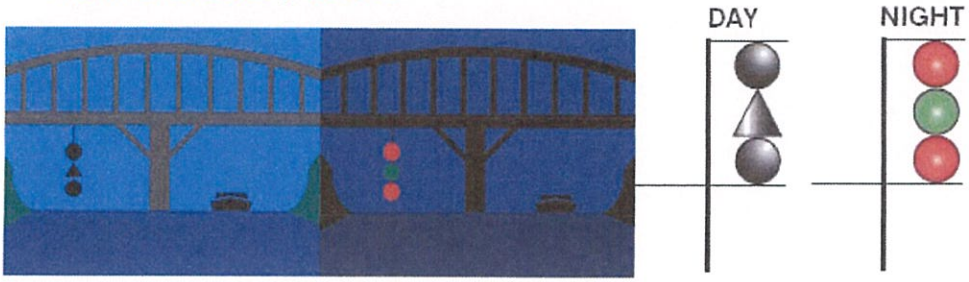
I note your proposal to place a rock platform spanning the entire width of the River.RMS would advise that it would be preferable to maintain a navigation channel for the duration of the works. However due to the minor vessel activity in the area it will be acceptable to block the River if required provided the following navigation measures are implemented:

Ongoing Works

1. Appropriate navigational marks, signage and Marine Notices will need to be implemented and updated during the period of this work.
2. Marine Notices to be placed in local press and NSW Maritime website during works and updated during different construction phases.
3. Consultation will be required throughout the duration of the works to develop forward plans for the on-water traffic management whilst the works are carried out and as plant and structures are deployed in different locations.

4. Navigational Aids plan to be approved by RMS- Maritime.
5. Yellow marker buoys no less than 1 metre in height with continuous 360 degree yellow flashing light visible 1nm (SL60) to be positioned around the rock platform and silt curtain.
6. Channel blocked day shapes to be suspended in the centre of all blocked spans of bridge. Channel blocked fixed night lights to be suspended on all blocked spans.

7. **Channel Blocked / Closed**



These signals mean vessels should NOT attempt to navigate in that part of the channel: Bridge span blocked or Channel is blocked.

Standard Channel Blocked Navaid Shapes

- Shapes will consist of 3 x 300mm diameter black plastic navaid shapes.
- These shapes will be mounted vertically (ball, triangle, ball) in a channel blocked navaid configuration.
- The shapes can be attached to the bridge handrail.
- Channel Blocked Fixed Night Lights
- Solar Channel Blocked Lights mounted vertically
- The lights will be red, green, and red.
- The supporting frame can be attached to the bridge handrail.

Bridge Completion Requirements-Clarence River Tabulam

1. It is highly desirable that there will be a dedicated channel under one span heading upstream and the same heading downstream, this matter will need to be further discussed once bridge piers are in place. However in the interests of safety and taking into account the width between piers this is the preferred outcome from a navigational point of view.
2. Suitable (Class One diamond grade. 600mm high x 450mm wide) Port & starboard reflective navigational signs for day time operations are to be attached to the Bridge piers approximately 1.5-2m from the pile cap.

3. Yellow reflectors should be fitted to adjacent piles on both sides approximately 1.5-2m from pile cap. These to be 300mm x 600mm.
4. Signage indicating minimum clearance in the navigational channel to be affixed to the bridge in the centre of the span roughly at headstock/parapet height. See examples below

5. Schedule of work to be submitted to RMS-Maritime.
   RMS- Maritime reserves the right to add or change position of navigational aids at its discretion to ensure any vessels are alerted of potential danger.

8. At the completion of works a hydrographic survey of the area may need to be undertaken to ensure the area is free of obstruction and that the rock platform has been satisfactorily removed
9. Once works are completed additional buoys may be required to indicate the channel and approaches to the bridge. This can be evaluated at a later stage

I trust I have supplied you with relevant details for the navigational aspects of the bridge construction

Please contact me at any time if you wish to raise any further matters

Yours Sincerely

Rod McDonagh
Manager Operations North
Boating Operations Branch
T 02 6565 9803 F 02 6565 9899 M 0418 494 153
Roads and Maritime Services
Locked Bag 156 South West Rocks 2431

Lisa King

To:	Shaun Lawer
Subject:	RE: FW: New Tabulam Bridge
CompleteRepository:	2216888
Description:	Tabulam New Bridge - Contract No 13.2547.0314
JobNo:	16888
OperatingCentre:	22
RepoEmail:	2216888@ghd.com
RepoType:	Job

From: Peter Hackett [mailto:Peter.Hackett@water.nsw.gov.au]
Sent: Friday, 1 August 2014 11:08 AM
To: Shaun Lawer
Subject: Re: FW: New Tabulam Bridge

Shaun,

I have had a look at the project and offer the following comments for consideration.

1. Wherever possible there should be minimal disturbance of the bed & banks of the river incorporated in the design and during the construction of the new bridge and removal of the old structure and supports. Guideline for watercourse crossings is attached.

2. Appropriate sediment and erosion control should be undertaken during construction and post construction until the site has stabilized.

3. The riparian zone should be managed in line with the "Guidelines for Riparian Corridors on Waterfront Land" brochure attached.

4. A vegetation management plan should be developed for the project to maintain or enhance the riparian zone and minimise any possible future erosion on the site. Brochure on vegetation management plans is attached.

Further information is available at the web page below.

http://www.water.nsw.gov.au/Water-Licensing/Approvals/Controlled-activities/default.aspx

RMS are exempt from requiring a Controlled Activity Approval but should abide by the guidelines.

Peter

Peter Hackett
Water Regulation Officer
NSW Department of Primary Industries | Office of Water
Level 3 49 Victoria St, Locked Bag 10 Grafton NSW 2460
T:02 66416563 F:02 66416642
M: 0424000134 (personal)
peter.hackett@water.nsw.gov.au
W: www.dpi.nsw.gov.au | www.water.nsw.gov.au

>>> Shaun Lawer <Shaun.Lawer@ghd.com> 7/31/2014 11:05 am >>>
Peter, wondering whether you've had a chance to look over this project yet and offer any comments??

Regards

Shaun Lawer
Senior Environmental Planner

GHD
T: +61 2 6650 5605 | V: 225605 | M: 0402 092 310 | F: +61 2 6650 5601 | E: shaun_lawer@ghd.com
PO Box 1340 Coffs Harbour NSW 2450 | Level 1 230 Harbour Drive Coffs Harbour NSW 2450 Australia | www.ghd.com

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

From: Shaun Lawer
Sent: Thursday, 17 July 2014 4:36 PM
To: 'peter.hackett@water.nsw.gov.au'
Cc: Graeme P (Robbo) Robinson
Subject: New Tabulam Bridge

Peter, further to our discussions this morning, please find attached the Preferred Route Report for the proposed New Tabulam Bridge over the Clarence River. The Department's comments on the proposal would be appreciated. Should you have any questions please don't hesitate to give me a call.

Regards

Shaun Lawer
Senior Environmental Planner

GHD
T: +61 2 6650 5605 | V: 225605 | M: 0402 092 310 | F: +61 2 6650 5601 | E: shaun_lawer@ghd.com
PO Box 1340 Coffs Harbour NSW 2450 | Level 1 230 Harbour Drive Coffs Harbour NSW 2450 Australia | www.ghd.com

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Please consider our environment before printing this email

CONTROLLED ACTIVITIES ON WATERFRONT LAND

Guidelines for riparian corridors on waterfront land

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WM Act). The NSW Office of Water administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity.

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

This means that a controlled activity approval must be obtained from the Office of Water before commencing the controlled activity.

What is a riparian corridor?

A riparian corridor (RC) forms a transition zone between the land, also known as the terrestrial environment, and the river or watercourse or aquatic environment. Riparian corridors perform a range of important environmental functions such as:

- providing bed and bank stability and reducing bank and channel erosion
- protecting water quality by trapping sediment, nutrients and other contaminants
- providing diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- providing connectivity between wildlife habitats
- conveying flood flows and controlling the direction of flood flows
- providing an interface or buffer between developments and waterways
- providing passive recreational uses.

The protection, restoration or rehabilitation of vegetated riparian corridors is important for maintaining or improving the shape, stability (or geomorphic form) and ecological functions of a watercourse.

Changes to controlled activities within riparian corridors

On 1 July 2012 new rules commenced regarding controlled activities within riparian corridors. The new rules amend the riparian corridor widths that apply to watercourses, providing more flexibility in how riparian corridors can be used and making it easier for applicants to determine the Office of Water controlled activity approval requirements. Key aspects of the changes include:

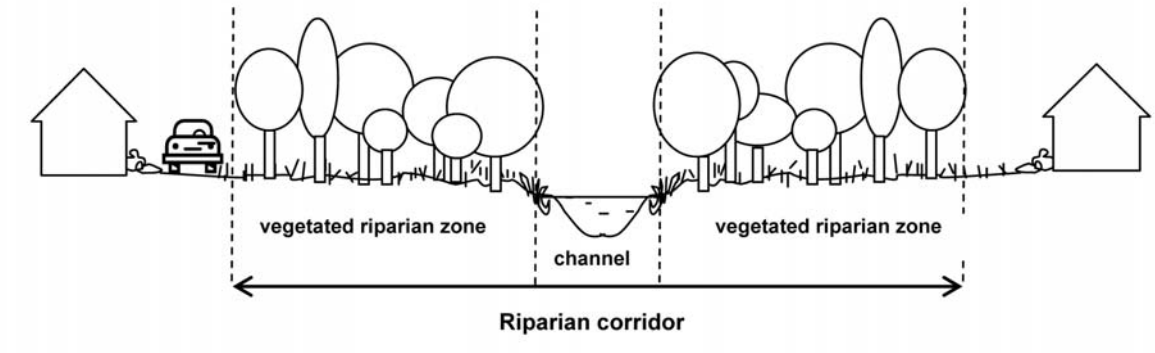
- Provision of greater flexibility in the allowable uses and works permitted within riparian corridors.
- The core riparian zone and vegetated buffer have been combined into a single vegetated riparian zone (VRZ).
- The width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses.
- Where suitable, applicants may undertake non-riparian corridor works or development within the outer 50 per cent of a VRZ, as long as they offset this activity by connecting an equivalent area to the RC within the development site.
- A new ‘riparian corridors matrix’ enables applicants to determine what activities can be considered in riparian corridors.

These changes will simplify the controlled activities application and assessment process, provide greater flexibility, help make more land available for housing, support floodplain, stormwater and bush fire management, and allow riparian corridors to be used for public amenity whilst continuing to deliver environmental outcomes required under the WM Act.

The riparian corridor consists of:

- the channel which comprises the bed and banks of the watercourse (to the highest bank) and
- the vegetated riparian zone (VRZ) adjoining the channel.

Figure 1. The riparian corridor



Riparian corridor widths

The Officer of Water recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using current 1:25 000 topographic maps (see Figure 2 and Table 1). The width of the VRZ should be measured from the top of the highest bank on both sides of the watercourse.

Figure 2. The Strahler System

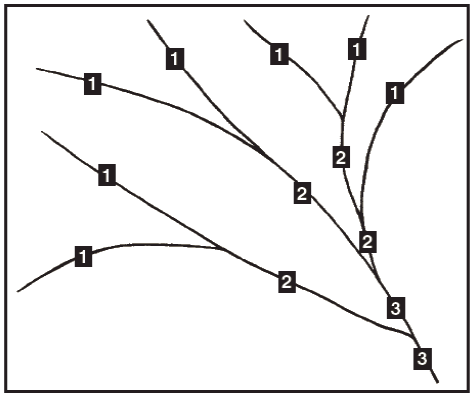


Table 1. Recommended riparian corridor (RC) widths

Watercourse type	**VRZ width** (each side of watercourse)	**Total RC width**
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Note: where a watercourse does not exhibit the features of a defined channel with bed and banks, the Office of Water may determine that the watercourse is not waterfront land for the purposes of the WM Act

Objectives for riparian corridor management

The overarching objective of the controlled activities provisions of the WM Act is to establish and preserve the integrity of riparian corridors.

Ideally the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- Identify whether or not there is a watercourse present and determine its order in accordance with the Strahler System.
- If a watercourse is present, define the RC/VRZ on a map in accordance with Table 1.
- Seek to maintain or rehabilitate a RC/VRZ with fully structured native vegetation in accordance with Table 1.
- Seek to minimise disturbance and harm to the recommended RC/VRZ.
- Minimise the number of creek crossings and provide perimeter road separating development from the RC/VRZ.
- Locate services and infrastructure outside of the RC/VRZ. Within the RC/VRZ provide multiple service easements and/or utilise road crossings where possible.
- Treat stormwater run-off before discharging into the RC/VRZ.

The Office of Water however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, so long as they cause minimal harm as outlined in the riparian corridor matrix below.

Riparian corridor matrix

The riparian corridor matrix enables applicants to identify certain works and activities that can occur on waterfront land and in riparian corridors. Applicants should note that the matrix relates to controlled activity approvals under the WM Act only. They are still required to comply with other relevant government legislation, such as threatened species, flood planning levels and fisheries guidelines.

Table 2. Riparian corridor matrix

Stream order	**Vegetated Riparian Zone (VRZ)**	**RC off-setting for non RC uses**	**Cycleways and paths**	Detention basins Only within 50% outer VRZ	Detention basins Online	**Stormwater outlet structures and essential services**	**Stream realignment**	Road Crossings Any	Road Crossings Culvert	Road Crossings Bridge
1st	10m	●	●	●	●	●	●	●		
2nd	20m	●	●	●	●	●		●		
3rd	30m	●	●	●		●			●	●
4th +	40m	●	●	●		●			●	●

Key

Stream order: The watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps whichever is the smallest scale available. A full list is provided at Part 2, Schedule 2 of the Water Management (General) Regulation 2011.

Vegetated riparian zone (VRZ): The required width of the VRZ measured from the top of the high bank on each side of the watercourse.

Riparian corridor (RC) off-setting for non RC uses: Non-riparian uses, such as Asset Protection Zones are allowed within the outer 50 per cent of the VRZ, so long as offsets are provided in accordance with the averaging rule as seen in Figure 3.

Cycleways and paths: Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ.

Detention basins: Detention basins can be built in the outer 50 per cent of the VRZ or online where indicated. Refer to the Office of Water's *Controlled activities. Guidelines for outlet structures* and *Controlled activities. Guidelines for instream works*. Online basins must:

- be dry and vegetated
- be for temporary flood detention only with no permanent water holding
- have an equivalent VRZ for the corresponding watercourse order
- not be used for water quality treatment purposes.

Stormwater outlet structures and essential services: Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's *Controlled activities. Guidelines for laying pipes and cables in watercourses* and *Controlled activities. Guidelines for outlet structures.*

Stream realignment: Indicates that a watercourse may be realigned. Refer to the Office of Water's *Controlled activities. Guidelines for instream works.*

Road crossings: Indicates permitted road crossing methods. Refer to the Office of Water's *Controlled activities. Guidelines for watercourse crossings* and NSW DPI policy and guidelines for fish friendly waterway crossings for Class 1 and 2 waterways.

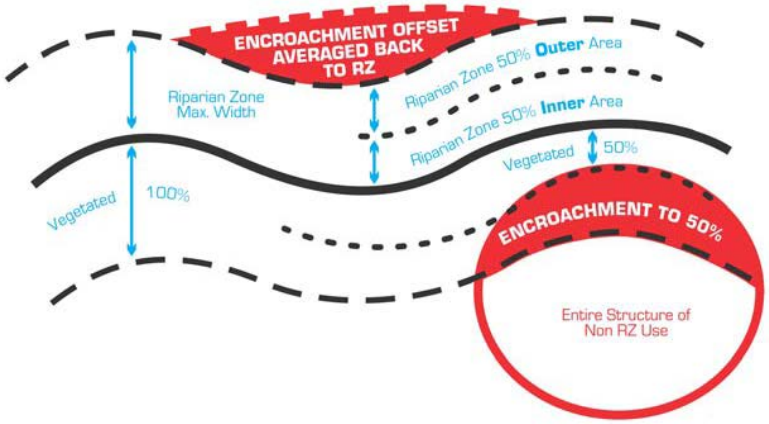
What is the averaging rule?

Non riparian corridor works and activities can be authorised within the outer riparian corridor, so long as the average width of the vegetated riparian zone can be achieved over the length of the watercourse within the development site. That is, where appropriate 50 per cent of the outer vegetated riparian zone width may be used for non-riparian uses including asset protection zones, recreational areas, roads, development lots and infrastructure. However, an equivalent area connected to the riparian corridor must be offset on the site (see Figure 3) and the inner 50 per cent of the vegetated riparian zone must be fully protected and vegetated with native endemic riparian plant species.

Bridges, cycleways, paths, stormwater oulets and other essential services do not need to be offset, but must comply with the requirements set out in the riparian corridor matrix (Table 2) and other relevant Office of Water controlled activities guidelines. Offline detention basins do not need to be offset so long as there is an equivalent VRZ for the corresponding watercourse and they are built in compliance with the Office of Water's *Controlled activities: Guidelines for watercourse crossings* and *Controlled activities: Guidelines for in-stream works*. If a proposed basin will not have an equivalent VRZ for the corresponding watercourse, it may still be built in the outer 50 per cent of the VRZ but must be offset.

The averaging rule should generally be applied to cleared waterfront land. Development proposals involving waterfront lands that contain existing native vegetation should seek to preserve that riparian vegetation in accordance with the minimum riparian corridor requirements outlined in Table 1.

Figure 3. Averaging rule



Applications for controlled activity approvals

Applications for controlled activities approvals should be informed by the riparian corridor matrix shown in Table 2 and prepared using the *Application for a Controlled Activity Approval for works on waterfront land* form and the *Guideline for completing an application for a Controlled Activity Approval*.

Other controlled activity guidelines are available on the Office of Water website and outline relevant considerations for applicants when proposing activities and works on waterfront lands.

Streamlined assessment

Where applications are presented in accordance with the riparian corridor matrix (Table 2) and other Office of Water controlled activity guidelines, they will be assessed under a streamlined process. This may decrease the amount of time it takes the Office of Water to make a determination, saving applicants time and money.

Applications that do not conform to the matrix and/or relevant Office of Water controlled activity guidelines will continue to be subject to merit assessment to ensure that the proposals meet the requirements of the WM Act. All applications will still need to demonstrate that minimal harm will occur to waterfront land before a controlled activity approval will be issued.

Where do I go for additional information?

Find out more about controlled activities at the Office of Water website www.water.nsw.gov.au.

Contact us

Contact a water regulatory officer as listed on the Office of Water website www.water.nsw.gov.au, free call the licensing information on 1800 353 104 or email information@water.nsw.gov.au.

Published by the Department of Primary Industries, a division of NSW Department of Trade and Investment, Regional Infrastructure and Services.
NOW 12_136_e

Controlled activities

Guidelines for Vegetation Management Plans

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WMA). The NSW Office of Water administers the WMA and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land.

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

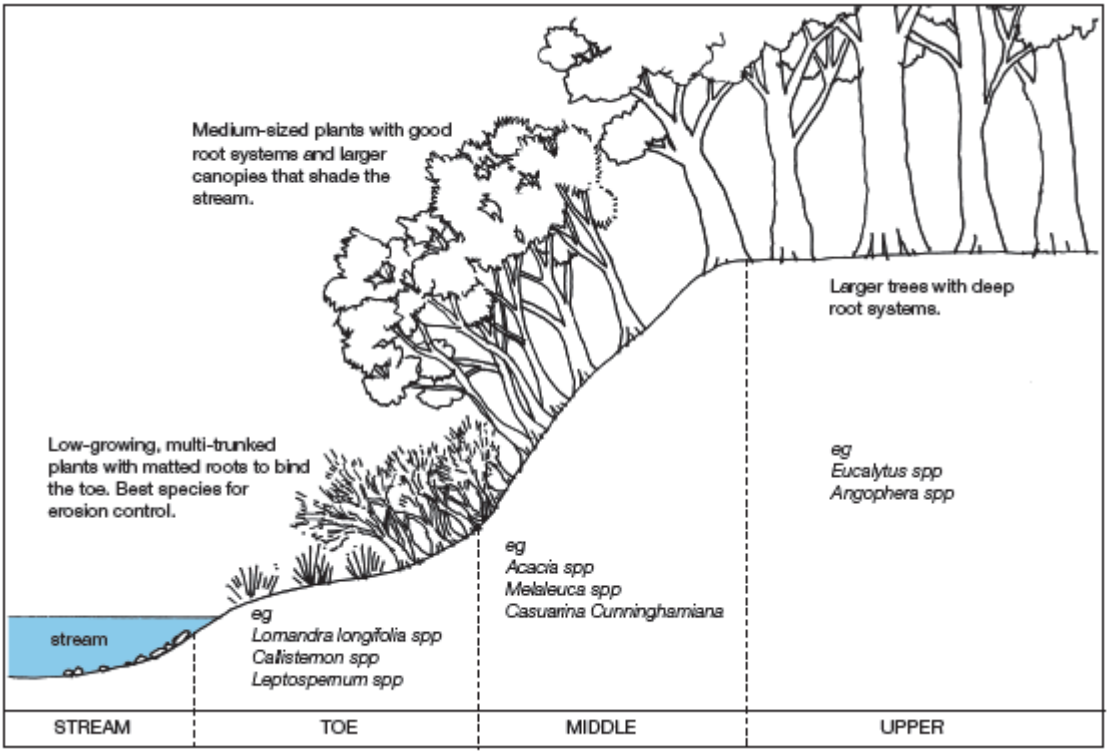
This means that a Controlled Activity Approval must be obtained from the NSW Office of Water before commencing the controlled activity.

WHY IS A VEGETATION MANAGEMENT PLAN REQUIRED?

When a proposed controlled activity disturbs or substantially modifies the riparian corridor, its restoration or rehabilitation will be a requirement of the Controlled Activity Approval. A Vegetation Management Plan (VMP) details how the restoration or rehabilitation will be carried out.

The main objective of a VMP is to provide a stable watercourse and riparian corridor which will emulate local native vegetation communities.

Figure 1. Typical riparian cross section - Adapted from *Rivercare: Guidelines for Ecological Sustainable Management of Rivers and Riparian Vegetation*: Raine, A.W & Gardiner, J.N, (1995), Land and Water Resources Research and Development Corporation, Canberra.



HOW SHOULD A VEGETATION MANAGEMENT PLAN BE PREPARED?

A VMP should be prepared by a suitably qualified person and should clearly address the following criteria:

- An appropriate width for the riparian corridor should be identified by consulting either the development consent, the relevant Environmental Planning Instrument or the NSW Office of Water's *Guidelines for riparian corridors*. The VMP should consider the full width of the riparian corridor and its functions including accommodating fully structured native vegetation.
- Maps or diagrams which clearly identify the riparian corridor; the existing vegetation; the vegetation to be retained; the vegetation to be cleared; the footprint of construction activities; and areas of proposed revegetation etc should be prepared.
- The location of the bed and banks or foreshore of waterfront land and the footprint of the riparian corridor should be clearly identified. Core riparian zones must be indicated.
- Photographs of the site should be supplied and photo points should be identified. To assist with future monitoring and reporting requirements, the photo points should be identified by GPS coordinates or by survey. This is particularly important for large scale earthworks or extractive industries.
- Measures for controlling long term access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified.
- Vegetation species composition, planting layout and densities should be identified. The required mix of plant species relates to the actual community to be emulated and the size of the area/s to be rehabilitated but mature vegetation communities are generally well structured, comprising trees, shrubs and groundcovers species. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse. Costs associated with high density planting will be recovered through reduced maintenance costs (weeding, replacement planting etc) in the maintenance period specified in the Controlled Activity Approval (CAA).
- Seed/plant sources should be identified. Where possible, native plants and seed sources of local provenance should be used.
- Exotic vegetation should be avoided. The use of exotic species for temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.
- Details of the planting program, rehabilitation methods and staging should be provided. Techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.
- Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for the treated riparian corridor (controlled activity) is achieved.
- Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.
- Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance (including plant replacement), monitoring and reporting should be prepared.
- Processes for monitoring and review, including a method of performance evaluation, should be identified. This should include replacing plant losses, addressing deficiencies, problems, climatic conditions, successful completion of works, etc.
- Regular reporting on the implementation and status of works (progress, success/failures and completion) should be provided. The number and duration of reporting periods will be identified in the CAA. 'Works as executed' plans and reports detailing how the components of the VMP have been implemented will be required prior to the release of any security held by the NSW Office of Water.
- Security (as bank guarantees) may be required before a controlled activity involving the implementation of a VMP is commenced. The amount of security is usually based on the costings provided.

WHERE DO I GO FOR ADDITIONAL INFORMATION?

Find out more about controlled activities at www.water.nsw.gov.au

CONTACT US

Contact a water licensing officer at a local office listed on our website, free call the licensing information line on 1800 353 104 or email information@water.nsw.gov.au

NOW 10_140f

- Minimise the design and construction footprint and extent of proposed disturbances within the watercourse and riparian corridor.
- Maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse.
- Demonstrate that where a raised structure or increase in the height of the bed is proposed there will be no detrimental impacts on the natural hydraulic, hydrologic, geomorphic and ecological functions.
- Maintain natural geomorphic processes:
  - accommodate natural watercourse functions
  - maintain the natural bed and bank profile
  - ensure the movement of sediment and woody debris is not inhibited
  - do not increase scour and erosion of the bed or banks in any storm events
  - avoid locating structures on bends in the channel
  - where bed degradation has occurred, address bed degradation to protect the structure and restore channel and bed stability.
- Maintain natural hydrological regimes:
  - accommodate site hydrological conditions
  - do not alter natural bank full or floodplain flows or increase water levels upstream
  - do not change the gradient of the bed except where necessary to address existing bed and bank degradation
  - do not increase velocities by constricting flows, for example filled embankments on approaches.
- Protect against scour:
  - provide any necessary scour protection, such as rock rip-rap and vegetation
  - ensure scour protection of the bed and banks downstream of the structure is extended for a distance of either twice the channel width or 20 metres whichever is the lesser
  - if cutting into banks, protect cuttings against scour.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation, mulching, weed control and maintenance in order to adequately restore the integrity of the riparian corridor.

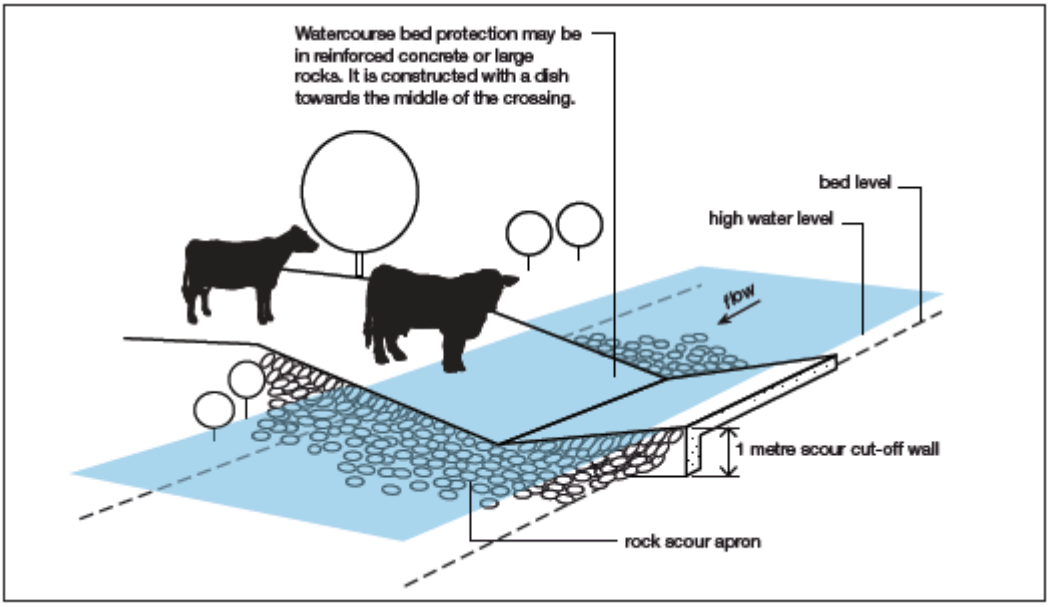
Bridges - additional design considerations

- Ideally, bridges shall be elevated and span the riparian corridor.
- Bridge piers or foundations should not be located within the main channel of the watercourse.
- The bridge design must be certified by a suitably qualified engineer.

Causeways or bed level crossings – additional design considerations

- The deck of the crossing shall be at the natural bed elevation.
- The crossing should have a vertical cut-off wall on the downstream side of the crossing to a minimum depth of one metre and minimum width of 100 mm.
- Approaches to crossings should be sealed and incorporate appropriate roadside drainage, such as stabilised table drains where necessary.

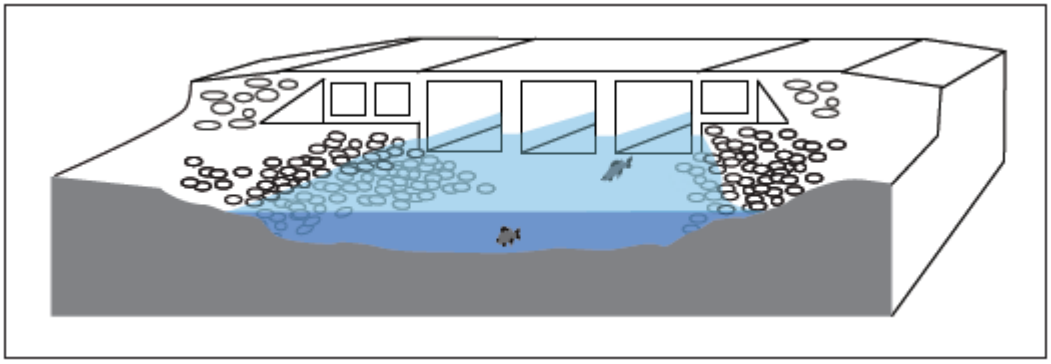
Figure 2. Splash crossing for livestock and vehicles on small intermittent watercourses



Culverts – additional design considerations

- Box culverts are preferred to pipes.
- Align culverts with downstream channel.
- Incorporate elevated 'dry cells' and recessed 'wet cells' with the invert at or below the stable bed level.
- The culvert design must be certified by a suitably qualified engineer.

Figure 3. Road crossing allowing fish passage



WHAT INFORMATION SHOULD BE SUBMITTED FOR ASSESSMENT?

When seeking approval for watercourse crossings, the NSW Office of Water will rely on the above information to undertake its assessment and to determine if the activity should be approved. All works/activities should be designed by suitably qualified persons.

The following additional information may also be required:

- Detailed design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing proposed works relative to existing and proposed bed and bank profiles and water levels. The cross section should extend to the landward limit of the identified riparian corridor. All plans MUST include a scale bar.
- Detailed crossing design plans should include a location plan, plan view, elevation view and cross-section of the proposed crossing structure.

- Detailed report of pre and post construction hydraulic conditions. The report should address - bank full discharge, velocity, tractive force or sheer stress, afflux (modified RTA method is acceptable), and Froude and Manning 'n', relative to the proposed structure.
- Plans showing the extent and designs of permanent bed and bank stabilisation works necessary for scour protection (see NSW Office of Water's *Guidelines for in-stream works*).
- A Vegetation Management Plan prepared in accordance with the NSW Office of Water's *Guidelines for Vegetation Management Plans.*
- Sediment and erosion control plan.
- A site management plan incorporating a works schedule, sequence and duration of works, contingencies (in case of flood etc) erosion and sediment controls and proposed monitoring and reporting periods.
- Costing of all works (materials, labour) and stages of works (crossing construction, rehabilitation).
- Copies of other relevant approvals, for example land owner's or development consent.

WILL A MAINTENANCE PERIOD BE NECESSARY?

Applicants will also need to provide for a maintenance period of between three and five years after practical completion of each stage or until site is stable. The maintenance period will depend on the scope (size) and level of risk. Engineering certification may be required at the end of the maintenance period. Maintenance should include sediment and erosion control, replacement of any works/areas damaged or destroyed by flows and flooding or vandalism, and any other requirements necessary to ensure a naturalised stable watercourse system is functioning by the end of the maintenance period.

WILL A SECURITY BE REQUIRED?

Applicants should note that if the likelihood of significant impact – on the watercourse or waterfront land – is identified, security (as bank guarantees) may be required before the controlled activity is commenced. The amount of security is usually based on the costings provided.

WHERE DO I GO FOR ADDITIONAL INFORMATION?

Find out more about controlled activities at www.water.nsw.gov.au

CONTACT US

Contact a water licensing officer at a local office listed on our website, free call the licensing information line on 1800 353 104 or email information@water.nsw.gov.au

NOW 10_140e

TENTERFIELD SHIRE COUNCIL

Birthplace of Our Nation

21 July 2014
CAS 15013-81NP

Mr Scott Smith
Roads & Maritime Services
PO Box 576
GRAFTON NSW 2460

Dear Mr Smith

Re: Bruxner Highway – Replacement of the Bridge Over Clarence River at Tabulam

I refer to your correspondence of 11 July 2014 regarding the Tabulam Bridge, and Council's comments on any potential impacts on flood liable lands and local heritage.

Consideration should be given to the potential for aboriginal heritage/artefacts to be discovered during construction, and this should be addressed in any future construction management plan.

Please do not hesitate to contact Mr Ralf Stoeckeler, Acting Director of Engineering Services on (02) 6736 6001 should you require any further information.

Yours sincerely

Lotta Jackson
General Manager

All correspondence should be addressed to:

The General Manager

Tenterfield Shire Council

247 Rouse Street (PO Box 214) TENTERFIELD NSW 2372

Telephone: (02) 6736 6000 Facsimilie: (02) 6736 6005 email: council@tenterfield.nsw.gov.au website: www.tenterfield.nsw.gov.au

ABN: 85 010 810 083