



Riverina Highway (HW20) - Stage 2 Safety Improvement Work

Review of environmental factors

June 2016



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Roads and Maritime Services

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Prepared by EnviroKey Pty. Ltd



Project Title: Review of Environmental Factors:
Riverina Highway (HW20) - Stage 2
Safety Improvement Work

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Executive summary

The proposal

Roads and Maritime proposes to carry out safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be carried out between 0.0 and 3.3 kilometres west of the Bethanga Bridge within the Albury Local Government Area (LGA).

Need for the proposal

The proposal would improve road user safety along this section of the Riverina Highway. Between May 2009 and January 2015, 16 accidents have been recorded between Bethanga Bridge and Hawksview. This is considered generally higher in the context of other similar rural locations. One fatality is known from this period. The proposed work aims to improve safety and minimise or eliminate the potential for road accidents to occur along this section of the Riverina Highway.

Proposal objectives

The objective of this proposal is to rehabilitate the existing narrow width sections to a safer standard and provide a new pavement with a 40 year design life. The proposal would also provide minimal disruption to the travelling public, a safe working environment for road workers and road users and to achieve this in the most efficient way practicable.

Options considered

Three options were identified and considered as part of the proposal to improve safety of the Riverina Highway. These were:

Option 1 – ‘Do Nothing’

The do nothing option involves not undertaking the proposal, continuing to use the Riverina Highway in its current design.

Option 2 – Upgrade the Riverina Highway road pavement

This option would include upgrading the road pavement along this section of the Riverina Highway.

Option 3 – Widen existing Riverina Highway with some minor curve realignment (preferred option)

This option would include the widening of the Riverina Highway from 6.5 metres to seven metres with a 1.5 metre sealed shoulder and 0.5 metre verge with some minor curve realignment, installation of safety barriers, pavement reconstruction and culvert installation.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 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 the purpose of a road and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. Development consent is not required.

Community and stakeholder consultation

All necessary community and stakeholder consultation would be carried out by Roads and Maritime, in accordance with the Roads and Maritime *Community Involvement Practice Notes and Resource Manual*.

Community consultation that would be carried out as part of this proposal includes the following activities:

- Notification of landowners to be affected by the proposal such as the sensitive receivers adjacent to the proposal
- Notifications would be placed in local print media prior to the commencement of work detailing the likely timing of the proposal, potential changes to traffic conditions and project management contact details to open communication channels to provide further details or address complaints
- Temporary electronic Variable Message Signs placed at both the northern and southern ends of the proposal to advise of the project and potential delays to motorists
- Meetings and briefings with stakeholders, businesses and residences (as required)
- Letters, phone calls, emails and target correspondence
- Project updates on the Roads and Maritime website: www.rms.nsw.gov.au/projects
- Live traffic website.

Roads and Maritime have also commenced consultation with the following stakeholders:

- Albury City Council
- NSW Fisheries
- NSW Office of Water
- Woolshed Thurgoona Landcare Group.

Environmental impacts

Native and exotic vegetation would be removed as part of this proposal. The total area of native vegetation impacted would be about 0.245 hectares. This includes impact to 0.037 hectares of native tree planting and impact to the threatened ecological community (TEC) Box-Gum Woodland (TSC Act listed) of about 0.208 hectares (0.207 hectares with canopy and 0.001 hectares of derived native grassland). The remaining impact would be restricted to introduced grassland/tree areas.

There is the some potential for impact to the threatened species Squirrel Glider which was recorded using a nest box in the native tree planting next to the proposal. Additional indirect impact includes the removal of some native and introduced vegetation considered potential foraging areas for some threatened fauna species. Two hollow-bearing trees would be impacted as part of the proposal. There is also the potential for the proposal to result in the spread of weed species, including the environmental weeds African Lovegrass, St. John's Wort and Tree-of-heaven.

Justification and conclusion

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. The proposal would result in both positive and negative impact. Safeguards are identified in this review of environmental factors to manage and mitigate the identified negative impact.

On balance, it is considered that the adverse environmental impact of the proposal is outweighed by the useful effects and that the proposal is therefore justified. This REF has determined that the proposal is unlikely to have a significant impact on the environment and therefore the preparation of an Environmental Impact Statement is not required.

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1 Introduction

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) propose to carry out safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be carried out between 0.0 and 3.3 kilometres west of the Bethanga Bridge within the Albury Local Government Area (LGA). A regional map of the location of the proposal is provided (Map 1-1).

The Riverina Highway is a state road that connects the Lake Hume Village at the Bethanga Bridge and Deniliquin via Albury. The road mainly serves as a local access function with limited strategic importance.

Key features of the proposal include:

- Widening the existing road formation from 6.5 metres to seven metres with one and a half metre road shoulders
- Reconstructing road pavement along the length of the proposal
- Culvert installation
- Installing safety barriers where there are 0.5 metre verges
- Localised widening by up to two metres on the back of curves
- Clearing and grubbing
- Major cut and fill activities
- Installation of safety barriers where batters exceed 1.5 metres in height and are steeper than 4:1.

The proposal is required to improve safety along the Riverina Highway. The Minister for Roads and Freight has approved an allocation of \$11 Million over three financial years from 2015-2017 to conduct safety improvement works on the Riverina Highway.

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by EnviroKey on behalf of Roads and Maritime Services South West region. For the purposes of this work, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the proposed work and associated environmental impact have been carried out in 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 Australian Government's *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 Services examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval 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, in 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.



Map 1-1: Regional location of the proposal

2 Need and options considered

2.1 Strategic need for the proposal

The proposal would improve road user safety along this section of the Riverina Highway. Between May 2009 and January 2015, 16 accidents have been recorded between Bethanga Bridge and Hawksview. This is considered generally higher in the context of other similar rural locations. One fatality is known from this period. The proposed work aims to improve safety and minimise or eliminate the potential for road accidents to occur along this section of the Riverina Highway.

In addition to the above, the proposal would result in the following:

- A reduction in travel time between Lake Hume and Albury
- An improvement to the existing road surface and improved visibility
- Overall improvements to road safety along the Riverina Highway.

The proposal is required to meet current network safety and design standards and improve road user safety.

2.2 Existing road and infrastructure

This section of the Riverina Highway is a two lane single carriageway with a posted speed limit of 80 kilometre per hour. The road corridor and shoulders are of varying widths, while the current road surface has deteriorated and is of varying width from about six and a half to seven metres. There are no intersections within the proposal however there is an entrance to a boat ramp on Lake Hume. There are also gravel surfaced roads that are access points into rural properties adjacent to the road. Native and exotic vegetation along with significant native plantings are present within the road reserve. The road is flanked in sections by steep batters with existing culverts. Safety barriers are not present in sections. Existing steep batters, tight curves and vegetation currently reduce visibility.

2.3 Proposal objectives

The objective of this proposal is to rehabilitate the existing narrow width sections to a safer standard and provide a new pavement with a 40 year design life, while providing minimal disruption to the travelling public, a safe working environment for road workers and road users and to achieve this in the most efficient way practicable.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

The method used for the selection of the preferred option was to analyse the environmental, community and safety outcomes of each option and whether they achieved the objectives of this proposal. The option that minimised the environmental and community impact and achieved the desired safety outcomes was the selected option.

2.4.2 Identified options

Three options were identified and considered as part of the proposal to improve safety of the Riverina Highway. These were:

Option 1 – ‘Do Nothing’

The do nothing option involves not undertaking the proposal, continuing to use the Riverina Highway in its current design.

Option 2 – Upgrade Riverina Highway road pavement

This option would include upgrading the road pavement along this section of the Riverina Highway.

Option 3 – Widen existing Riverina Highway with some minor curve realignment

This option would include the widening of the Riverina Highway from 6.5 metres to seven metres with a 1.5 metre sealed shoulder and 0.5 metre verge with some minor curve realignment, installation of safety barriers, pavement reconstruction and culvert installation.

2.4.3 Analysis of options

Option 1 – ‘Do nothing’

The do nothing option would not meet the proposal objectives and would not result in any improvement to safety of the Riverina Highway.

Advantages:

- No impact on vegetation and the surrounding environment
- No community impact including temporary road traffic impact during construction work
- No construction costs.

Disadvantages:

- Road safety would not be improved.

Option 2 – Upgrade Riverina Highway road pavement

Option 2 would partially meet the objectives of the proposal through improvement to the road surface. However, substandard width, alignment and batter slopes would remain in place.

Advantages:

- Low impact on vegetation and the surrounding environment
- Low community impact including temporary road traffic impact during construction work
- Low construction costs.

Disadvantages:

- Road hazards would remain in place
- Road use safety would not be improved.

Option 3 – Widen existing Riverina Highway with some minor curve realignment (preferred option)

Option 3 would improve road safety by ensuring the Riverina Highway is consistent with Roads and Maritime standards and community expectation.

This option would result in widening of the road pavement surface, road shoulders and verges, minor realignment of some curves, reduction of some batter slopes and installation of safety barriers where batters are over 1.5 metres in height and widening of existing culverts. To accommodate the widening and batter slope reduction, major cut and fill activities would be required. Some clearing and grubbing of vegetation would also be required.

This option would significantly increase the safety of the Riverina Highway.

Advantages:

- Improved road user safety for all road users
- Increased efficiency of the road network
- Removal of clear zone hazards.

Disadvantages:

- Higher relative impact on vegetation
- Higher relative impact to community including traffic delays during construction
- Greater potential for soil erosion during construction
- Increased duration of construction
- Increased cost of construction.

2.5 Preferred option

Option 3 was the preferred option as it meets the objectives of the proposal. This option would have the greatest impact on vegetation and the surrounding environment. This was deemed acceptable due to the vast improvements that would be made to road user safety on the Riverina Highway with consideration of the 'integration' principle of ESD.

2.6 Design refinements

No specific design refinements have been carried out.

3 Description of the proposal

3.1 The proposal

Roads and Maritime proposes to carry out safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20), about 12 kilometres east of Albury. The location of the proposal is provided (Map 3-1).

The proposed work would include:

- Widening the Riverina Highway from about 6.5 metres to seven metres with a 1.5 metre sealed shoulder and 0.5 metre verge
- Installation of safety barriers where batters exceed 1.5 metres in height and are steeper than 4:1
- Localised widening of the sealed shoulder by up to two metres on the back of some curves
- Pavement reconstruction
- Culvert installation
- Minor curve realignment
- Clearing and grubbing of vegetation
- Major cut and fill activities.

3.2 Design

3.2.1 Design criteria

The design criteria for the proposed work is to improve road user safety on the Riverina Highway. Detailed cross-sections of the proposal are provided in the construction plans (Appendix 1).

3.2.2 Engineering constraints

The engineering constraints associated with this proposal include the steep topography, narrow road corridor and proximity to Lake Hume.

3.2.3 Major design feature

The major design feature of this proposal is the widening of the Riverina Highway.

3.3 Construction activities

3.3.1 Work methodology

The general construction activities for the proposal include:

- Installation of environmental controls including erosion and sediment controls
- Site establishment including establishment of compound and stockpile sites, and traffic controls
- Removal of ground cover and trimming/removal of vegetation
- Potential minor utility adjustments
- Cleaning and shaping of existing table drains
- Culvert extension and installation work
- Widening of the existing road formation to accommodate a sealed pavement width of 10 metres (providing a 3.5 metre travel lane with a 1.5 metre sealed shoulder), widening would also include provision of a 0.5 metre verge, which in total provides a 10.5 - 11 metre formation width
- Blasting
- Pavement overlay

- Reinstatement of private accesses as required
- Reinstatement of signage as required
- Site clean-up and rehabilitation of disturbed areas.

Map 3-1 identifies the proposed compound site and stockpile sites that would be used during construction. The compound site for Stage 1 work (adjacent to the Riverina Highway near Lake Hume village) would be utilised, however it would be extended to the west to provide additional area for a stockpile site. Two existing stockpile sites established for Stage 1 work would be used. In addition to these sites it is proposed to establish a stockpile site within the existing, but disused, quarry located adjacent to the work. These sites have been considered and assessed within this REF.

Existing permanent stockpile sites that occur along the Riverina Highway would be utilised. Any stockpile sites would be subject to the criteria set out in the Roads and Maritime *Stockpile Site Management Guideline EMS-TG-10*. The compound site and any temporary stockpile sites would be removed and rehabilitated following the completion of work.

3.3.2 Construction hours and duration

Standard working hours would be adopted to carry out the work. These are:

Standard Working Hours	
Monday – Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday and Public Holidays	No work

Out of hours work may be required in order to meet project deadlines and community expectations and outcomes. This would be conducted in conjunction with community consultation in order to minimise noise and traffic impacts while meeting the project targets.

The work would be staged over two financial years, with construction likely to commence in October 2016 (drainage and bulk earthworks), with pavement to be completed from October 2017.

3.3.3 Plant and equipment

The following typical plant/equipment, though not limited to, would be used during the proposed work:

- | | |
|---------------|-------------------|
| • Bulldozers | • Delivery Trucks |
| • Dump Trucks | • Bitumen Trucks |
| • Scrapers | • Light Vehicles |
| • Cranes | • Water Carts |
| • Excavators | • Graders |
| • Rollers | • Line Markers |

3.3.4 Earthworks

The earthwork estimates are as follows:

- Total cut volume - 35,000 cubic metres
- Total general fill volume - 14,000 cubic metres.

It is anticipated that there would be some excess materials from the excavation process however the majority is likely to be utilised as fill. Any excavated material that is surplus would be stored

temporarily at an approved stockpile site for the work. This excavated material would be utilised by Roads and Maritime in other areas of the proposal where possible. If the excess material cannot be used onsite, then it would be transported to a Roads and Maritime facility and stored for use in other local road work. If the excess material had not been excavated prior to the proposal, is uncontaminated and cannot be used onsite or by the Albury City Council for other road work then it would be managed according to the Roads and Maritime *Waste Fact Sheet 1 - Virgin Excavated Natural Material*. If the material has been excavated prior to the proposal, for example if it was transported as fill for previous construction activities, then it would be managed in accordance with Roads and Maritime *Waste Fact Sheet 2 - Excavated Natural Material*.

3.3.5 Source and quantity of materials

Some materials would be sourced from onsite, during bulk earthworks and used to construct the new road formation. However some fill, base, sub-base, select gravel and bridging rock may be required to create the new pavement surface for the widening and minor realignment, and the culvert installation and extension. It is proposed that this material would be sourced from existing commercial quarries in the local area if required.

3.3.6 Traffic management and access

A Traffic Control Management Plan would be prepared in line with the Roads and Maritime *Traffic Controls at Work Sites Manual- Version 4 (2010)*. The Riverina Highway is a two lane single carriageway therefore single lane closures would be required during the construction activities. For example, the southbound lane would be closed while work is carried out on the eastern side of the road. A contraflow would be put in place which would direct southbound traffic into the northbound lane. This would most likely require a timed traffic light system to effectively manage the length of time required for the traffic standstill which would occur in both directions on the Riverina Highway.

It is likely that construction work would also impact on traffic movements due to an increase in truck and machinery movements accessing the site. Increased truck/vehicle movements are likely to be restricted to the area of the proposal during construction hours. However additional movements would be required when constructing the new road formation. Impact from construction activities would cease at the completion of work. Existing vehicular tracks would be used on both sides of the proposed construction that would allow access between the site compound and the disused quarry and adjacent to the proposed work near Hume Dam. Given the existing condition of these, any impact from using these would be minimal. These tracks may need some minor grading to allow for truck and other vehicle movements.

3.4 Ancillary facilities

A site compound, sediment controls and other ancillary facilities would be required for construction. A temporary compound site and several existing stockpile sites in the road reserve of the Riverina Highway would be utilised (see Map 3-1).

3.5 Public utility adjustment

The proposal would potentially require the minor adjustment of some public utilities. The final details of the public utility adjustment are yet to be finalised.

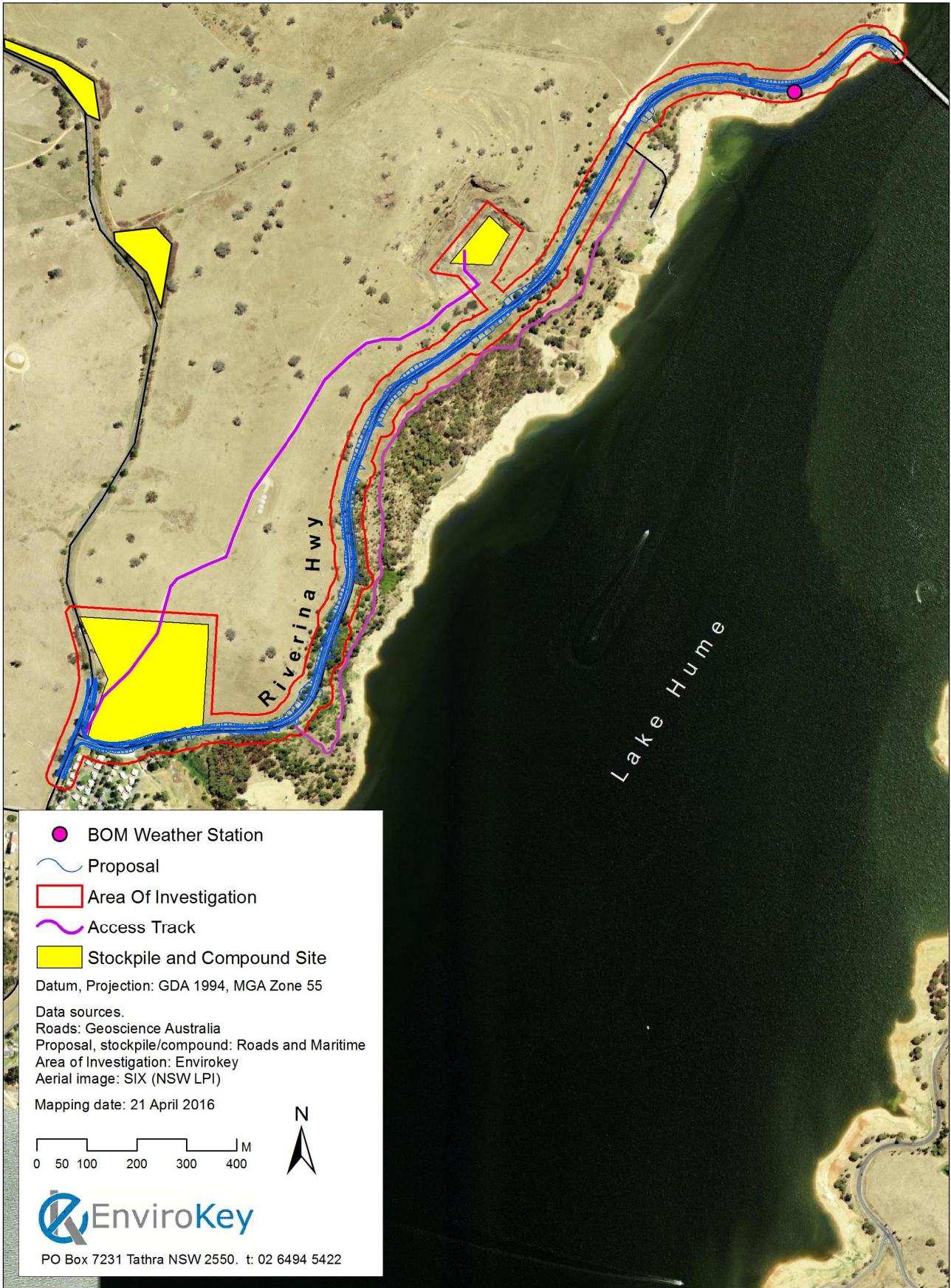
A Bureau of Meteorology (BOM) weather station is located next to the proposal (see Map 3-1). This is the Hume Reservoir weather station (station number 072023). The proposal would not impact on the weather station.

Details of utility adjustments are provided in Appendix 1.

3.6 Property acquisition

Some potential property acquisition is expected as a result of the proposal. The final details of the property acquisition are yet to be finalised.

All property valuations and acquisitions would be carried out in accordance with the Roads and Maritime *Land Acquisition Policy* and the *Land Acquisition (Just Terms Compensation) Act 1991*.



Map 3-1: The location of the proposal.

4 Statutory and planning framework

4.1 State Environmental Planning Policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

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

As the proposal is for a road and road infrastructure facilities and is to be carried out by Roads and Maritime Services, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. 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 as required by ISEPP (where applicable), is discussed in chapter 5 of this REF.

4.1.2 State Environmental Planning Policy No. 44 – Koala Habitat

While Roads and Maritime is not bound by the provisions of SEPP 44 for a Part 5 assessment, it is Roads and Maritime practice to consider the objectives of this SEPP. Albury local government area (LGA) is not identified under Schedule 1 of SEPP44 and therefore this policy does not apply to the land subject to proposal.

The SEPP aims to facilitate the conservation and management of areas that provide habitat for Koalas, by identifying potential Koala habitat and core Koala habitat. These are described as follows:

- *Core Koala Habitat* is defined as an area of land with a resident population of Koala evidenced by attributes such as breeding females (that is, females with young) and recent and historical records of a population.
- *Potential Koala Habitat* is defined as areas of native vegetation where the trees or the types listed in Schedule 2 constitute at least 15% of the total number trees in the upper or lower strata of the tree component.

The Biodiversity Impact Assessment (BIA) determined that one feed tree as listed under Schedule 2 of the SEPP, White Box (*Eucalyptus albens*), was present in small, isolated patches where the trees constituted 15% of the canopy (Appendix 3). There was no evidence of a resident population of Koalas in the vicinity of the proposal and there are no historical records of Koala sightings within a buffer of 10 kilometres of the proposal. Given this, the vegetation within the vicinity of the proposal would be considered Potential Koala Habitat as defined by SEPP44 though it is unlikely to support a population. The proposal is not located within Core Koala Habitat as defined by SEPP44; therefore the proposal would not impact on potential or core Koala Habitat as defined by SEPP44. The BIA provides further details on SEPP 44 (Appendix 3).

4.2 Local Environmental Plans

4.2.1 Albury Local Environmental Plan 2010

The proposal is wholly included within the Albury Shire and is subject to the Albury Local Environmental Plan 2010 (LEP). Under the LEP the proposal would be undertaken on three land zones; E3 Environmental Management, RU5 Village and W2 Recreational Waterways zones. Within these zones road work is not permitted without consent; however Clause 94 of the 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. Notwithstanding, Roads and Maritime would notify Albury City Council of the proposal. There are no further potential restrictions related to this LEP.

4.3 Other relevant legislation

4.3.1 Environmental Planning and Assessment Act (EP&A Act)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment of Roads and Maritime activities. Roads and Maritime proposals are assessed and approved or determined under the following regimes:

1. **Part 5** applies to the majority of Roads and Maritime road projects. Usually a review of environmental factors (REF) is prepared to assess the environmental impact of a project prior to commencing the work.
2. **Part 5.1** applies to State significant infrastructure. These major projects require approval from the Minister for Planning and Infrastructure. An environmental impact statement is prepared in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.
3. **Part 4** applies to projects that require development consent from a consent authority (usually a local council). A statement of environmental effects or environmental impact statement (for designated development) is prepared to assess environmental impact.
4. **Division 4.1 of Part 4** applies to State significant development. These major projects require approval from the Minister for Planning and Infrastructure. An environmental impact statement is prepared in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.

Clause 5A and 5C of the EP&A Act requires that the **significance** of the impact of the proposal on terrestrial and aquatic threatened species, populations and endangered ecological communities is assessed as follows:

1. **Part 5.1** – the proponent must demonstrate the proposal will improve or maintain biodiversity outcomes. Threatened species assessment guidelines have been developed to assist in making this assessment. Assessment of biodiversity issues is to be in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.
2. **Part 5** (and Part 4 where relevant) – a **Seven-part Test** is prepared in accordance with Clause 5A(2).

4.3.2 Protection of the Environment Operations Act 1997 Act

The Protection of the Environment Operations Act 1997 (POEO Act) establishes a regulatory framework for the protection and restoration of the environment. It provides a mechanism for licensing certain activities (scheduled activities), listed in Schedule 1 of the POEO Act.

The proposal would require an Environment Protection Licence (EPL) as it meets the definition of 'extractive activities' under clause 19 of Schedule 1.

4.3.3 Threatened Species Conservation Act 1995 (TSC Act)

The objectives of the TSC Act are as follows:

- To conserve biological diversity and promote ecologically sustainable development
- To prevent the extinction and promote the recovery of threatened species, populations and ecological communities
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered
- To eliminate or manage certain processes that threatens the survival or evolutionary development of threatened species, populations and ecological communities
- To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed
- To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The threatened species assessment process under section 5A of the EP&A Act includes an Assessment of Significance (also known as the Seven-part test). These factors must be considered by decision makers regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats.

An assessment of the potential impacts of the proposal on threatened species, populations, ecological communities and critical habitat listed on the TSC Act was undertaken in accordance with section 5A of the EP&A Act. A Seven-part test was conducted to characterise the significance of any potential impacts within the BIA. That report is provided in Appendix 3 and concluded that there would be no significant impact on threatened species, populations or ecological communities, or their habitats.

4.3.4 Fisheries Management Act 1994 (FM Act)

The FM Act aims to conserve fish stocks, key habitats, threatened species, populations and ecological communities of fish and marine vegetation. It also aims to promote viable commercial fishing, aquaculture industries and recreational fishing.

The provisions of the *Fisheries Management Act 1994* relating to the development approval process operate similarly to the TSC Act. The Act identifies threatened aquatic species, populations and ecological communities and requires an identical test of significance.

Significant impacts trigger the need for a species impact statement for Part 4 and Part 5 projects.

Activities that trigger the requirement for Roads and Maritime services to notify the Minister for Fisheries as follows:

- Dredging or reclamation of waterways, including removal of snags (28 days notification) (sections 198 and 199)
- Construct, alter or modify a dam, weir or reservoir on a waterway (section 218)

A permit from the Minister for Fisheries is required to:

- Harm to marine vegetation, including mangroves, seagrasses and any other marine vegetation declared in the regulations to be vegetation to which the act applies (section 205).

An evaluation for the potential for biota listed under the FM Act to occur or to be impacted by the proposal is included within the BIA provided in Appendix 3.

Roads and Maritime has commenced consultation with Fisheries NSW and the NSW Office of Water as part of this REF.

4.3.5 National Parks and Wildlife Act 1974 (NP&W Act)

The objectives of this Act are the conservation of nature, objects, places or features of cultural value within the landscape, fostering public appreciation understanding and enjoyment of nature and cultural heritage and their conservation and providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation. Further, the objects are to be achieved by applying the principles of ecologically sustainable development.

This proposal would not impact on any land reserved under this Act. This REF applies the principles of ecologically sustainable development.

4.3.6 Heritage Act 1977

The NSW *Heritage Act 1977* makes provisions to conserve the environmental heritage of NSW. It provides for the identification and registration of items of State heritage significance.

Bethanga Bridge is listed under the NSW *Heritage Act 1977* as an item of State heritage significance. Given the proximity of the bridge to the proposed work, a Statement of Heritage Impact was prepared, a standard exemption permit under s57(2) of the *NSW Heritage Act* would be sought for the work. Heritage is considered further in section 6.7.

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. These are considered in the BIA in Appendix 3 and chapter 6 of the REF.

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

4.5 Confirmation of statutory position

The Roads and Maritime is the determining authority for the proposal as defined by the *Environmental Planning and Assessment Act 1979*. Under Section 111 of the EP&A Act, Roads and Maritime is obligated to undertake an environmental assessment as the proponent for the proposed work; this REF fulfils that obligation. The proposed work would be undertaken under part 5 of the EP&A Act.

5 Stakeholder and community consultation

All necessary community and stakeholder consultation would be carried out by Roads and Maritime in accordance with the Roads and Maritime *Community Involvement Practice Notes and Resource Manual*.

5.1 Community involvement

Community consultation that would be carried out as part of this proposal includes the following activities:

- Notification of landowners to be affected by the proposal such as the sensitive receivers adjacent to the proposal
- Notifications would be placed in local print media prior to the commencement of work detailing the likely timing of the proposal, potential changes to traffic conditions and project management contact details to open communication channels to provide further details or address complaints
- Temporary electronic Variable Message Signs (VMS) placed at both the northern and southern ends of the proposal to advise of the project and potential delays to motorists
- Meetings and briefings with stakeholders, businesses and residences (as required)
- Letters, phone calls, emails and target correspondence
- Project updates on the Roads and Maritime website: www.rms.nsw.gov.au/projects
- Live traffic website.

Details of stakeholder and community consultation including the Roads and Maritime Community and Stakeholder Engagement Plan (May 2016) are provided in Appendix 2.

5.2 Aboriginal community involvement

Aboriginal heritage was considered in accordance with the *Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI, Resource 7). According to the PACHCI from Roads and Maritime (Appendix 5), the proposal was assessed as being unlikely to have impact on Aboriginal Cultural Heritage.

There is an Aboriginal Land Claim on two Lots adjacent to the proposal. The work has been designed to avoid these areas.

5.3 ISEPP consultation

As council consent would not be required for this proposal, Roads and Maritime needs to take into account the items listed in Clauses 13 to 16 of the SEPP (Infrastructure). These clauses relate to consultation requirements for work which may be carried out without consent but which trigger the items listed in the following table. If any of these items are triggered, the public authority, or persons representing the public authority would not be able to carry out the work. Once the items in the following table are triggered, the public authority must give written advice to the council of the intention to carry out the development and also take into consideration any response to the notice received from the council. Table 5-1 outlines items in clause 13 to 16 of the ISEPP and the potential impact.

Table 5-1: ISEPP clause 13 to 16 assessment

Item	Impact
Clause 13: 1(a): Substantial impact on	The proposed work would not have a significant

Item	Impact
stormwater management services provided by a council	impact on the stormwater system.
Clause 13: 1(b): Likely to generate traffic to an extent that will strain the capacity of the road system in a local government area	The work is unlikely to generate traffic that would strain the capacity of the road system. Some traffic delays would be experienced however this would only be during construction. The proposal aims to improve road user safety and therefore improve traffic conditions.
Clause 13: 1(c): Involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council	This proposal does not involve connection to or alteration of the sewerage system.
Clause 13: 1(d): Involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council	The proposal does not involve connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council.
Clause 13: 1(e): Involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential	This proposal does not involve the installation of a temporary structure on, or enclose a public place, or disrupt pedestrian or vehicular traffic in a place that is under council management.
Clause 13: 1(f): Involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the <i>Roads Act 1993</i> (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath)	This proposal does not involve the excavation of the footpath adjacent to a road for which the council is the roads authority.
Clause 14: Development that is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area	A Statement of Heritage impact (SOHI) has determined that the proposal would have an inconsequential impact on Bethanga bridge.
Clause 15: Development on flood liable land.	The proposal would not be developed on flood liable land, as mapped in the Albury City LEP.
Clause 16: Development adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i> .	This proposal would not be carried out on land adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i> .

As none of the items listed in Table 1 would be triggered by this proposal under ISEPP, consultation with Albury City Council would not be required.

5.4 Government agency and stakeholder involvement

5.4.1 Albury City Council

Consideration of the items listed in Clause 13-16 of the Infrastructure SEPP determines whether or not consultation with council is required. This assessment has concluded that no statutory consultation with council is required. However, Roads and Maritime would advise council of the proposal.

5.4.2 NSW Fisheries

Roads and Maritime has commenced consultation with NSW Fisheries regarding the proposal given the close proximity to Lake Hume. Copies of the correspondence carried have been included in Appendix 2.

5.4.3 NSW Office of Water

Roads and Maritime has commenced consultation with NSW Office of Water regarding the proposal given the close proximity to Lake Hume. Copies of the correspondence carried have been included in Appendix 2.

5.4.4 NSW Office of Environment and Heritage

Clause 16 of ISEPP outlines a requirement to consult with the NSW Office of Environment and Heritage (OEH) where work is adjacent to land gazetted under the *National Parks and Wildlife Act 1974*. The proposal is not located adjacent to land reserved under that Act. Therefore further consultation with the OEH is not required.

In order to identify threatened and migratory biota that have been previously recorded in the locality (and therefore, potentially impacted by the proposal), data was sought from OEH BioNet database. These were mapped at a scale in accordance with an OEH data licence agreement (no less than 1:250,000). These species and their potential to occur within the study area are considered further in the BIA, Appendix 3.

No Aboriginal sites were located within the vicinity of the proposal based on the PACHCI. Should any Aboriginal heritage be discovered on site, the *RMS Standard Management Procedure: Unexpected Archaeological Finds* would apply which is consistent with OEH guidelines.

5.4.5 Woolshed Thurgoona Landcare Group

Roads and Maritime has commenced consultation with Woolshed Thurgoona Landcare Group regarding the proposal given that the proposal would have some impact to the native tree plantings adjacent to the Riverina Highway. No comments were made regarding the proposal by the landcare group.

5.5 Ongoing or future consultation

Notification for residents and motorists would be implemented prior to and during construction using VMS. Consultation with those residents whose access may be affected by the work, or may be affected by construction noise would be carried out by Roads and Maritime. The work would also be added to the Roads and Maritime Live Traffic Website as 'scheduled road work' to provide advance notice to motorists to inform them of the potential for delays and to allow for travel time adjustment where possible. In addition notifications would also be placed in local print media advising the community of the proposed work and where possible contact via email, letters and phone calls would be made. A stakeholder database and issues register would also be managed by Roads and Maritime. Meetings and briefings would also be arranged for ongoing consultation as needed.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities* (DUAP 1996) as required 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 9. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Biodiversity

6.1.1 Database searches

A series of database searches were carried out to develop an understanding of the biodiversity that may occur within the vicinity of the proposal. Searches were conducted of the:

- Protected Matters Search Tool using a 10 kilometre radius of the proposal (EPBC Act) (2 February 2016)
- NSW Office of Environment and Heritage Threatened Species Predictor Database in the Murray CMA, Upper Slopes CMA sub-region (2 February 2016)
- NSW BioNet: a whole of government system for flora and fauna sightings using a 10 kilometre radius of the proposal (2 February 2016)
- DPI (I&I) Records Viewer: Threatened and Protected Fish Species in the Albury LGA (2 February 2016)
- DPI Noxious Weeds Database in the Albury LGA.

In addition to the database searches, a literature review and searches for previous relevant studies was carried out which identified the following documents of potential relevance:

- Albury City Biodiversity Strategy (ACC 2012)
- Albury City Local Environmental Plan including relevant mapping (ACC 2010)
- Lake Hume: Land and On-water Management Plan (GMW 2008)
- Thurgoona Threatened Species Strategy (AWDC 2004)
- Albury Regional Crown Reserve and Environmental Lands - Plan of Management (GHD 2011).

A minor work review of environmental factors (MWREF) was prepared for the Riverina Highway (HW20) 2.3km West of Trout Farm Road Hazard Removal (Hawkesview) (NGH 2013). This work has been completed adjoining the northern end of the Riverina Highway Stage 1 Safety Improvement Work which is currently under construction and assessed under an REF previously prepared by EnviroKey.

The area of investigation adopted for this investigation is detailed (Map 6-1).

EnviroKey prepared a Biodiversity Impact Assessment (BIA) to consider the potential impact of the proposal on biodiversity (Appendix 3). The BIA identified one native vegetation community within the vicinity of the proposal (Map 6-1) that corresponded with the NSW Vegetation Types Database MU550 Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282). The MU550 vegetation community meets with the identification guidelines for the threatened ecological community (TEC) known as *White Box Yellow Box Blakely's Red Gum Woodland* (Box-Gum Woodland) listed under the NSW *Threatened Species Conservation Act 1995* (Map 6-2). This community is also listed under the Commonwealth

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), however the vegetation within the area of investigation did not meet the specific criteria under this act. No threatened flora species were found within the vicinity of the proposal. The area of investigation is mostly dominated by non-native vegetation. A total of 69 introduced species were identified within the vicinity of the proposal, including the noxious weeds African Lovegrass, Blackberry, St. John's Wort and Tree of Heaven.

No threatened fauna species were detected within the proposal footprint however two threatened species were detected within the area of investigation. These were Squirrel Glider and Grey-headed Flying Fox. Three migratory species listed under the Commonwealth EPBC Act, White-bellied Sea-eagle, Caspian Tern and Rainbow Bee-eater, were observed during the field surveys. Desktop analysis determined that there is a moderate to high potential for a number of threatened and migratory species to occur within the vicinity of the proposal.

Fauna habitat identified by the BIA included woodland, native tree planting, disturbed and introduced grassland/trees (Map 6-3).

The BIA is provided in full in Appendix 3 of this REF.

6.1.2 Potential impacts

The proposal would result in direct and indirect impact on flora and fauna including:

- Potential for weeds to be imported or distributed
- The disturbance of flora habitat (e.g. removal of soil)
- The direct removal of 1.991 hectares of vegetation (as detailed below).

Native and introduced vegetation and therefore potential habitat and foraging habitat for fauna, would be removed as part of this proposal. The total area of native vegetation impacted would be about 0.208 hectares of biometric vegetation type (BVT) MU550 which also corresponds with the TSC Act listed Box-Gum Woodland threatened ecological community (TEC) (0.207 hectares with canopy and 0.001 of derived native grassland). The remaining impact would be restricted to areas of native tree planting (0.037 hectares), introduce grassland/trees (1.735 hectares) and highly disturbed (about 0.011 hectares).

There is the potential for impact to the threatened species Squirrel Glider which was recorded using a nest box in the native tree planting next to the proposal. This species is known from the area through the targeted survey work carried out by the Woolshed Thurgoona Landcare Group and the Friends of the Spillway Gliders Group. These groups have been actively involved in the installation of the nest boxes and monitoring of the known population that occurs there.

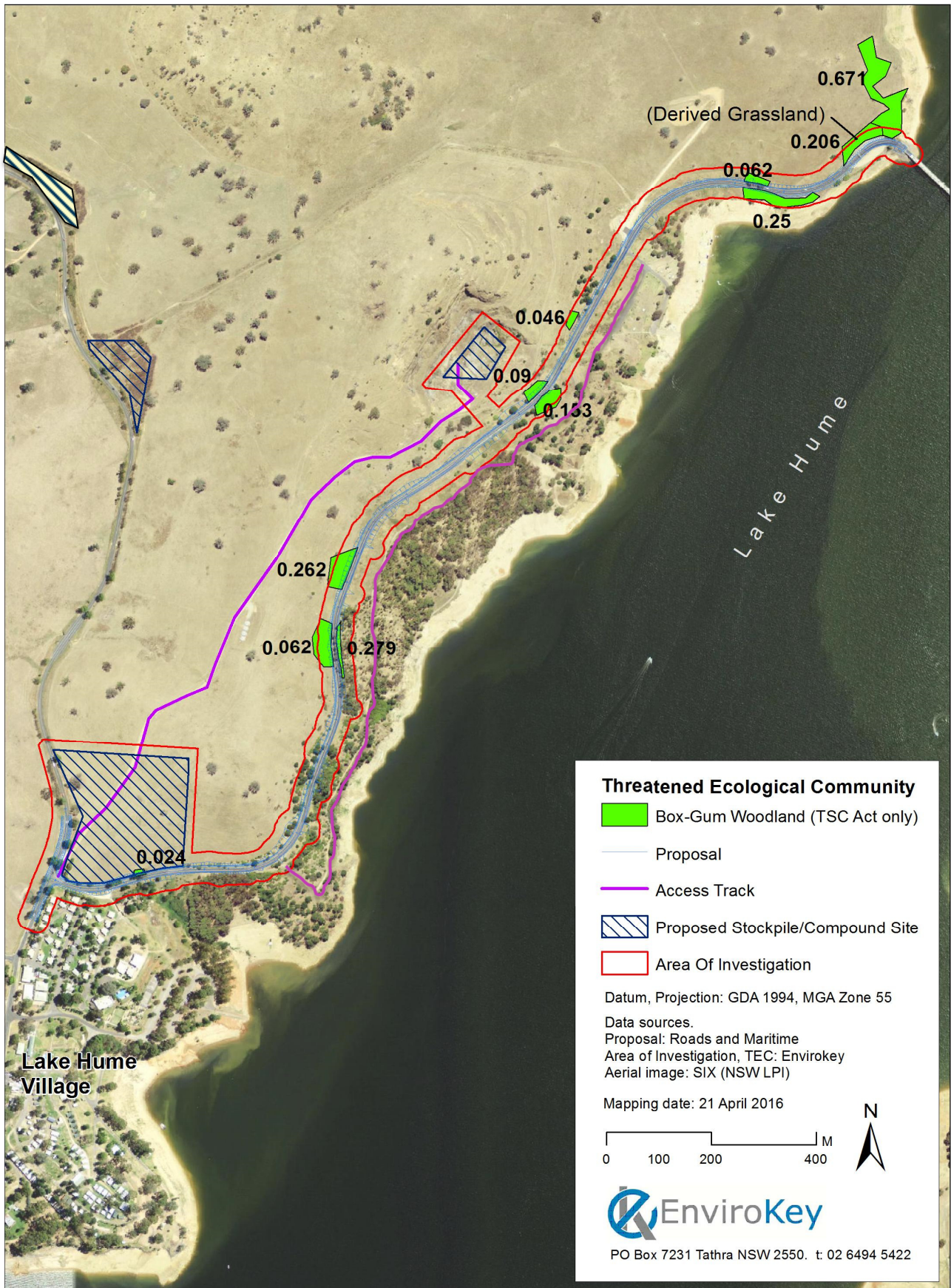
Current connectivity between vegetation on either side of the existing pavement is very low for the majority of the proposal. Higher quality corridors (where canopy vegetation provides connectivity between larger patches and forms patches of greater width than those within the road corridor) are not present elsewhere in the locality of the proposal. However large scale removal of pine trees between the native tree plantings has occurred reducing general connectivity across this landscape. These plantings are now separated by large open areas where once large trees were present. It is believed that these trees were providing a means of movement between native tree plantings for the threatened Squirrel Glider which have been previously recorded there and subsequently recorded during targeted surveys for this BIA. Further, individual Squirrel Gliders have been observed crossing the Riverina Highway from the tree plantings to the opposite side of the highway to Box-Gum Woodland (pers. comm. Stuart Lucas, OEH), likely to be either dispersing or feeding on isolated paddock trees. The proposal would increase the existing canopy gap from 10 metres to up to 25 metres in the central portion of the study area, where gliders have been observed crossing. This does not represent a risk for any gliders remaining in this landscape given that the new gaps are considered well below the general threshold of the gliding ability for this species (around 40 metres) (Van der Ree 2002).

Additional indirect impact includes the removal of some native and introduced vegetation considered potential foraging areas for some threatened fauna species. Two hollow-bearing trees would be impacted as part of the proposal. There is also the potential for the proposal to result in the spread of weed species, including African Lovegrass, St. John's Wort and Tree-of-heaven.

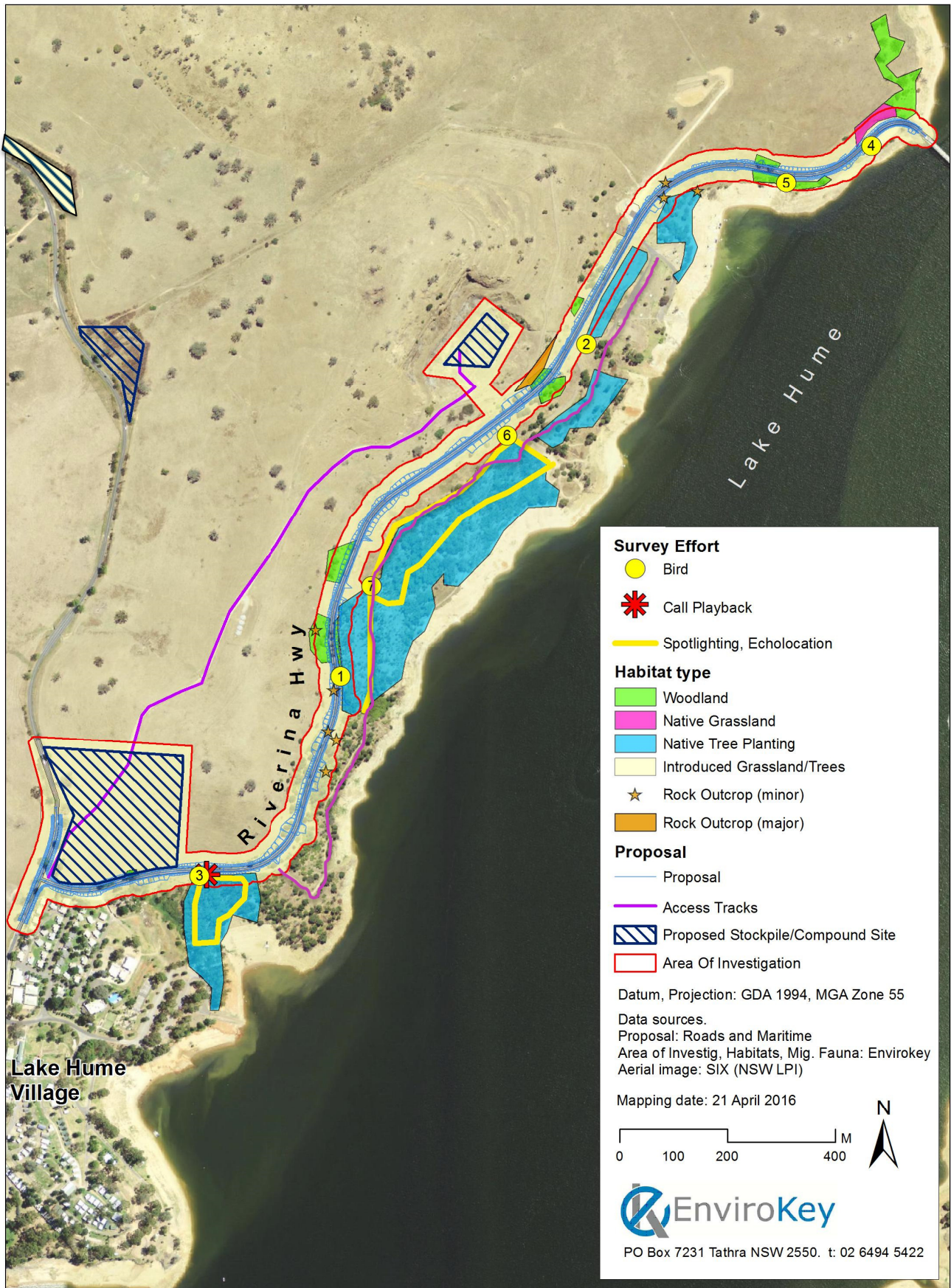
Mitigation measures are proposed to minimise the impact of the clearing activities on native vegetation, TEC's and fauna habitat. Assessments of Significance carried out in the BIA (Appendix 3) have determined that the proposal is '*unlikely*' to have a '*significant effect*' on threatened species, populations, communities and their habitats for TSC and EPBC listed biota. The recently approved Strategic Assessment by the Federal Government details when proposals are required to be referred. Based on the proposed impact of the work, referral to the Federal Minister is not required under the EPBC Act.



Map 6-1: Vegetation communities within the area of investigation



Map 6-2: Threatened ecological communities within the area of investigation



Map 6-3: Fauna habitats and fauna survey effort within the area of investigation

6.1.3 Safeguards and management measures

Roads and Maritime has developed *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects* (RTA 2011) which are intended for Roads and Maritime Project Managers, Staff and Contractors to help minimise impact on biodiversity during construction projects such as the proposal.

A recommended range of mitigation measures to minimise the potential impact of the proposal on biodiversity are summarised in Table 6-1.

Table 6-1: Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	<p>Guide 1: Pre-clearing process</p> <ul style="list-style-type: none"> • If any unexpected threatened fauna or flora are discovered, work would stop and the Roads and Maritime Unexpected Threatened Species Find Procedure within the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 1: Pre-clearing process</i> be followed. This would only apply to the existing woodland and derived native grassland and native tree planting areas • All fauna handling should be carried out by licensed wildlife carers and/or ecologists and in accordance with <i>Guide 9: Fauna Handling</i> • Carry out staged habitat removal as outlined in <i>Guide 4: Clearing of vegetation and removal of bushrock</i> where fauna habitat features have been identified and marked. <p>Guide 2: Exclusion Zones</p> <ul style="list-style-type: none"> • Any clearing required would be the smallest extent required to undertake the proposal • All retained vegetation would be clearly identified as an exclusion zone and that all machinery, persons and equipment would not enter these areas without the expressed permission of the Roads and Maritime Environment Officer. A fence will be established in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 2: Exclusion zones</i>. <p>Guide 3: Re-establishment of native vegetation</p> <ul style="list-style-type: none"> • Any revegetation work should be 	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>based on sound ecological principles and be undertaken in accordance with Roads and Maritime Landscape Guidelines.</p> <ul style="list-style-type: none"> Roads and Maritime will contact the local landcare group to determine if they can assist with any revegetation <p>Guide 4: Clearing of vegetation and removal of bushrock</p> <ul style="list-style-type: none"> All clearing including hollow-bearing trees would be conducted in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 4: Clearing of vegetation and removal of bushrock</i> Non-habitat vegetation should be removed first (e.g. shrubs, regrowth, groundcover and non-habitat trees). Allow fauna at least 24 hours to vacate remaining habitat. Ensure that a wildlife carer and/or ecologist inspects trees before and after felling. Capture and relocate non-injured fauna that are found in any felled trees to pre-determined habitat identified for fauna release <p>Guide 5: Re-use of woody debris and bushrock</p> <ul style="list-style-type: none"> Woody debris re-use and retaining of bushrock within vegetation should be conducted in accordance with the Roads and Maritime document <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 5: Re-use of woody debris and bushrock</i> <p>Guide 6: Weed management</p> <ul style="list-style-type: none"> Five noxious weeds listed in the Albury LGA were present within the area of investigation. Noxious weeds should be removed, where possible, to an appropriate waste management facility in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects Guide 6: Weed Management.</i> <p>Guide 7: Pathogen Management</p> <ul style="list-style-type: none"> Work should be minimised during excessively wet or muddy conditions 	<p>Roads and Maritime Project Manager</p>	

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> • Exclusion zones established to protect retained vegetation (Guide 2) would restrict access • Vehicles and machinery should be free from dirt when entering the site • Pathogen management would be undertaken in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects Guide 7: Pathogen Management</i>. 		

6.2 Soils and Water

6.2.1 Existing Environment

According to the Mitchell Landscapes dataset (Mitchell 2002), the proposal is located within the Albury - Oaklands Hills and Foothills landscape system (Map 6-4) which is found in the NSW South West Slopes Bioregion. This landscape consists of isolated hills and rises on folded lower Ordovician greywacke, phyllite, chert, schist and small areas of Silurian-Devonian granite, general elevation 150 to 480 metres, with a local relief of 20 to 150 metres (Mitchell 2002). The soils consist of shallow gritty loam amongst rock outcrop on hills, red-brown texture-contrast soil on slopes with bleached A2 horizons and strongly structured subsoil (Mitchell 2002). Soils are generally moderately erodible in these landscapes therefore the potential for soil erosion and mitigation measures to minimise the potential for erosion and sedimentation have been considered in this REF.

The major water feature in the area is Lake Hume which is about 20 metres, immediately to the east of the proposal footprint.

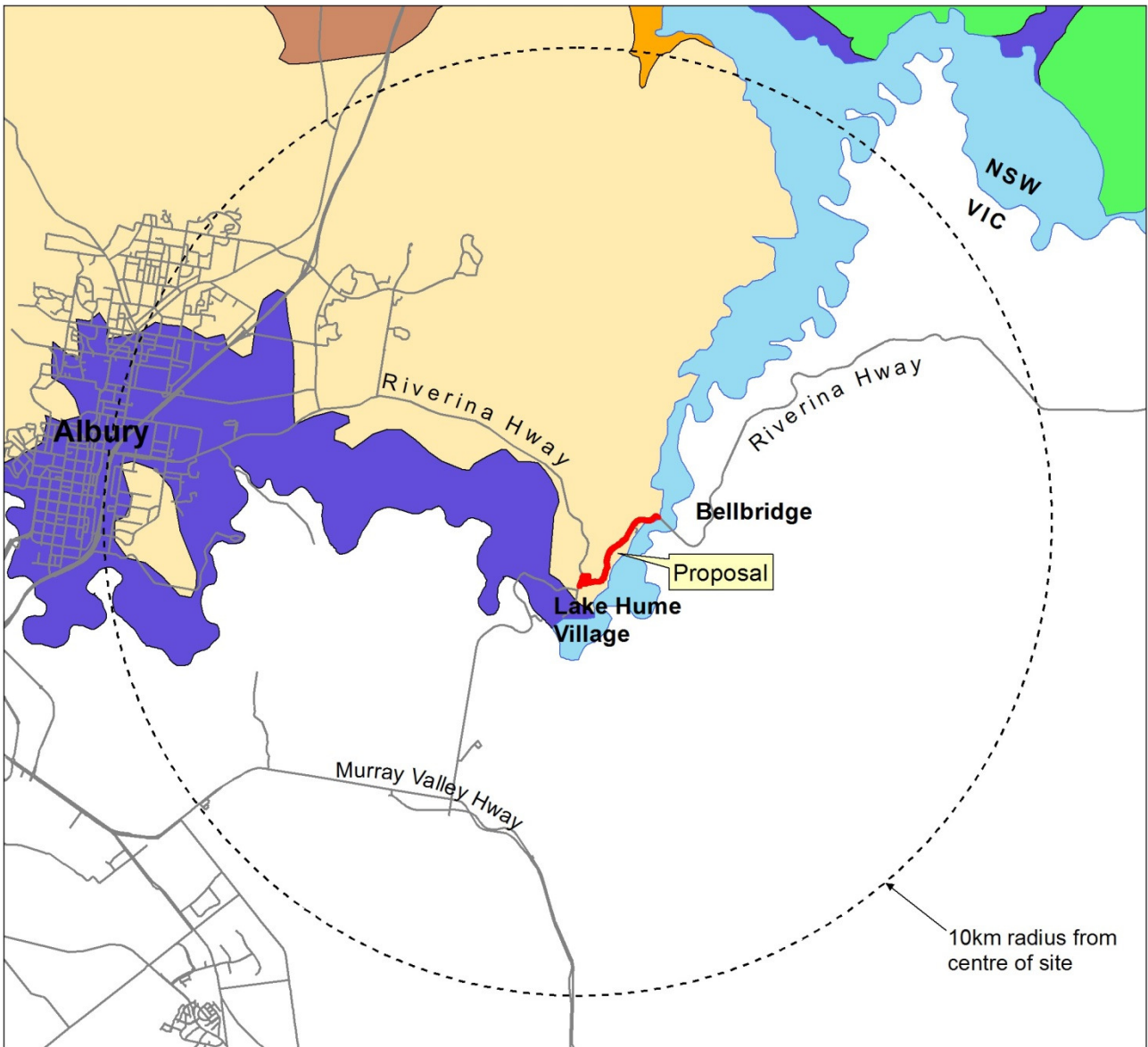
6.2.2 Potential impact




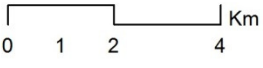





The proposal would require the removal of vegetation, excavation and the deposition of fill and the resulting soil disturbance would expose these areas to erosion, runoff and sedimentation hazards during rainfall events. The total likely area of exposed soil would equate to about 1.991 hectares. This has the potential to impact the adjacent Lake Hume. Work would be required to build up the level of the Riverina Highway on the eastern side of the highway and create new fill batters.

Further impact could result from strong winds blowing over exposed soils causing dust disturbances. It is not expected that any fill material would require long term stockpiling as excavated material would be required in the fill areas.

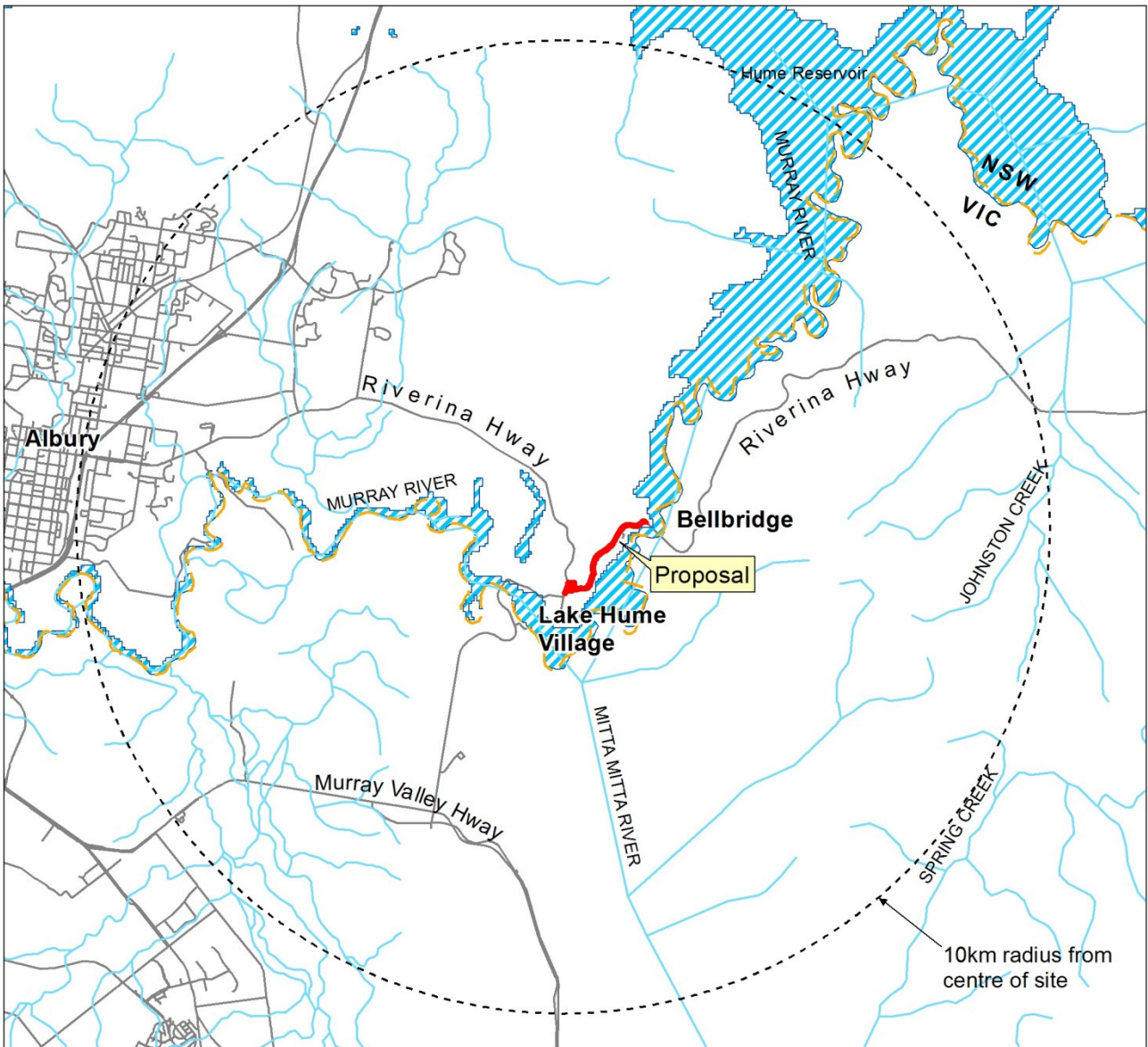
There is the potential for the toe of a fill batter to come into close proximity of the weather station.

Machinery could become potential sources of contamination. Leakage or spillage of fuels from construction machinery could result in soil contamination which is most likely to occur where construction machinery is repeatedly used or parked periodically while not in use. The proposed site compound would be located about 380 metres from Lake Hume. Any chemical or fuel spills in this area could potentially cause contamination of Lake Hume.




<p>Landscape name</p>	<p>Datum, Projection: GDA 1994, MGA Zone 55</p>
<p> Albury - Oaklands Hills and Footslopes</p>	<p>Data sources. Roads, Mitchell L/scapes: OEH Spatial Data Online Proposal: Roads and Maritime</p>
<p> Brokong Plains</p>	<p>Mapping date: 15 February 2016</p>
<p> Burrumbuttock Hills and Footslopes</p>	<p></p>
<p> Murray Channels and Floodplains</p>	<p></p>
<p> Tipperary Hills Granites</p>	<p></p>
<p> Water</p>	<p>PO Box 7231 Tathra NSW 2550. t: 02 6494 5422</p>

Map 6-4: Mitchell landscapes within the vicinity of the proposal



 NSW wetlands layer (2006)

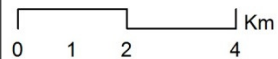
 Watercourse

 NSW-VIC Border

Datum, Projection: GDA 1994, MGA Zone 55

Data sources:
 Roads, NSW Wetlands layer (2006): OEH Spatial Data Online
 Watercourses: GeoScience Australia
 Proposal: Roads and Maritime

Mapping date: 15 February 2016



PO Box 7231 Tathra NSW 2550. t: 02 6494 5422

Map 6-5: Wetlands and named watercourses within the vicinity of the proposal

Impact	Environmental safeguards	Responsibility	Timing
	<p>spills/slicks) must be carried out on a regular basis to identify any potential spills or deficient erosion and sediment controls</p> <ul style="list-style-type: none"> • Water quality control measures must be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways • Potable water is used for wash down • Fisheries NSW (ph. 1800 043 536) and the Office of Environment and Heritage (OEH) (ph. 131 555) and Roads and Maritime Environment Officer are to be immediately notified of any fish kills in the vicinity of the work. In such cases, all work other than emergency response procedures must cease until the issue is rectified and written approval to proceed is provided by Fisheries NSW or OEH. 		
Chemical runoff	<ul style="list-style-type: none"> • Fuels, chemical and liquids must be stored in an impervious bunded area a minimum of 50 metres away from: <ul style="list-style-type: none"> • Rivers, creeks, or any areas of concentrated water flow. • Flooded or poorly drained areas. • Slopes above 10%. • Cleaning of spray bars (or equivalent equipment) is to occur in suitable areas (e.g. not table drains) and not cause water pollution • Refuelling of plant and equipment must occur in impervious bunded areas located a minimum of 50 metres away from drainage lines of waterways • Vehicle wash down and/or cement truck washout must occur in a designated bunded area • An Emergency spill kit must be kept onsite at all times. All staff must be made aware of the location of the spill kit and trained in its use • If an incident (e.g. spill) occurs, the Roads and Maritime <i>Environmental Incident Classification and Management Procedure</i> would be followed and the Roads and Maritime Services Contract Manager notified as soon as practicable. 	Contractor	Construction
Weather Station	<ul style="list-style-type: none"> • There is the potential for the toe of a fill batter to come into close proximity of the weather station. Should this occur Roads and Maritime would build a retaining wall around the station to stop potential impact as a result of the 		

Impact	Environmental safeguards	Responsibility	Timing
	fill material deposition.		

6.3 Waste and Resource Management

6.3.1 Policy setting

Roads and Maritime Services are committed to ensuring responsible management of unavoidable waste and to promoting the reuse of such waste through appropriate measures. This is done in accordance with the resource management hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001*. The resource management hierarchy principles in order of priority as outlined in the *Waste Avoidance and Resource Recovery Act 2001* 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.

6.3.2 Potential impact

The proposed work is expected to result in the following waste, some of which would be able to be recycled or reused:

- Excess and unsuitable excavated materials
- Millings from removal and replacement of pavement
- Paper and office waste from project management activities
- Waste from staff and construction personnel (food, packaging)
- Minor amounts of vegetation including environmental weeds.

The proposed work would result in the use of a number of resources, including but not limited to:

- Asphalt
- Concrete
- Steel
- Select fill
- Water
- Resources associated with the operation of construction machinery, and motor vehicles.

The majority of resources to be used are non-renewable and have the potential to contribute to climate and air quality impact.

6.3.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact of waste are found in

Table 6-3.

Table 6-3: Waste minimisation safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Waste minimisation and management	<ul style="list-style-type: none"> • Resource management hierarchy principles must be followed: <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is carried out as a last resort (in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>). • Bulk project waste (e.g. fill) sent to a site not owned by Roads and Maritime (excluding EPA licensed landfills) for land disposal will have prior formal written approval from the landowner, in accordance with Roads and Maritime <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk Roads and Maritime Project Wastes</i> • Waste must not be burnt onsite • Waste material other than vegetation and tree mulch, must not to be left on site once the work has been completed • Working areas must be maintained, kept free of rubbish and cleaned up at the end of each working day. 	Contractor	Construction

6.4 Traffic and Access

6.4.1 Existing environment

The Riverina Highway provides access for local commuters and tourists between Lake Hume Village and north-east Victoria via access over the Bethanga Bridge. The average number of vehicles over a seven day period as recorded from the northern approach to Lake Hume Village is 2476 vehicles per day, 1761 vehicles from the eastern approach and 1893 vehicles from the southern approach. This would be classed as low to medium traffic flow. One fatal crash has been recorded at the location of the proposal.

There is a private access point to a rural farm next to the proposal however this does not provide access to a residence. There is also one access point to a boat ramp in Lake Hume. There is one road intersection with Hume Road which is the main access into Lake Hume Village.

The existing access track that runs between the site compound and the disused quarry is currently used sporadically for agricultural activity. However, it was likely the main access track into the quarry during the construction of Hume Dam so would be considered highly compacted and potentially suitable for heavy to medium use. The existing access track on the eastern side of the proposal is likely only suitable for light vehicles and would be in need of grading and compaction should it be used for medium to heavy vehicles. This track is currently used by recreational users of Lake Hume Dam and Council maintenance vehicles.

There are no existing pedestrian or cycle ways.

6.4.2 Potential impact

The proposal would require the temporary closure of one lane of the Riverina Highway as work proceeds on one side of the road when the widened shoulders and verges are being constructed and tied in to the existing road surface. This would be the case for both directions of traffic. For example, the southbound lane would be closed, with a contraflow put in place with traffic control at either end directing southbound traffic onto the northbound lane. This would disrupt traffic flow at the proposal site causing short delays for traffic, however this would only be temporary for the duration of work.

Access to the boat ramp on Lake Hume may be impacted and would need to be maintained during both construction and operation.

There are no existing pedestrian or cycle ways, however, cyclists use the Riverina Highway in the vicinity of the proposal.

The existing track between the site compound and the disused quarry is unlikely to require any type of upgrade. Substantial use by medium to heavy vehicles during the Lake Hume Dam construction is likely to have made this ground reasonably compact. This may not be the case for the existing track on the eastern side of the proposal as it is currently eroded in places and is only suitable for light to medium traffic without some kind of rehabilitation.

6.4.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on traffic are found in Table 6-4.

Table 6-4: Traffic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Traffic	<ul style="list-style-type: none"> • Consultation with stakeholders and the community will be carried out by Roads and Maritime • Current traffic movements and property accesses including the boat ramp must be maintained during the work, where possible • A traffic management plan must be prepared prior to work commencing • A Road Occupancy Licence must be obtained for the work • Any work that has potential to significantly disrupt traffic on the Riverina Highway must be scheduled to be carried out outside peak holiday periods. 	<p>Roads and Maritime</p> <p>Contractor</p>	<p>Pre-construction and Construction</p> <p>Construction</p>

6.5 Noise and Vibration

6.5.1 Due diligence determination

A Construction Noise and Vibration Impact Assessment was carried out by Roads and Maritime in March 2016. The report is provided in full in Appendix 4.

To predict the effect of increased noise due to construction, Roads and Maritime examined the local environment of the area. Two locations along the proposal length were identified as sensitive receivers. The first is the Lake Hume Village, located on the corner of the Riverina Highway and

Hume Road. The second is a reserve located about 600 metres along the highway from Bethanga Bridge. In addition, there are some receivers located close by to the stockpiles used in Stage 1 that may be used at times during Stage 2 (see Map 6-6 below).

Existing noise levels for the Lake Hume Village have been taken from the Operational Noise and Vibration Assessment conducted by Muller Acoustic Consulting for Stage 1 of the project. The background noise level during the day, evening and night was found to be 34, 28 and 25 dB(A) respectively, however for RBLs of less than 30 dB(A) an RBL of 30 dB(A) can be applied, making the background noise levels 34, 30 and 30 dB(A). Likewise, background noise levels around the Stage 1 stockpiles were found to be 33, 30 and 28 dB(A) during day, evening and night respectively, which therefore become 33, 30 and 30 dB(A).

While no noise data exists for the reserve located about 600 metres along the highway from Bethanga Bridge, it is not required as there are no residential receivers within the area and NMLs for non-residential receivers are unaffected by the surrounding noise environment. The NML for this receiver is 65 dB(A) at all hours.

Blasting may be required to carry out the proposal in a small section to break up granite boulders, about a kilometre from Bethanga Bridge. This has been considered in the Construction Noise and Vibration Impact Assessment.

6.5.2 Potential impact

The results of the noise assessment found that noise levels may impact the nearest receivers within Lake Hume Village (Appendix 4). These range between 1dB to 40dB above standard criteria. Predicted levels are at their highest at R3 where vegetation clearing and pavement work pass near receivers. However, construction noise levels are predicted to remain below the highly noise affected criteria.

For Out of Hours (OOH) work, the night noise criteria are predicted to be exceeded at all receivers.

6.5.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on noise and vibration are found in Table 6-5.

Table 6-5: Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Noise and vibration	<ul style="list-style-type: none"> • Consultation with affected stakeholders. This would take the form of the following (see Appendix 4 for further details on individual requirements): <ul style="list-style-type: none"> • Verify levels by measurement • Individual briefings • Letterbox drop • Negotiated respite • Respite offer • Respite period 1 • Respite period 2 • Phone calls • Specific notifications • Alternative accommodation • Distance between a noise-generating source and a receiver should be 	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>measured directly from the source to the curtilage (property boundary) of the receiver, unless the building/s are greater than 30 metres from the curtilage, in which case the distance is measured to within 30 metres of the building/s</p> <ul style="list-style-type: none"> • Solid objects provide a barrier between a source of noise and a receiver. This reduces the effective distance of the noise. If line of sight between a noise source and a receiver is effectively blocked by a dense object such as a house or a hill, the “no line of sight” category should be applied • The mapped noise envelopes are only accurate to a few metres. If there is any doubt about which noise-affected category a receiver should belong to, the more conservative option should be chosen • Recommended Safe Working Distances for Vibration Intensive Plant, determines the maximum tonnage that a vibratory roller can be when within set distances from a structure. The closest structure to the work, a holiday cabin at Lake Hume Village, is about 11 metres from where the vibratory roller would operate. Therefore the maximum tonnage a vibratory roller could be is about 4 tonnes, putting the extent of cosmetic damage at less than 6 metres from the works and human comfort at less than 20 metres from the work. 		

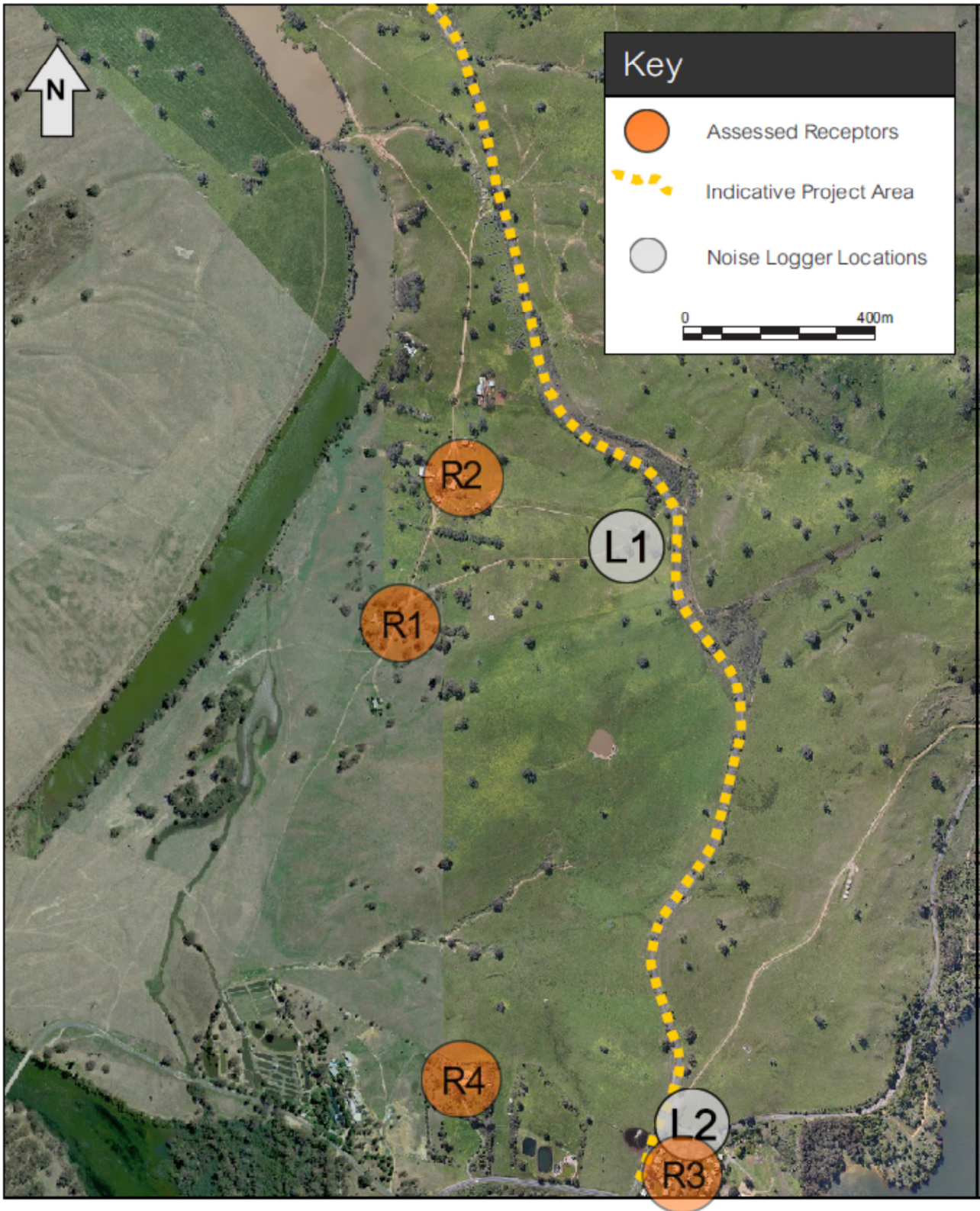


Figure 1 - Locality plan
Riverina Highway Safety Upgrade Works



Map 6-6: Location of noise logging and sensitive receivers

6.6 Aboriginal Heritage

6.6.1 Due diligence determination

A search of the OEH Aboriginal Heritage Information System (AHIMS) carried out by Roads and Maritime on 29 January 2016 revealed no known Aboriginal objects within the defined search region (Appendix 5).

A preliminary assessment was carried out by Roads and Maritime based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI). The assessment is based on the following due diligence considerations:

- The proposal is unlikely to harm known Aboriginal objects or places
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and the Roads and Maritime procedure
- The cultural heritage potential of the study area appears to be reduced due to past disturbance
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

The PACHCI and AHIMS search results are provided in Appendix 5.

6.6.2 Potential impact

The PACHCI Stage 1 identified that there is unlikely to be any damage to Aboriginal objects, culturally sensitive sites or any of the items listed on the AHIMS register.

Nonetheless, safeguards and management measures, such as those described in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* and the standard Roads and Maritime practices regarding Aboriginal objects have been listed in the following section.

There is an Aboriginal Land Claim on two Lots adjacent to the proposal. The work has been designed to avoid these areas.

6.6.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on aboriginal heritage are found in Table 6-6.

Table 6-6: Aboriginal heritage safeguards and management measures

Impact	Environmental Safeguards	Responsibility	Timing
Aboriginal Heritage	<ul style="list-style-type: none">• If Aboriginal heritage items are uncovered during the work, all work in the vicinity of the find must cease and the Roads and Maritime Aboriginal Cultural Heritage Officer and the regional Environment Officer be contacted immediately. Steps in the <i>Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds</i> would be followed.	Contractor	Construction

6.7 Non-Aboriginal Heritage

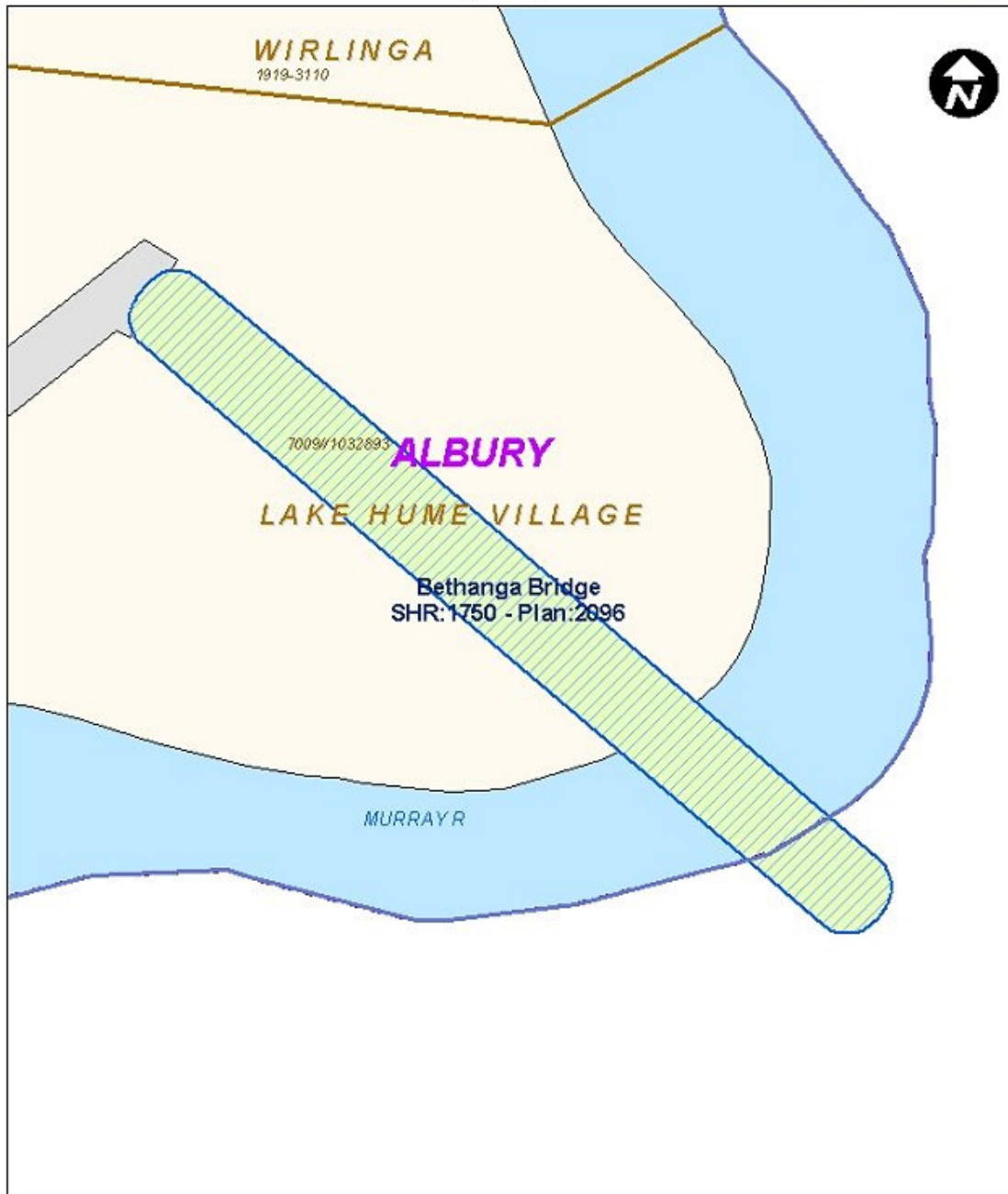
6.7.1 Existing environment

To enable an understanding of the existing environment, a search of relevant online databases was carried out (Appendix 7). The databases consulted included:

- EPBC Act Protected Matters Search Tool (Appendix 8) within a 10 kilometres radius (DoE 2016)
- Australian Heritage Database within the Albury City LGA (DoE 2016)
- State Heritage Inventory within the Albury City LGA (OEH 2016)
- Roads and Maritime s.170 Register, within the Albury City LGA (OEH 2016)
- Albury City LEP 2010.

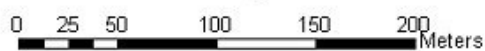
The relevant results of the searches are provided in Appendix 7.

There was one heritage item within the Albury City LGA in the vicinity of the proposal, which is the Bethanga Bridge, listed on the State Heritage Inventory, the Albury City LEP 2010 (heritage item I359) and the RMS s.170 Register (Item number 4302002). According to the OEH (2016), Bethanga Bridge was constructed between 1927 and 1930 as a joint venture between New South Wales and Victoria as part of the Hume Dam project. The bridge was a key element of the River Murray Waters Agreement put in place in 1915 by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River as a provision against drought and to ensure that the three states received their agreed share of water. The item known as the Bethanga Bridge over the Hume Dam, includes all of the bridge and its support structure, its abutments, the roads and embankments and all the land 20 metres to each side of the bridge (OEH 2016), as shown in Figure 1. The Albury City LEP 2010 listing for item I359 also includes the same area, as shown in Figure 2, from the LEP 2010 Heritage Map, Sheet HER_010.



State Heritage Register

Gazettal Date: 26 May 2006



Scale: 1:3,000

Produced by: W.H. Nethery

Legend

- SHR Curtilage
- Historic Regions
- LGAs
- Suburbs
- Land Parcels
- Water
- Roads
- Railways
- NSW Reserves

Figure 1: Location of the State Heritage Registered Bethanga Bridge heritage area (Source: OEH 2016)

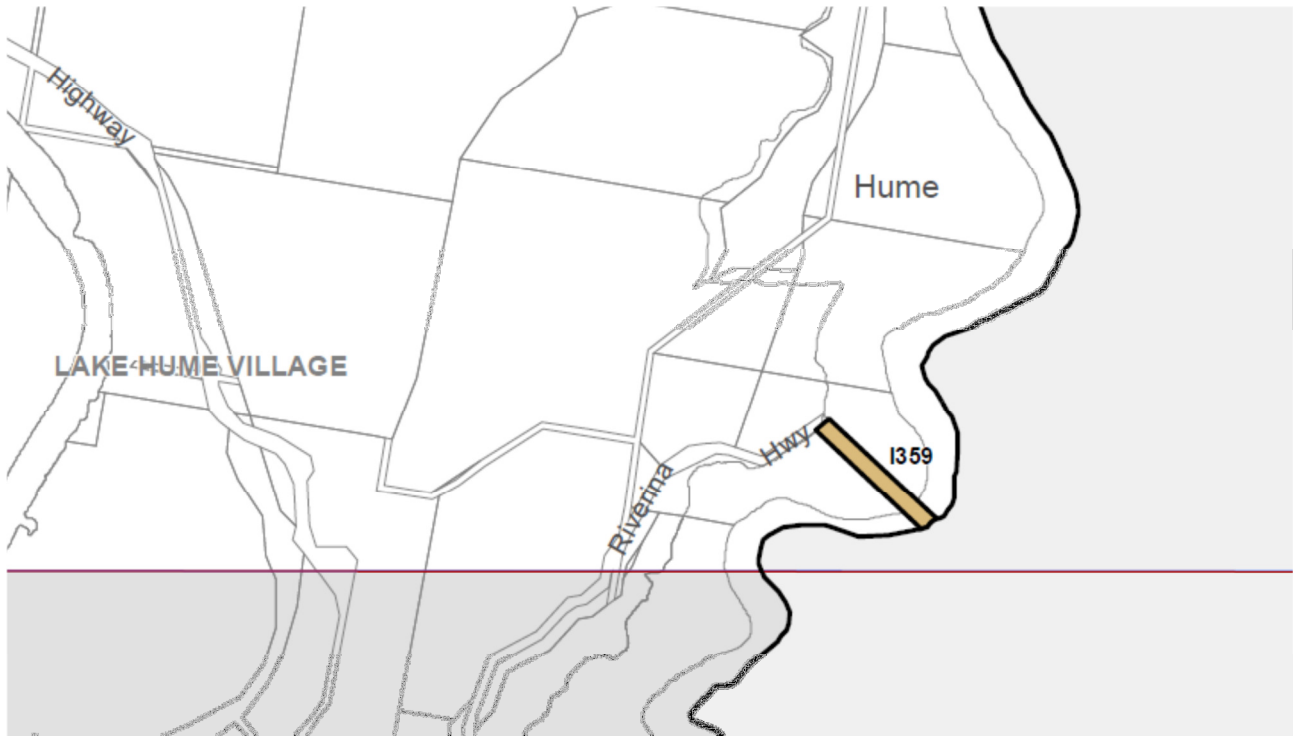


Figure 2: Location of the Albury City LEP 2010 heritage area for Bethanga Bridge (Source: Albury City LEP 2010)

6.7.2 Potential impact

The proposal has the potential to impact on the heritage item, Bethanga Bridge, listed on the State and Local heritage databases. Subsequently, a Statement of Heritage Impact (SOHI) was prepared by Onsite Cultural Heritage Management (Appendix 6). The SOHI found that the proposed work will have a negligible impact on the heritage significance of the Bethanga Bridge.

6.7.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on Non-Aboriginal heritage are found in Table 6-7.

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

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal Heritage	<ul style="list-style-type: none"> Seek a standard exemption permit under s57(2) of the NSW Heritage Act for the proposed work Advise Heritage Victoria of the proposed work Install an interpretative sign detailing the heritage importance of Bethanga Bridge If unexpected archaeological remains are uncovered during the work, all work must cease in the vicinity of the material/find and the steps in the <i>Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds</i> would be followed. Roads and Maritime Services Regional Environment Manager be contacted immediately. 	Contractor	Construction

6.8 Air Quality

6.8.1 Existing environment

A review of the National Pollutant Inventory website (<http://www.npi.gov.au>) revealed that there are eight main sources of pollution located within 10 kilometres of the proposal site. These are:

- Albury Kremer Waste Water Treatment Plant
- Albury Water Filtration Plant
- Albury Waterview Waste Water Treatment Plant (in West Albury)
- DSI Holdings Pty Limited (car part manufacturing in Lavington)
- Albury Renewable Energy (Renewable electricity generation from landfill gas in Hamilton Valley)
- Mobil Aviation Albury (at the Albury Airport)
- Norse Skog Albury Papermill Rivalea (in Ettamogah)
- Snopak Manufacturing (Production of expanded polystyrene foam trays for food service and food packaging applications in Thurgoona).

The closest source of pollution is about 8.5 kilometres west of the proposal. With consideration of the distance from the proposal, these are unlikely to affect air quality. With the absence of any source of atmospheric pollutants noted, it is likely that exhaust fumes from vehicular traffic would be the main source of air pollution in the vicinity of the proposal given the moderate traffic levels. Accordingly, air quality within the vicinity of the proposal is considered to be moderate to good with no obvious signs of polluters.

6.8.2 Air quality criteria

It is expected that construction vehicles and plant would be maintained to manufacturer's standards. The *Protection of the Environment Operations Act 1997* (POEO Act) requires that no vehicle shall have continuous smoky emissions for more than 10 seconds.

6.8.3 Potential impact

The proposal is unlikely to generate significant dust or air quality impact. Small quantities of dust could occur from the excavation work and the use of fill. Levels of dust are unlikely to cause concern to sensitive receivers however, in the short term, minor impact could occur to highway traffic.

Construction equipment and plant used on site would emit exhaust fumes and would contribute to local air quality. However, in the context of the existing vehicular movements along the Riverina Highway, this is expected to be negligible.

6.8.4 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on air quality are detailed in Table 6-8.

Table 6-8: Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Air quality	<ul style="list-style-type: none">• Measures (including watering or covering exposed areas) must be used to minimise or prevent air pollution and dust• Work must not to be carried out during strong winds or in weather conditions where high levels of dust or airborne particulates are likely• Vegetation or other materials must not to be burnt on site	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> Vehicles transporting waste or other materials that may produce odours or dust must be covered during transportation 		

6.9 Landscape Character and Visual Amenity

6.9.1 Existing environment

The existing environment and the potential impacts of the proposal are considered in the context of the Roads and Maritime *Landscape character and visual amenity Guidance Note* (EIA-N04).

The visual landscape (qualities of the area) surrounding the road reserve is predominately agricultural land which has been cleared of native vegetation. There are small areas of native vegetation however these areas also exhibit a high level of introduced species due to the proximity of agricultural lands. There are also disturbed areas dominated by exotic vegetation. Most of the batters are very steep in this section of the Riverina Highway and most are covered in non-native vegetation such as Kikuyu, or introduced trees such as Pine, Apple, Peach and Tree of Heaven. Within the road reserve, there are some native canopy trees, including some larger trees, however these are sparse and do not form a continuous canopy. There are several significant native tree plantings, mostly consisting of species not endemic to the area, and some of these extend into the road reserve. It is estimated that these plantings could be 30 years old or even up to 50 years considering the size of some of the trees present and a number of trees would require removal to complete the proposal. There also some broad views of Lake Hume from several positions along the Riverina Highway. The road reserve in the area of the proposal is undulating.

6.9.2 Potential impact

The potential visual amenity impacts of the proposed work would include the removal of vegetation (native, planted and introduced) and exposed soil surfaces. The removal of native vegetation (trees and groundcover) has the potential to damage surrounding vegetation and would expose areas of soils, which would represent a short-term, temporary change to visual amenity while regeneration occurs. Exposure of soils can also increase the potential for weeds to spread due to the disturbance which is often beneficial to many of these species.

Road users would be the main receivers of these changes to the visual amenity. They would only be subject to fleeting views as they pass the proposal. Local residents would most likely be subject to greater visual impact including those living next to the proposal and those who commute along the Riverina Highway. This would be on a temporary basis during the construction work and revegetation establishment phase. Given these factors, the magnitude of the potential impact is considered to be low.

No additional operational impacts to landscape character or visual amenity are anticipated as a result of the proposal.

6.9.3 Safeguards and management measures

The recommended safeguards and management measures to minimise the potential impact on landscape character and visual amenity are detailed in Table 6-9.

Table 6-9: Visual amenity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Visual amenity	<ul style="list-style-type: none"> Landscaping would be managed in accordance with the Roads and Maritime <i>Landscape Guideline, 2008</i> 	Project Manager	Detailed Design

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> Work would be carried out in accordance with EIA_N04 <i>Guidelines for visual impact assessment and landscape character assessment</i>. 		

6.10 Socio-economic

6.10.1 Existing environment

The Riverina Highway is an important local access route used by commuters to Albury. It also provides access for tourists to the Hume Weir and surrounding areas along the Murray River. The proposal lies within the Albury – East area identified by the Australian Bureau of Statistics. As of the 2013 census period, the area has a population of about 13,727 with 8,423 registered motor vehicles. The main employing industry is Health Care and social assistance (13.9% of the workforce).

The Hume Dam provides a major recreational facility for the wider community, and in some respect, to the region. Camping, boating, fishing and other water sports bring large numbers of tourists to the region.

Land use is primarily agricultural, with tourist accommodation and other commercial activity occurring within the Lake Hume Village.

6.10.2 Potential impact

The potential impact to socio-economic factors that are related to this proposal include the disruption to local businesses reducing their ability operate on a normal basis and delays in commuter travel times. This would be associated with the traffic disruptions caused by the proposed work.

These disruptions are considered to be minor and offset by the improvement in the road safety which would increase efficiency and safety of the road in the long term. The impact to traffic and the mitigation measures to minimise the impact including a traffic management plan, have been considered further in Section 6.4 - Traffic and Access.

6.11 Cumulative Impact

6.11.1 Existing environment

There is one Roads and Maritime project currently being constructed on Riverina Highway. This is the Riverina Highway Stage 1 Safety Improvement Work (3.22 to 5.56 km west of Bethanga Bridge). Another project was carried out at the Albury end of the Stage 1 project, Riverina Highway (HW20) 2.3 kilometres west of Trout Farm Road Hazard Removal (Hawksview) – adjoins the north western point of the Stage 1 work.

The current proposal for Stage 2 Safety Improvement Work would join with the Stage 1 work at Lake Hume Village.

The following major projects that could potentially be carried out or are being constructed in the region, as listed on the NSW Department of Planning website in the Albury City LGA:

- Albury Paper Mill Upgrade

A total of 13.59 hectares were approved for clearing within the Murray CMA under the NSW *Native Vegetation Act 2003* until the end of 2015, however, no specific information for the Albury City LGA was provided.

None of these projects would impact directly on the Riverina Highway. There is not expected to be any cumulative impact as a result of large scale road work construction on the Riverina Highway in the region. Should additional projects be carried out in the region, a cumulative approach to offsets should be considered where required. Based on the current proposal, impact to TECs have been minimal and in consideration of the Roads and Maritime *Guidelines for biodiversity offsets*, a regional approach to offsets is not warranted.

The improvement in safety and efficiency of the Riverina Highway, justifies the impact.

6.11.2 Negative cumulative impact

A number of actions as a result of the proposed work would have a negative cumulative impact. These include:

- Social impact during the construction period based on minor traffic disruptions, dust and noise
- Biodiversity impact resulting from soil disturbance and the clearing of vegetation including a TEC.

Generally, negative cumulative impact associated with the proposal would be confined to the construction period and those associated with all proposals have been assessed as being of 'non-significance'. Proposed safeguards detailed within the REF confirm that risks from potential impact are both low and manageable.

6.11.3 Positive cumulative impact

Positive cumulative impact as a result of the proposal is expected to be:

- Continued improvements in road user safety by improving the Riverina Highway
- Continued improvements in efficiency by lowering the potential for accidents on the Riverina Highway.

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

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Services Environment Officer, South West Region, prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP 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 work on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of site specific environmental safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
1	General	<ul style="list-style-type: none"> All environmental safeguards must be incorporated within the following: <ul style="list-style-type: none"> Project Environmental Management Plan Detailed design stage Contract specifications for the proposal Contractor's Environmental Management Plan 	Project manager	Pre-construction
2	General	<ul style="list-style-type: none"> A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Services 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 carried out after the initial audit or inspection to evaluate if the level of risk chosen for the project is appropriate Any work 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	<ul style="list-style-type: none"> The environmental contract specification must be forwarded to the Roads and Maritime Services Environment Manager South West Region 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 Environment Manager South West Region. 	Project manager	Pre-construction
4	General	<ul style="list-style-type: none"> The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environment Officer South West Region at least ten working days prior to work commencing. 	Project manager	Pre-construction
5	General	<ul style="list-style-type: none"> All businesses and residences likely to be affected by the proposed work must be notified at least 10 working days prior to the commencement of the proposed activities. 	Project manager	Pre-construction
6	General	<ul style="list-style-type: none"> Environmental awareness training must be provided, by the contractor, to all 	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		field personnel and subcontractors. <ul style="list-style-type: none"> Ongoing environmental toolbox discussions will be provided by the Contractor as the work progresses. 		and during construction as required.
7	General	<ul style="list-style-type: none"> If the scope of work changes at any time, review under the Roads and Maritime Services <i>Environmental Assessment Procedure for Routine and Minor Work</i> (EIA-PO5-1) to determine any new measures to take. 	Project Manager, Roads and Maritime Environmental Officer, Site Manager	Pre-construction, construction and operation
8	Biodiversity	Guide 1: Pre-clearing process <ul style="list-style-type: none"> If any unexpected threatened fauna or flora are discovered, work would stop and the RMS Unexpected Threatened Species Find Procedure within the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 1: Pre-clearing process</i> be followed. This would only apply to the existing woodland and derived native grassland and native tree planting areas All fauna handling should be carried out by licensed wildlife carers and/or ecologists and in accordance with <i>Guide 9: Fauna Handling</i> Carry out staged habitat removal as outlined in <i>Guide 4: Clearing of vegetation and removal of bushrock</i> where fauna habitat features have been identified and marked. Guide 2: Exclusion Zones <ul style="list-style-type: none"> Any clearing required would be the smallest extent required to undertake the proposal All retained vegetation would be clearly identified as an exclusion zone and that all machinery, persons and equipment would not enter these areas without the expressed permission of the Roads and Maritime Environment Officer. A fence will be established in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 2: Exclusion zones</i>. 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Guide 3: Re-establishment of native vegetation</p> <ul style="list-style-type: none"> Any revegetation work should be based on sound ecological principles and be undertaken in accordance with Roads and Maritime Landscape Guidelines. Roads and Maritime will contact the local landcare group to determine if they can assist with any revegetation <p>Guide 4: Clearing of vegetation and removal of bushrock</p> <ul style="list-style-type: none"> All clearing including hollow-bearing trees would be conducted in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 4: Clearing of vegetation and removal of bushrock</i> Non-habitat vegetation should be removed first (e.g. shrubs, regrowth, groundcover and non-habitat trees). Allow fauna at least 24 hours to vacate remaining habitat. Ensure that a wildlife carer and/or ecologist inspects trees before and after felling. Capture and relocate non-injured fauna that are found in any felled trees to pre-determined habitat identified for fauna release. <p>Guide 5: Re-use of woody debris and bushrock</p> <ul style="list-style-type: none"> Woody debris re-use and retaining of bushrock within vegetation should be conducted in accordance with the Roads and Maritime document <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 5: Re-use of woody debris and bushrock</i> <p>Guide 6: Weed management</p> <ul style="list-style-type: none"> Five noxious weeds listed in the Albury LGA were present within the area of investigation. Noxious weeds should be removed, where possible, to an appropriate waste management facility in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects Guide 6: Weed Management.</i> <p>Guide 7: Pathogen Management</p>		

No.	Impact	Environmental safeguards	Responsibility	Timing
		accordance with the Roads and Maritime <i>Stockpile Site Management Guideline, 2015</i> .		
10	Water quality	<ul style="list-style-type: none"> • There must be no release of dirty water into drainage lines and/or waterways • Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) must be carried out on a regular basis to identify any potential spills or deficient erosion and sediment controls • Water quality control measures must be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways • Potable water is used for wash down • Fisheries NSW (ph. 1800 043 536) and the Office of Environment and Heritage (OEH) (ph. 131 555) and Roads and Maritime Environment Officer are to be immediately notified of any fish kills in the vicinity of the work. In such cases, all work other than emergency response procedures must cease until the issue is rectified and written approval to proceed is provided by Fisheries NSW or OEH. 	Contractor	Construction
11	Weather Station	<ul style="list-style-type: none"> • There is the potential for the toe of a fill batter to come into close proximity of the weather station. Should this occur Roads and Maritime would build a retaining wall around the station to stop potential impact as a result of the mill material deposited 	Roads and Maritime Project Manager	Construction
12	Chemical runoff	<ul style="list-style-type: none"> • Fuels, chemical and liquids must be stored in an impervious bunded area a minimum of 50 metres away from: <ul style="list-style-type: none"> • Rivers, creeks, or any areas of concentrated water flow. • Flooded or poorly drained areas. • Slopes above 10%. • Cleaning of spray bars (or equivalent equipment) is to occur in suitable areas (e.g. not table drains) and not cause water pollution • Refuelling of plant and equipment must occur in impervious bunded areas located a minimum of 50 metres away from drainage lines of waterways • Vehicle wash down and/or cement truck washout must occur in a designated bunded area 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> An Emergency spill kit must be kept onsite at all times. All staff must be made aware of the location of the spill kit and trained in its use If an incident (e.g. spill) occurs, the Roads and Maritime <i>Environmental Incident Classification and Management Procedure</i> would be followed and the Roads and Maritime Services Contract Manager notified as soon as practicable. 		
13	Waste minimisation and management	<ul style="list-style-type: none"> Resource management hierarchy principles must be followed: <ul style="list-style-type: none"> Avoid unnecessary resource consumption as a priority Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) Disposal is carried out as a last resort (in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>). Bulk project waste (e.g. fill) sent to a site not owned by Roads and Maritime (excluding EPA licensed landfills) for land disposal will have prior formal written approval from the landowner, in accordance with Roads and Maritime <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk Roads and Maritime Project Wastes</i> Waste must not be burnt onsite Waste material other than vegetation and tree mulch, must not to be left on site once the work has been completed Working areas must be maintained, kept free of rubbish and cleaned up at the end of each working day. 	Contractor	Construction
14	Traffic and Access	<ul style="list-style-type: none"> Consultation with stakeholders and the community will be carried out by Roads and Maritime Current traffic movements and property accesses including the boat ramp must be maintained during the work, where possible A traffic management plan must be prepared prior to work commencing A Road Occupancy Licence must be obtained for the work Any work that has potential to significantly disrupt traffic on the Riverina Highway must be scheduled to be carried out outside peak holiday periods. 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
15	Noise and vibration	<ul style="list-style-type: none"> • Consultation with affected stakeholders. This would take the form of the following (see Appendix 4 for further details on individual requirements): <ul style="list-style-type: none"> • Verify levels by measurement • Individual briefings • Letterbox drop • Negotiated respite • Respite offer • Respite period 1 • Respite period 2 • Phone calls • Specific notifications • Alternative accommodation • Distance between a noise-generating source and a receiver should be measured directly from the source to the curtilage (property boundary) of the receiver, unless the building/s are greater than 30 metres from the curtilage, in which case the distance is measured to within 30 metres of the building/s • Solid objects provide a barrier between a source of noise and a receiver. This reduces the effective distance of the noise. If line of sight between a noise source and a receiver is effectively blocked by a dense object such as a house or a hill, the “no line of sight” category should be applied • The mapped noise envelopes are only accurate to a few metres. If there is any doubt about which noise-affected category a receiver should belong to, the more conservative option should be chosen • Recommended Safe Working Distances for Vibration Intensive Plant, determines the maximum tonnage that a vibratory roller can be when within set distances from a structure. The closest structure to the work, a holiday cabin at Lake Hume Village, is about 11 metres from where the vibratory roller would operate. Therefore the maximum tonnage a vibratory roller could be is about 4 tonnes, putting the extent of cosmetic damage at 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		less than 6 metres from the works and human comfort at less than 20 metres from the work.		
16	Aboriginal Heritage	<ul style="list-style-type: none"> If Aboriginal heritage items are uncovered during the work, all work in the vicinity of the find must cease and the Roads and Maritime Aboriginal Cultural Heritage Officer and the regional Environment Officer be contacted immediately. Steps in the <i>Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds</i> would be followed. 	Contractor	Construction
17	Non-Aboriginal Heritage	<ul style="list-style-type: none"> Seek a standard exemption permit under s57(2) of the NSW Heritage Act for the proposed work Advise Heritage Victoria of the proposed work Install an interpretative sign detailing the heritage importance of Bethanga Bridge If unexpected archaeological remains are uncovered during the work, all work must cease in the vicinity of the material/find and the steps in the <i>Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds</i> would be followed. Roads and Maritime Services Regional Environment Manager be contacted immediately 	Contractor	Construction
18	Air quality	<ul style="list-style-type: none"> Measures (including watering or covering exposed areas) must be used to minimise or prevent air pollution and dust Work must not to be carried out during strong winds or in weather conditions where high levels of dust or airborne particulates are likely Vegetation or other materials must not to be burnt on site Vehicles transporting waste or other materials that may produce odours or dust must be covered during transportation 	Contractor	Construction
19	Visual amenity	<ul style="list-style-type: none"> Landscaping would be managed in accordance with the <i>Roads and Maritime Landscape Guideline, 2008</i> 	Project Manager	Detailed Design

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Work would be carried out in accordance with EIA_N04 <i>Guidelines for visual impact assessment and landscape character assessment.</i> 		

7.3 Licensing and approvals

Licensing and approvals will be required for this proposal. Table 7-2 provides a summary.

Table 7-2: Summary of licensing and approval required

Requirement	Timing
Minister for Primary Industries (Fisheries) would be notified of any work in the drainage line prior to the undertaking of such work.	A minimum of 28 days prior to the commencement of work.
The proposal would require an Environment Protection Licence (EPL) as it meets the definition of 'extractive activities' under clause 19 of Schedule 1	Prior to work commencing
Seek a standard exemption permit under s57(2) of the NSW Heritage Act	Prior to work commencing

8 Conclusion

8.1 Justification

The “do nothing” option would result in no impact to vegetation and the surrounding environment and no impact to traffic. It also means that the safety of the Riverina Highway would remain compromised for road users for the foreseeable future.

The Roads and Maritime has an obligation to provide safe conditions for road users. The proposal would improve the safety of the Riverina Highway by carrying out the proposed work. This improvement in safety for road users is considered to outweigh the potential impact associated with the proposal and therefore the proposal is justified.

8.2 Objects of the 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.	This proposal encourages proper management of the road system and would improve the social and economic welfare of the community by improving the safety of the Riverina Highway.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	Not relevant to the proposal.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Not relevant to the proposal.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to the proposal.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	Not relevant to the proposal.
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.	This REF lists safeguards and management measures to mitigate and minimise the potential impact on the environment including native animals and plants including threatened species (BIA, Appendix 3).
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4 below.
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.	Stakeholder consultation has been carried out throughout the planning of this proposal (Section 5). Consultation with stakeholders would continue through the construction phase.

8.2.1 The precautionary principle

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

This REF has been prepared using the precautionary principle. That is, if threats are perceived as possibly leading to serious or irreversible environmental damage, then either the non-development of the proposal would occur, or that the proposal would need to be modified to ensure that such threats do not exist. This has been the approach in relation to proposed safeguards detailed in Chapter 6 and summarised in Chapter 7.

8.2.2 Intergenerational equity

‘Inter-generational equity’ means that 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 impact on natural or cultural features to a level that would compromise the health, diversity or productivity of the environment to a level that would impact on future generations.

8.2.3 Conservation of biological diversity and ecological integrity

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

The REF has examined the environmental consequences of the proposal and identified mitigation measures for areas which have the potential to experience adverse impact. Requirements imposed in terms of implementation of these mitigation measures would result in an economic cost to Roads and Maritime. The implementation of mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

The design for the proposal has been developed with an objective of minimising potential impact on the surrounding environment. This indicates that the concept design for the proposal has been developed with an environmental objective in mind.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires that environmental assets should be appropriately valued. This REF has considered abiotic and biotic ecosystem factors together with social values in identifying potential impact and providing a range of environmental safeguards to minimise the impact of the proposal.

These factors ensure that the proposed activity is consistent with the principles of ESD.

8.3 Conclusion

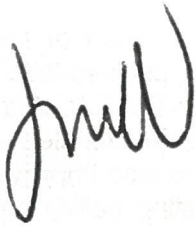
The proposed Riverina Highway safety improvement work between Lake Hume Village and Bethanga Bridge is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of 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 project objectives but would still result in some impacts on the TSC Act listed Threatened Ecological Community Box-Gum Woodland. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve road user safety of the Riverina Highway by widening, flattening batters and installing safety barriers. 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 *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.

9 Certification

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



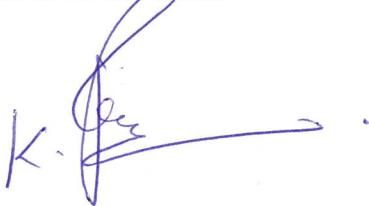
Joshua Wellington
Senior Project Officer
EnviroKey Pty. Ltd.
Date: 22.04.2016

Certified by:



Steve Sass
Director/Principal Ecologist
EnviroKey Pty. Ltd.
Date: 22.04.2016

I have examined this review of environmental factors and the certification by Steve Sass from EnviroKey Pty. Ltd. and accept the review of environmental factors on behalf of Roads and Maritime Services.



Parthi Parthiban
Project Manager
Roads and Maritime Services South West Region
Date: 21/06/2016

10 References

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- DEC. (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). *NSW Department of Environment & Conservation, Hurstville, NSW*.
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- OEH. (2015b) BioNET: The website for the Atlas of NSW Wildlife: A whole-of-government system for flora and fauna sightings information.
- OEH. (2015c) Threatened species, populations and ecological communities of NSW. *NSW Office of Environment & Heritage*. www.threatenedspecies.environment.nsw.gov.au.
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Terms and acronyms used in this REF

AHIMS	Aboriginal Heritage Information Management System
BBAM	Biometric/Biobanking Assessment Methodology
BVT	Biometric Vegetation Type
CMA	Catchment Management Authority
CEMP	Construction environmental management plan
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
HBT	Hollow-bearing tree
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
OEH	NSW Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation

REF	Review of environmental factors
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP 44	<i>State Environmental Planning Policy No.44 – Koala Protection</i>
SIS	Species Impact Statement
TEC	Threatened Ecological Community
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
VMS	Variable Message Sign
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services

Appendix 1

Construction Plans

Appendix 2

Stakeholder and Community Consultation

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<151215_Stage_2_Project_Plan_Reduced.pdf>

<160129_Stage_2_Concept_D_XSecs.pdf>

<Riverina Hwy 1.jpg>

<Riverina Hwy 2.jpg>

<Riverina Hwy 3.jpg>

From: Joshua Wellington [<mailto:joshua@envirokey.com.au>]
Sent: Wednesday, 9 March 2016 3:35 PM
Subject: Riverina Highway Safety Improvements - Stage 2

To Albury City Council,

We are acting on behalf of Roads and Maritime Services who currently have a proposal to undertake safety improvement works to the Riverina Highway (HW20), from Bethanga Bridge to Lake Hume Village. The proposal would include road formation widening, pavement reconstruction, culvert installation and minor curve realignment over about 2.6 kilometres of HW20. The proposal is located adjacent to Lake Hume, a major water reservoir on the Murray River, with some of the existing fill batters adjacent to Bethanga Bridge reaching the high water mark of the lake. To facilitate the widening of the road formation from the current width of about 6.5 metres to the Roads and Maritime standard of seven metres with 0.5 metre sealed shoulders and 0.5 metre verge, major cut and fill activities would be required. Initial estimates of the quantities required are about 17,400 cubic metres of material cut from existing batters and about 15,900 cubic metres of fill to build up the level of new batters. The estimated total mass of material is greater than 30,000 tonnes triggering a requirement under the *Protection of the Environment Operations Act 1997* for a license from the EPA. Currently EnviroKey are preparing a Review of Environmental Factors and a Biodiversity Impact Assessment and the proposed work will be assessed under Part 5 of the *Environmental Planning & Assessment Act 1979*.

We formally seek your comment in relation to the proposed work adjacent to Lake Hume on the Murray River. The banks of the lake along this stretch of HW20 are mostly dominated by exotic vegetation and subject to some erosion however there are also significant native tree plantings and some small patches of the endangered ecological community, Box-Gum Woodland, listed under the *Threatened Species Conservation Act 1995* (see attached images). Some clearing and grubbing of this native vegetation would be required. A large amount of fill material would be deposited on the downhill or lake side of the highway which would require significant sedimentation and erosion controls to mitigate the potential for stormwater and soil runoff entering Lake Hume.

I attach for you a project plan, concept design and some site photos for your information. In providing this information, I would ask that should you have any comment in relation to the proposed works, could you provide these to me by 30 March, 2016.

Should you have any questions, feel free to contact myself (details below) or Parthi Parthiban (Roads and Maritime Service) on (02) 6937 1652 or email parthi.parthiban@rms.nsw.gov.au

Thank you and kind regards,

Joshua Wellington
Senior Project Officer/Botanist
B. Sci (Env. Sci)

<image001.jpg>

A: PO Box 7231 TATHRA NSW 2550 **P:** 02 6494 5422 **M:** 040 056
9804E: joshua@envirokey.com.au **W:** www.envirokey.com.au

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From: [Joshua Wellington](mailto:Joshua.Wellington@envirokey.com.au)
To: steve@envirokey.com.au
Subject: Fwd: Riverina Highway Safety Improvements - Stage 2
Date: Thursday, 17 March 2016 3:54:02 PM

Sent from my iPhone

Begin forwarded message:

From: Andrew Lawson <ALawson@alburycity.nsw.gov.au>
Date: 14 March 2016 at 1:20:24 PM AEDT
To: ""joshua@envirokey.com.au"" <joshua@envirokey.com.au>
Subject: FW: Riverina Highway Safety Improvements - Stage 2

Hi Joshua,

Thanks for the email I will organise for any feedback from Council to come back through myself to you.

I am having some trouble opening the pdf plan (it is erroring) can you please rectify this and send through another file.

Thanks

Andrew Lawson
Group Leader Engineering Services
AlburyCity

553 Kiewa Street Albury NSW 2640 • t 02 6023 8227 • m 0417 687 070 • www.alburycity.nsw.gov.au

From: Steven Swann
Sent: Thursday, 10 March 2016 8:46 AM
To: Andrew Lawson; David Christy
Subject: FW: Riverina Highway Safety Improvements - Stage 2

Gents,

I received the attached email in TRIM late yesterday – RMS have engaged Envirokey to prepare an REF for works on the Riverina Highway between Lake Hume Village and Bethanga Bridge.

Are either of you involved in this at all or aware of it? I'm happy to liaise with them, but if someone else is already dealing with it I want to make sure we have a co-ordinated response.

Happy to discuss further or take your advice.

Cheers,

Steve

the lake. To facilitate the widening of the road formation from the current width of about 6.5 metres to the Roads and Maritime standard of seven metres with 0.5 metre sealed shoulders and 0.5 metre verge, major cut and fill activities would be required. Initial estimates of the quantities required are about 17,400 cubic metres of material cut from existing batters and about 15,900 cubic metres of fill to build up the level of new batters. The estimated total mass of material is greater than 30,000 tonnes triggering a requirement under the *Protection of the Environment Operations Act 1997* for a license from the EPA. Currently EnviroKey are preparing a Review of Environmental Factors and a Biodiversity Impact Assessment and the proposed work will be assessed under Part 5 of the *Environmental Planning & Assessment Act 1979*.

We formally seek your comment in relation to the proposed work adjacent to Lake Hume on the Murray River. The banks of the lake along this stretch of HW20 are mostly dominated by exotic vegetation and subject to some erosion however there are also significant native tree plantings and some small patches of the endangered ecological community, Box-Gum Woodland, listed under the *Threatened Species Conservation Act 1995* (see attached images). Some clearing and grubbing of this native vegetation would be required. A large amount of fill material would be deposited on the downhill or lake side of the highway which would require significant sedimentation and erosion controls to mitigate the potential for stormwater and soil runoff entering Lake Hume.

I attach for you a project plan, concept design and some site photos for your information. In providing this information, I would ask that should you have any comment in relation to the proposed works, could you provide these to me by 14 March, 2016.

Should you have any questions, feel free to contact myself (details below) or Parthi Parthiban (Roads and Maritime Service) on (02) 6937 1652 or email parthi.parthiban@rms.nsw.gov.au.

Joshua Wellington
Senior Project Officer/Botanist
B. Sci (Env. Sci)

<image004.jpg>

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9804E: joshua@envirokey.com.au W: www.envirokey.com.au

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Envirokey Pty. Ltd ABN 35150812570

From: [Joshua Wellington](mailto:Joshua.Wellington@envirokey.com.au)
To: steve@envirokey.com.au
Subject: Fwd: Riverina Highway Safety Upgrade - Stage 2
Date: Thursday, 17 March 2016 3:55:40 PM

Sent from my iPhone

Begin forwarded message:

From: "David Petrovic" <david.petrovic@wtlandcare.org>
Date: 22 February 2016 at 8:18:42 PM AEDT
To: "'Joshua Wellington'" <joshua@envirokey.com.au>
Subject: RE: Riverina Highway Safety Upgrade - Stage 2

Hi Joshua

Thanks for the notification. I'll send this info onto our Landcare members for comment.

Regards

David Petrovic
President | **Woolshed Thurgoona Landcare Group**
PO Box 684 Lavington NSW 2640
e: david.petrovic@wtlandcare.org w: www.wtlandcare.org

[<image001.jpg>](#) [<image003.png>](#)

From: Joshua Wellington [<mailto:joshua@envirokey.com.au>]
Sent: Monday, 22 February 2016 11:15 AM
To: enquiries@wtlandcare.org
Subject: Riverina Highway Safety Upgrade - Stage 2

To Woolshed Thurgoona Landcare Group,

We are acting on behalf of Roads and Maritime Services who currently have a proposal to undertake safety improvement works to the Riverina Highway (HW20), from Bethanga Bridge to Lake Hume Village. The proposal would include road formation widening, pavement reconstruction, culvert installation and minor curve realignment over about 2.6 kilometres of HW20. The proposal is located adjacent to Lake Hume, a major water reservoir on the Murray River, with some of the existing fill batters adjacent to Bethanga Bridge reaching the high water mark of

Joshua Wellington
Senior Project Officer/Botanist
B. Sci (Env. Sci)

<image001.jpg>

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Envirokey Pty. Ltd ABN 35150812570

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

We are acting on behalf of Roads and Maritime Services who currently have a proposal to undertake safety improvement works to the Riverina Highway (HW20), from Bethanga Bridge to Lake Hume Village. The proposal would include road formation widening, pavement reconstruction, culvert installation and minor curve realignment over about 2.6 kilometres of HW20. The proposal is located adjacent to Lake Hume, a major water reservoir on the Murray River, with some of the existing fill batters adjacent to Bethanga Bridge reaching the high water mark of the lake. To facilitate the widening of the road formation from the current width of about 6.5 metres to the Roads and Maritime standard of seven metres with 0.5 metre sealed shoulders and 0.5 metre verge, major cut and fill activities would be required. Initial estimates of the quantities required are about 17,400 cubic metres of material cut from existing batters and about 15,900 cubic metres of fill to build up the level of new batters. The estimated total mass of material is greater than 30,000 tonnes triggering a requirement under the *Protection of the Environment Operations Act 1997* for a license from the EPA. Currently EnviroKey are preparing a Review of Environmental Factors and a Biodiversity Impact Assessment and the proposed work will be assessed under Part 5 of the *Environmental Planning & Assessment Act 1979*.

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I attach for you a project plan, concept design and some site photos for your information. In providing this information, I would ask that should you have any comment in relation to the proposed works, could you provide these to me by 14 March, 2016.

Should you have any questions, feel free to contact myself (details below) or Parthi Parthiban (Roads and Maritime Service) on (02) 6937 1652 or email parthi.parthiban@rms.nsw.gov.au

Thank you and kind regards,

From: [Joshua Wellington](mailto:Joshua.Wellington@envirokey.com.au)
To: steve@envirokey.com.au
Subject: Fwd: Riverina Highway Safety Upgrade - Stage 2
Date: Thursday, 17 March 2016 3:55:05 PM

Sent from my iPhone

Begin forwarded message:

From: David Finnimore <david.finnimore@dpi.nsw.gov.au>
Date: 24 February 2016 at 11:43:15 AM AEDT
To: Joshua Wellington <joshua@envirokey.com.au>
Subject: Re: Riverina Highway Safety Upgrade - Stage 2

Joshua,

Thank you for your email regarding the proposed works. DPI-Water is not the responsible agency regarding clearing of vegetation. RMS are exempt from a Controlled Activity Approval under the Water Management Act 2000. However, RMS are not exempt from a water supply work approval to extract water from a water source (eg Hume Dam) for road construction. RMS currently have a water supply work approval for this area but this will expire in April this year. RMS will need to apply again for another water supply work approval.

Please give me a call if you have any questions.

regards
David

David Finnimore | Water Regulation Officer

NSW Department of Primary Industries | Water

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To David,

Appendix 3

Biodiversity Impact Assessment

Biodiversity Impact Assessment

Proposed Riverina Highway (HW20) - Stage 2 Safety Improvement Work




A report prepared for Roads and Maritime Services

MAY 2016

Report No. 16.EclA-015

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Executive Summary

EnviroKey were engaged by Roads and Maritime Services to carry out a Biodiversity Impact Assessment (BIA) for proposed safety improvements on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be undertaken between 0.0 and 3.3 kilometres west of the Bethanga Bridge within the Albury Local Government Area.

One native vegetation community was found to occur within the vicinity of the proposal which corresponded with the NSW Vegetation Types Database for Plant Community Types. Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion or Biometric Vegetation Types (BVT) MU550 is present. This community fits with the description of Box-Gum Woodland listed as an endangered ecological community under the the NSW *Threatened Species Conservation Act 1995* (TSC Act). This community is also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* however the vegetation within the area of investigation does not fit the specific criteria for this listing.

Four general fauna habitats were found to occur; woodland, native tree planting, rock outcrops and introduced grassland/trees. The fauna species detected are typical of those occurring in the generally disturbed and woodland areas of the region. Two threatened fauna species listed under the schedules of the TSC Act were detected during field surveys, Grey-headed Flying Fox and Squirrel Glider. Three species listed as migratory under the schedules of the EPBC Act were detected, White-bellied Sea-eagle, Caspian Tern and Rainbow Bee-eater. No species listed under the schedules of the NSW *Fisheries Management Act 1994* (FM Act) were detected within the vicinity of the proposal. A total of 21 threatened biota have a moderate to high potential to occur based on detailed habitat assessment.

The direct and indirect impact of the proposal includes the loss of about 0.245 hectares of native vegetation which comprises 0.001 hectares of derived native grassland, 0.207 hectares of woodland and 0.037 hectares of native tree plantings. Impacts also include and a minor reduction in connectivity for Squirrel Gliders between a native tree planting in the central portion of the study area to a small patch of Box-Gum Woodland. Up to 1.735 hectares of introduced grassland/trees would also be impacted. Two hollow-bearing trees would be removed resulting in the removal of about three small hollows. This assessment has concluded that the proposal is '*unlikely*' to have a significant effect on any listed threatened flora and fauna species, communities, populations and their habitats in accordance with the TSC Act and FM Act. Additional assessment has also determined that the proposal is '*unlikely*' to have a significant effect on any EPBC Act listed threatened and migratory biota and their habitats or other matters of national environmental significance. Therefore, a species impact statement is not required. A series of detailed mitigation measures are proposed that have been developed from the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects* to minimise potential impact to biodiversity.

Definitions & Acronyms used within this report

Area of Investigation - includes the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly

CMA - Catchment Management Authority

DotE - Department of the Environment

EP&A Act - NSW *Environmental Planning and Assessment Act 1979*

EPBC Act - Commonwealth *Environment Protection and Biodiversity Conservation Act 1995*

FM Act - NSW *Fisheries Management Act 1994*

LGA - Local Government Area

Likely - taken to be a real chance or possibility

Locality - means the area within a 10 km radius of the proposal

local population (migratory or nomadic fauna) - the population comprises those individuals that are likely to occur in the study area from time to time

local population (resident fauna) - the population comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to use habitats in the study area

local population (threatened flora) - the population comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area

migratory species - a species specified in the schedules of the EPBC Act

NV Act - NSW *Native Vegetation Act 2003*

OEH - NSW Office of Environment & Heritage

region - means a biogeographical region that has been recognised and documented such as the Interim Biogeographical Regions of Australia (IBRA) (Thackway and Creswell 1995). The study area is located within the South-west Slopes Bioregion

SIS - Species Impact Statement

study area - includes the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly

subject site - the area to be directly affected by the proposal. That is, the footprint of the proposal

threatened biota - means those threatened species, endangered populations or endangered ecological communities considered known or likely to occur in the study area

threatened species - a species specified in the schedules of the TSC Act or the EPBC Act

TSC Act - NSW *Threatened Species Conservation Act 1995*

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1 INTRODUCTION

1.1 BACKGROUND

The Riverina Highway (HW20) is a state road that connects the Lake Hume Village at the Bethanga Bridge and Deniliquin via Albury. The road mainly serves a local access function with limited strategic importance. Land use around the proposal is dominated by rural primary production areas with Lake Hume immediately adjacent to the east of the section of highway subject to this assessment.

The Minister for Roads and Freight has approved an allocation of \$11 Million over three financial years from 2015-2017 to conduct safety improvement work on the Riverina Highway. Roads and Maritime has consulted with the community in Albury, Lake Hume, Bethanga and other border communities and liaised with Albury City Council and local members of parliament.

Stage one of this project commenced in October 2015, and is scheduled to be completed in April 2016. Stage two of this project (subject to this assessment) is planned to be delivered in the 2016-2017 financial year. Project construction timeframe is expected between August 2016 and June 2017. The work is estimated to cost \$8.5 million.

Roads and Maritime Services (Roads and Maritime) propose to carry out safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be undertaken between 0.0 and 3.3 kilometres west of the Bethanga Bridge within the Albury Local Government Area (LGA).

EnviroKey were engaged by Roads and Maritime to carry out a Biodiversity Impact Assessment (BIA) that would form part of a Review of Environmental Factors (REF) to be assessed under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). For this proposal, Roads and Maritime would be the proponent and determining authority. Accordingly, the proposed work and associated environmental impact would be assessed in the context of clause 228 of the NSW *Environmental Planning and Assessment Regulation 2000*, the NSW *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 accordance with the requirements of section 111 of the EP&A Act, an REF allows Roads and Maritime to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment due to a proposed activity.

1.2 PROJECT DESCRIPTION

Roads and Maritime proposes to carry out safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall

proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be undertaken between 0.0 and 3.3 kilometres west of the Bethanga Bridge.

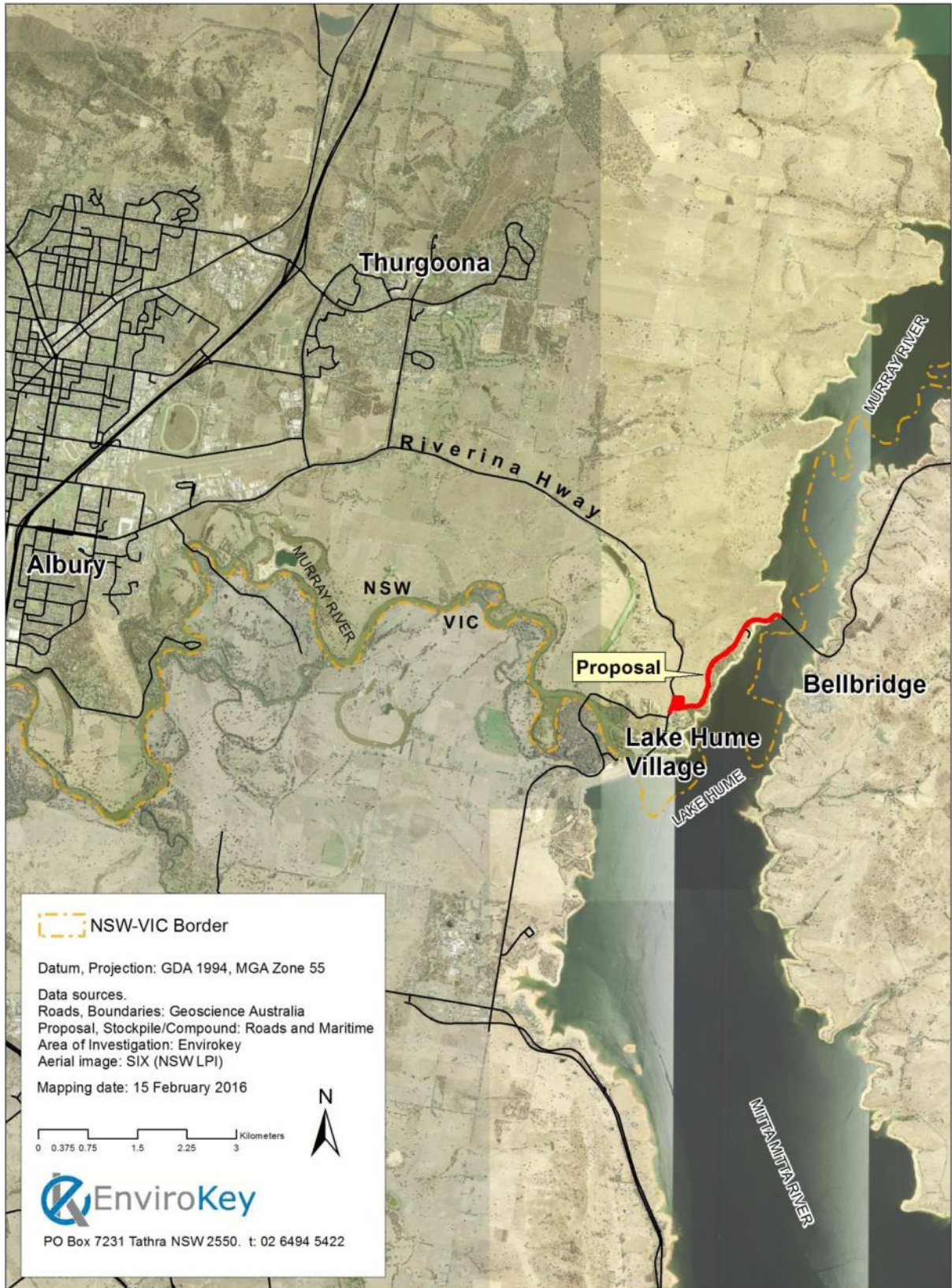
Key features of the proposal include:

- Widening Riverina Highway from about 6.5 metres to seven metres with a 1.5 metre sealed shoulder and 0.5 metre verge
- Installation of safety barriers where batters exceed 1.5 metres in height and are steeper than 4:1
- Localised widening of the sealed shoulder by up to two metres on the back of some curves
- Pavement reconstruction
- Culvert installation
- Minor curve realignment
- Clearing and grubbing of vegetation
- Major cut and fill activities.

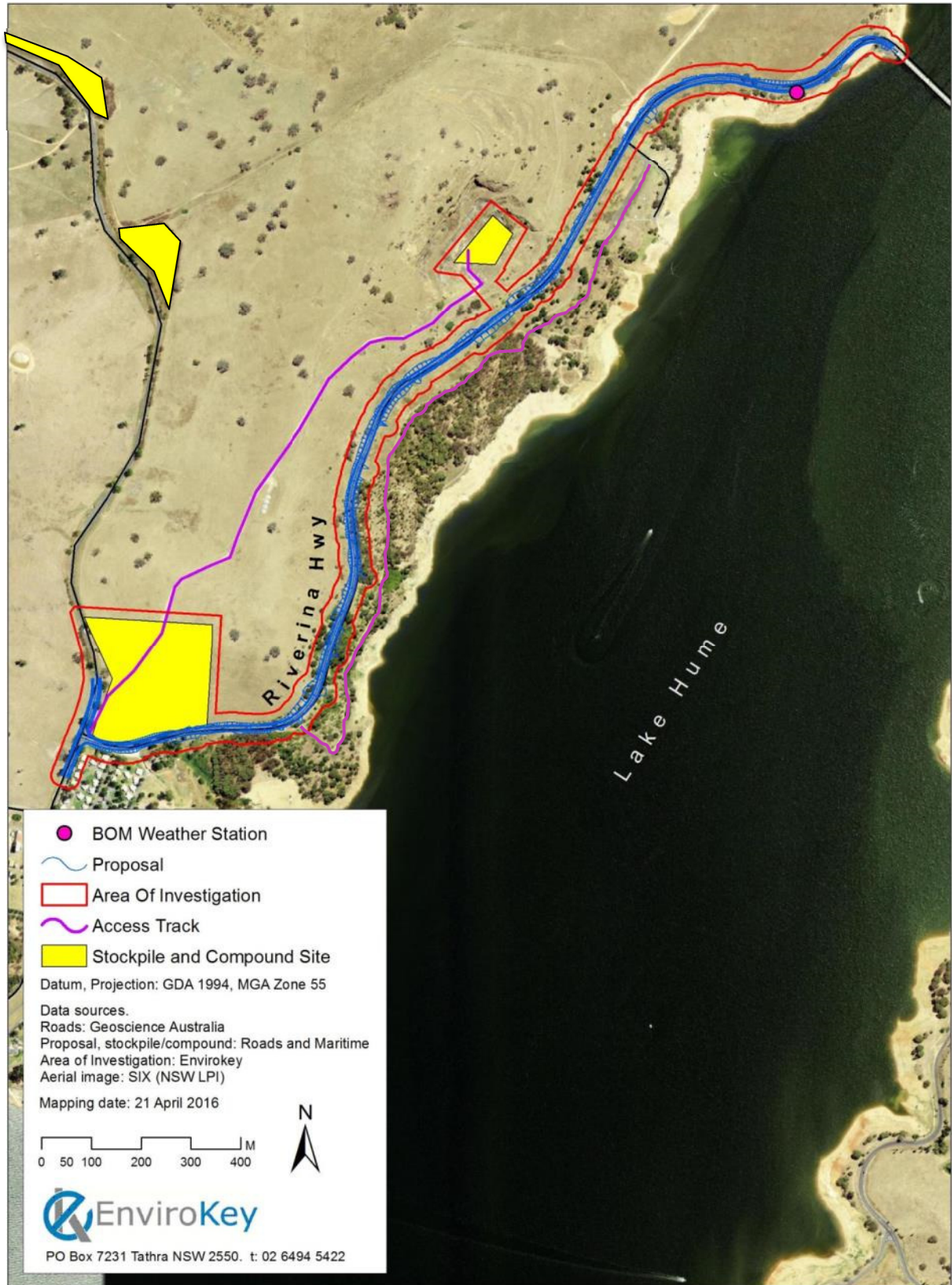
1.3 STUDY AREA

The area of investigation (study area) is located between Lake Hume Village and Bethanga Bridge on the Riverina Highway (HW20) in the South Western Slopes Bioregion (NPWS 2003a; Thackway and Creswell 1995), Albury local government area (LGA), Murray Local Land Service (LLS) region (Previously Murray Catchment Management Authority (CMA)) and the Albury - Oaklands Hills and Foothills landscape system (Mitchell 2002). The regional location of the proposal is provided (**Map 1**).

The extent of the study area has been developed to allow flexibility in preparing the final design for the proposed work by considering a larger area than required (**Map 2**).



Map 1: Regional location of the proposal



Map 2: Extent of the study area in relation to the proposal

1.4 LEGISLATIVE CONTEXT

1.4.1 *NSW Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment of Roads and Maritime activities. Roads and Maritime projects are assessed and approved or determined under the following regimes:

1. **Part 5** applies to the majority of Roads and Maritime road projects. Usually a review of environmental factors (REF) is prepared to assess the environmental impact of a project prior to commencing the work.
2. **Part 5.1** applies to State significant infrastructure. These major projects require approval from the Minister for Planning and Infrastructure. An environmental impact statement is prepared in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.
3. **Part 4** applies to projects that require development consent from a consent authority (usually a local council). A statement of environmental effects or environmental impact statement (for designated development) is prepared to assess environmental impact.
4. **Division 4.1 of Part 4** applies to State significant development. These major projects require approval from the Minister for Planning and Infrastructure. An environmental impact statement is prepared in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.

Clause 5A and 5C of the EP&A Act requires that the **significance** of the impact of the proposal on terrestrial and aquatic threatened species, populations and endangered ecological communities is assessed as follows:

1. **Part 5.1** – the proponent must demonstrate the proposal would improve or maintain biodiversity outcomes. Threatened species assessment guidelines have been developed to assist in making this assessment. Assessment of biodiversity issues is to be in accordance with the requirements of the Director-General of the Department of Planning and Infrastructure.
2. **Part 5** (and Part 4 where relevant) – a **seven-part test** is prepared in accordance with Clause 5A(2).

1.4.2 *Threatened Species Conservation Act 1995*

The *Threatened Species Conservation Act 1995* (TSC Act) specifies seven factors which must be considered by decision-makers regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats (DECC 2007). These factors form part of the threatened species assessment process under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and are collectively referred to as the 'seven-part test' (DECC 2007).

Determining authorities have a statutory obligation, under Part 5 of the *EP&A Act*, to consider whether a proposal is likely to significantly affect threatened species, populations or ecological communities, or their habitats by applying the seven-part test. If the determination is made that there is likely to be a significant effect then either of the following must be undertaken:

- A Species Impact Statement (SIS) must be prepared and the concurrence of the Director-General of the Office of Environment and Heritage (OEH) obtained prior to the consent authority making a determination
- The proposal may be modified such that a significant effect on threatened species, populations or ecological communities, or their habitats is unlikely (DEC 2004).

This BIA applies the seven-part test to species, populations and communities which occur or have the potential to occur within the study area in order to characterise the significance of the impact (**Appendix 6**).

1.4.3 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation.

Under the EPBC Act, actions that have, or are likely to have a significant impact on a matter of national environmental significance (NES) require approval from the Australian Government Minister for the Department of the Environment (DotE) (DotE 2013).

The nine matters of NES that are protected under the EPBC Act are:

- Listed threatened species and communities
- Listed migratory species
- Wetlands of international importance
- Commonwealth marine environment
- World heritage properties
- National heritage properties
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

This BIA provides an assessment to ascertain whether the proposal will impact on matters of NES (**Appendix 7**).

1.4.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of the 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 the maintenance of an existing road, through the widening and upgrade of the road surface and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the EP&A Act. Therefore development consent from Albury City Council is not required.

Additionally, 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 Projects) 2005*.

1.4.2 Fisheries Management Act 1994

The NSW *Fisheries Management Act 1994* aims to conserve fish stocks, key habitats, threatened species, populations and ecological communities of fish and marine vegetation. It also aims to promote viable commercial fishing, aquaculture industries and recreational fishing.

This BIA applies the seven-part test to species, populations and communities which occur or have the potential to occur within the study area in order to characterise the significance of the impact (**Appendix 5 & 6**).

1.4.3 State Environmental Planning Policy No. 44

State Environmental Planning Policy (SEPP) No. 44 encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free-living populations will be maintained over their present range across 107 local government areas (LGA). Local councils listed under Schedule 1 of SEPP44 cannot approve development in an area affected by the policy without an investigation of core koala habitat. The policy provides the state-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of koalas and their habitat.

SEPP 44 aims to identify areas of *potential* and *core* Koala Habitat. These are described as follows:

- *Potential Koala Habitat* is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component
- *Core Koala Habitat* is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

Prior to 2004, the area was likely to be within the Hume Shire which is listed on schedule 1 of SEPP 44. A boundary adjustment of the LGA resulted in the proposal area being located

in Albury LGA which is not listed on schedule 1. However White Box (*Eucalyptus albens*), listed under schedule 2 of this SEPP as a Koala feed tree species, is present within the study area. Therefore, SEPP 44 is still of some relevance to the proposal and it is considered further within **Section 4.11** of this BIA.

1.4.4 *Native Vegetation Act 2003*

The objectives of the *Native Vegetation Act 2003* (NV Act) are to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, further, aims of the NV Act are:

- (a) to prevent broad scale clearing unless it improves or maintains environmental outcomes
- (b) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation
- (c) to improve the condition of existing native vegetation, particularly where it has high conservation value
- (d) to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation.

Vegetation that falls within the definition of this Act would be cleared as part of the proposed activity however, clearing that is excluded from the provisions of section 25 of the NV Act includes;

“(g) any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the Environmental Planning & Assessment Act 1979 if the determining authority has complied with that Part, ...”

The proposal would be assessed as a Part 5 development (under the *EP&A Act 1979*) and carried out by Roads and Maritime, a determining authority as defined by the Act. Therefore the work is not subject to this legislation. Clearing of vegetation is considered essential to carrying out the proposal, the amount and location of clearing of native vegetation required has been given consideration within this BIA.

1.4.5 *Noxious Weeds Act 1993*

Part 3 of the *Noxious Weeds Act 1993* outlines the obligations of a public authority to control noxious weeds. Noxious Weeds are investigated within **Section 4.4** this BIA.

1.4.6 *Albury Local Environment Plan 2010*

The proposal is subject to the Albury Local Environment Plan 2010 (LEP). The aims of this plan are as follows:

- (1) This Plan aims to make local environmental planning provisions for land in Albury in accordance with the relevant standard environmental planning instrument under Section 33A of the Act
- (2) The particular aims of this Plan are as follows:
 - (a) to give effect to the desired outcomes, principles and actions contained in the Council's adopted strategies and policy documents
 - (b) to promote sustainable urban development by providing for efficient management of urban growth and resource utilisation
 - (c) to promote a city for the people, with a high level of social and physical amenity and a diversity of activities and uses
 - (d) to maintain or improve biodiversity across Albury, and to avoid significant impacts on matters of environmental significance.

Under this plan, the land subject to this proposal is zoned as the following:

- Zone E3 - Environmental Management
- Zone RU2 - Rural Landscape
- Zone RU5 - Village.

Zone E3 - Environmental Management

The objectives of this zone are:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values
- To provide for a limited range of development that does not have an adverse effect on those values
- To ensure the long term viability of populations of threatened species, populations and ecological communities by protection and improving the condition of wildlife habitats and wildlife corridors
- To allow appropriate land uses in close proximity to the Landfill Buffer Area.

All of the land subject to the proposal is zoned E3, except for 300 metres at the northern end adjacent to Bethanga Bridge and a small section at the intersection with Trout Farm Road. Within the Environmental Management Zone a road is permitted with consent. However under the State Environmental Planning Policy 2007 (Infrastructure), development consent is not required by a determining authority, therefore development consent is not required from council. Additionally, the assessment provided within this BIA indicates that the proposal would be unlikely to have a significant adverse effect on ecological values or the long term viability of populations of threatened species, populations and ecological communities in the area.

Zone RU5 - Village

The objectives of this zone are:

- To provide for a range of land uses, services and facilities that are associated with a rural village
- To ensure that land use and development maintains and contributes to the character of both the Table Top and Lake Hume villages
- To protect the amenity of all residents within this zone.

The majority of the land at the western end of the proposal and the road reserve are zoned RU5. Under the Rural Village Zone, roads are permitted with consent. However under the State Environmental Planning Policy 2007 (Infrastructure), development consent is not required by a determining authority, therefore development consent is not required from council. Additionally the proposal would improve the safety of HW20, which is providing a service to Lake Hume village and also protecting the amenity within the zone.

Zone W2 - Recreational Waterways

The objectives of this zone are:

- To protect the ecological, scenic and recreational values of recreational waterways
- To allow for water-based recreation and related uses
- To provide for sustainable fishing industries and recreational fishing
- To prohibit development that would have an adverse effect on the natural values of recreational waterways.

A section of about 300 metres in length at the northern end of the proposal is zoned W2 - Recreational Waterways. Under the Recreational Waterways Zone, roads are permitted with consent. However under the State Environmental Planning Policy 2007 (Infrastructure), development consent is not required by a determining authority, therefore development consent is not required from council. Additionally, the proposal is a compatible land use in that it would upgrade and improve safety on the existing road for all commuters including agricultural farmers in the area.

Biodiversity Certification of the Albury LEP

Biodiversity certification of the Albury LEP under the *Threatened Species Conservation Act 1995* was gazetted by Order of the Climate Change and Environment Minister, February 2011. Through Biodiversity Certification, about 5,262 hectares of Endangered Ecological Communities and threatened species habitat in the Albury local government area was retained in Natural Areas (zoned E2 - Environmental Conservation and E3 - Environmental Management). The proposal would potentially impact on several small areas zoned E3 - Environmental Management, however the assessment provided in this BIA has determined that it is unlikely to have a significant impact. Further, the proposal is not subject to the requirements of Biodiversity Certification as it is subject to the provisions of the ISEPP. Nevertheless, Roads and Maritime intends to appropriately manage potential impact and has consulted with Albury City Council, NSW Fisheries, NSW Office of Water and Thurgoona Woolshed Landcare in regards to the proposal.

1.4.7 *Ecologically Sustainable Development*

Ecologically sustainable development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all state and territory governments endorsed the *National Strategy for Ecologically Sustainable Development*. In NSW, the concept has been incorporated in legislation such as the EP&A Act and Regulation.

For the purposes of the EP&A Act and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the *Protection of the Environment Administration Act 1991* outline the following principles which can be used to achieve ESD.

(a) The precautionary principle: that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation

In the application of the precautionary principle, public and private decisions can be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
 - (ii) an assessment of the risk-weighted consequences of various options
- (b) Inter-generational equity: that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations
- (c) Conservation of biological diversity and ecological integrity: that conservation of biological diversity and ecological integrity should be a fundamental consideration.

The aims, structure and content of this BIA are guided by these principles. The precautionary principle has been adopted in the assessment of impact with all potential impact considered and mitigated where a risk is present. Where uncertainty exists, measures have been suggested to address it.

1.5 STUDY AIMS

This BIA aims to:

- Provide a brief description of the proposed activity
- Provide the results of the desktop analysis (legislative context, literature review, database searches)
- Identify and describe the flora and fauna values of the study area including descriptions of field methodologies used and the results of the field survey

- Identify species and communities of conservation significance which are present or have the potential to be present, including threatened flora, fauna, their habitats and threatened ecological communities
- Provide maps and photographs detailing vegetation communities, habitat extent and condition and the location of any significant flora and fauna species present
- Identify the potential direct and indirect impact of the proposed work
- Undertake an evaluation of the potential for threatened and migratory biota listed within the schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, NSW *Threatened Species Conservation Act 1995* and NSW *Fisheries Management Act 1994* to be affected by the proposed work
- Assess the significance of the potential impact of the proposed work on species, populations, communities and their habitats that occur, or have the potential to occur within the study area pursuant to the NSW *Threatened Species Conservation Act 1995*, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the NSW *Fisheries Management Act 1994* (where required)
- Provide a series of recommendations designed to reduce risks and minimise the impact of the proposed work on flora and fauna
- Explicitly discuss the potential of the work to generate a significant adverse impact to biota listed under NSW and Commonwealth legislation
- Explicitly conclude whether the proposed activity would require a Species Impact Statement or if referral to the Commonwealth Environment Minister is warranted.

In preparing this BIA, EnviroKey have considered the following documents that guide biodiversity assessments in NSW: '*Guidelines for threatened species assessment: draft*' (DEC/DPI 2005), '*Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – working draft*' (DEC 2004), '*Threatened Species Assessment Guidelines – The Assessment of Significance*' (DECC 2007) and EPBC Act *Matters of National Environmental Significance: Significant Assessment Guidelines* (DotE 2013).

The BIA was also guided by the *Environmental Impact Assessment Practice Note: Biodiversity Assessment* (EIA-N06) which has been produced by the Roads and Maritime to assist consultants in the preparation of Biodiversity assessments (RMS 2011a).

2 METHODOLOGY

2.1 QUALIFICATIONS AND EXPERIENCE OF PERSONNEL

The BIA was prepared by suitably qualified and experienced personnel under the authority of a Scientific Licence (SL100110) issued under Clause 22 of the *National Parks and Wildlife Regulation 2002* and section 132C of the *National Parks and Wildlife Act 1974* by the NSW OEH and an Animal Research Authority (09/2596) approved by, and in accordance with, the Animal Care and Ethics Committee (ACEC) of the Director-General of Industry and Investment NSW. Details of the qualifications and experience of these personnel are provided (**Appendix 1**).

2.2 DATABASE SEARCHES

2.2.1 *NSW Office of Environment & Heritage: Threatened Species Profile database*

The NSW Office of Environment & Heritage (OEH) allow for the searching of a Catchment Management Authority (CMA) and subsequently CMA sub-regions for threatened biota that are known or predicted to occur (OEH 2016c). The study area is located within the Upper Slopes CMA sub-region of the Murray CMA.

A search conducted on the 2 February 2016 identified that 65 threatened biota, threatened ecological communities (TEC) and endangered populations are known to, or are predicted to occur within that CMA sub-region. Littoral and marine species have been excluded given the absence of suitable habitat. The search revealed the follow biota:

- Three species of amphibian
- Five species of bat
- 35 species of bird
- Five species of mammal
- Three species of reptile
- 11 species of flora
- Two threatened ecological communities.

An evaluation of the likelihood of these biota occurring within the study area and the potential for them to be impacted by the proposal is considered further within **Chapter 6** and **Appendix 5, 6, and 7**.

2.2.2 *NSW BioNet: A whole-of-government system for flora and fauna sightings*

BioNet is a portal for accessing a range of government-held information from several NSW government agencies (OEH 2016b). These being:

- NSW Office of Environment and Heritage

- National Parks and Wildlife Service
- Royal Botanic Gardens and Domain Trust
- Department of Primary Industries.
 - Forests NSW
 - Fisheries NSW
 - Australian Museum.

A search of the BioNet database conducted on 2 February 2016 was completed for entities in the locality across a 10km radius within the following categories:

- Threatened in NSW
- Threatened Nationally
- CAMBA (migratory species)
- JAMBA (migratory species)
- ROKAMBA (migratory species).

That search revealed the presence of:

- 19 species of threatened fauna
- One species of threatened flora
- Six species of migratory fauna.

Under OEH data licence agreement (CON09007), the spatial locations of these records were mapped at a scale permissible by this agreement (1:250,000) within this assessment (**Error! Reference source not found., 4 & 5**).

An evaluation of the likelihood of these biota occurring within the study area and the potential for them to be impacted by the proposal, is considered further within **Chapter 6, Appendix 5, 6 & 7**.

2.2.3 *Protected Matters Search Tool*

The protected matters search tool identifies matters of national environmental significance (NES) or other matters protected by the EPBC Act that may occur within the nominated search area (DotE 2016).

A search using this tool was conducted on the 2 February 2016 for matters of NES within the locality (10 kilometre radius). This search revealed the following:

- Three listed threatened ecological communities
- 19 listed threatened species
- 11 listed migratory species.

An evaluation of the likelihood of these biota occurring within the study area and the potential for them to be impacted by the proposal, is considered further within **Chapter 6 and Appendix 5 & 7**.

Extra information provided by the search tool that may also have relevance to this assessment includes:

- One National Heritage Place
- Seven Wetlands of International Importance
- Four areas of Commonwealth land
- Five State or Territory Reserves
- One Regional Forest Agreement
- Two nationally important wetlands
- 34 invasive species.

The Protected Matters Search Tool results are provided in **Appendix 2**.

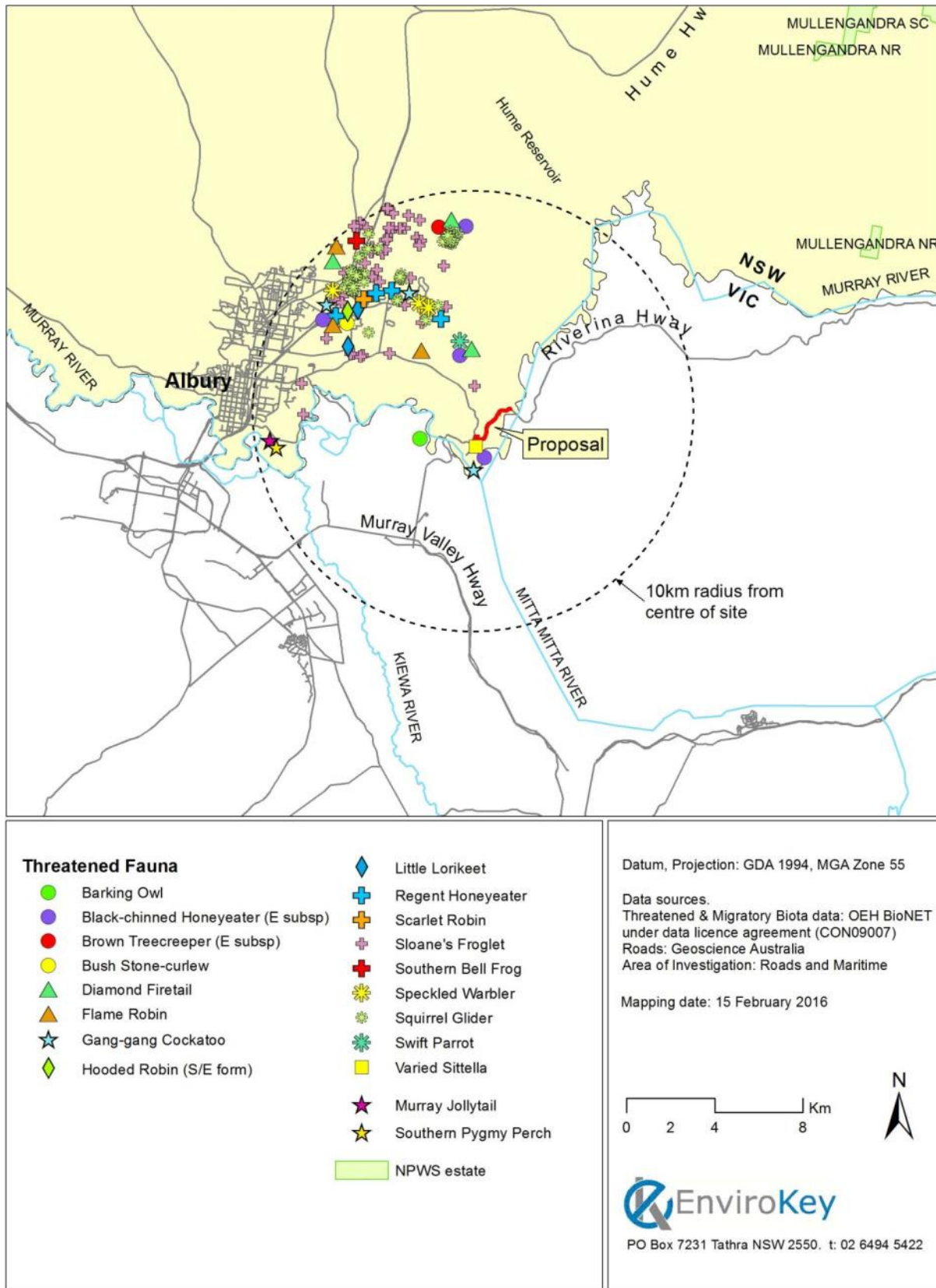
2.2.4 *Records Viewer: Threatened and Protected Fish Species*

The Records Viewer has been developed to provide access to records of threatened and protected fish species held by Industry & Investment (I&I) NSW (I&INSW 2016). Records come from a variety of sources including:

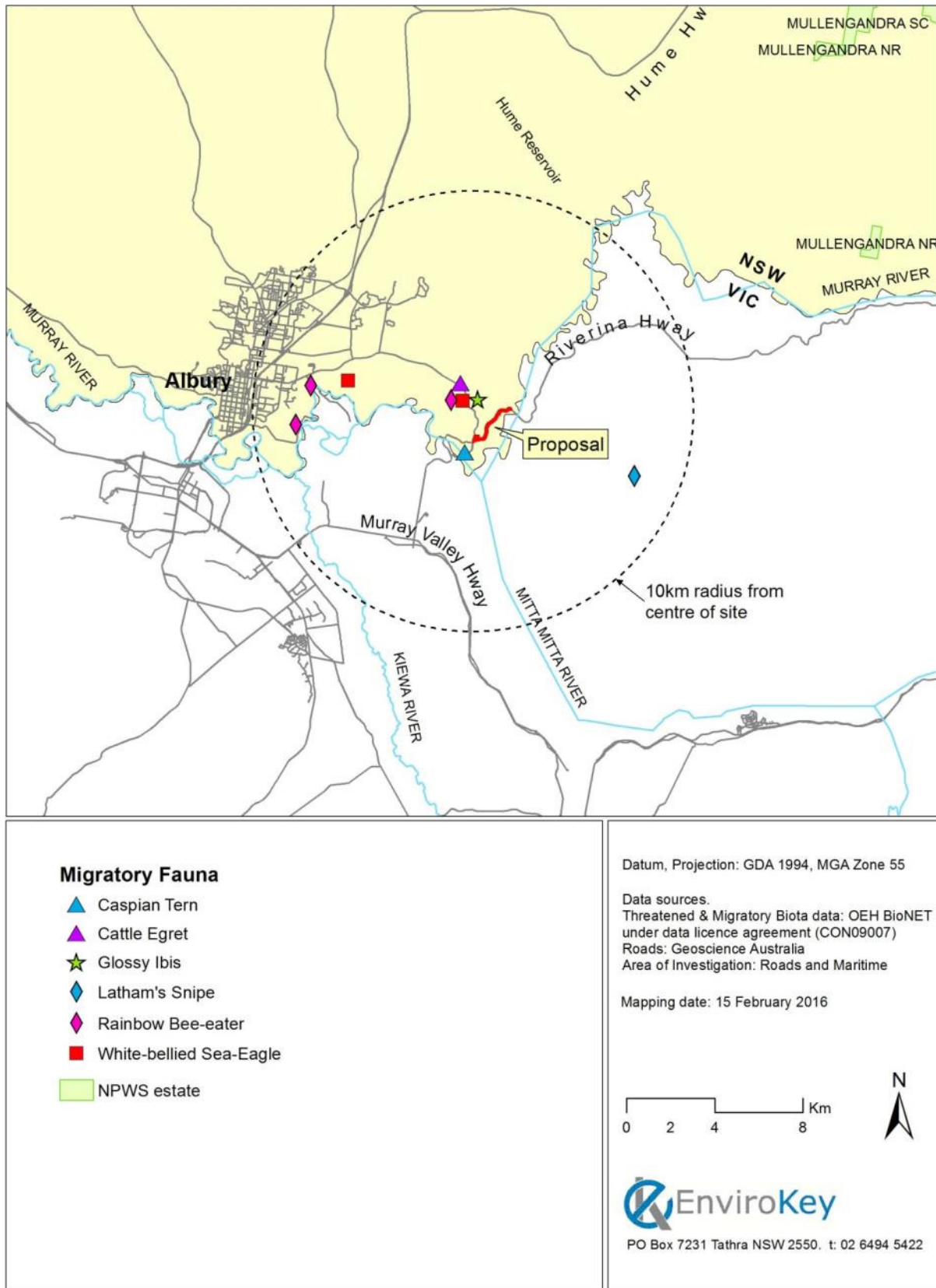
- Field survey records by I&I NSW
- Data from specific I&I NSW research projects
- Community sightings from the Protected, Threatened and Pest Species Sighting Program
- Scientific literature and published reports
- Scientific, broodstock and aquarium collection permit returns.

A search of the Records Viewer conducted on 2 February 2016, revealed a record of Murray Jollytail and Southern Pygmy Perch in Normans Lagoon, just south of Albury. These single records are the only threatened or protected fish species for the Albury LGA.

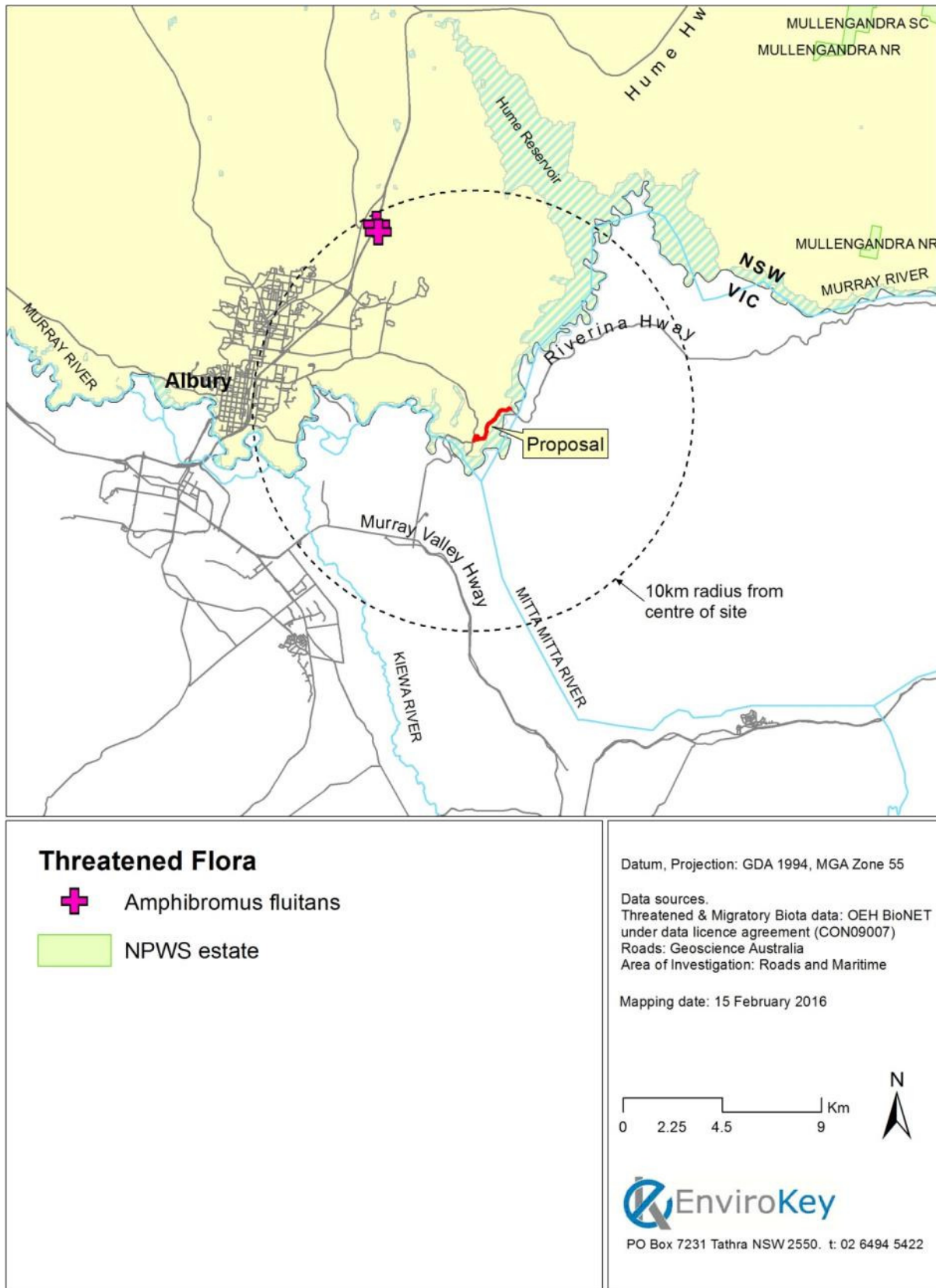
Nonetheless, an evaluation of the likelihood of aquatic species occurring within the study area and the potential to be impacted by the proposal are considered further within **Chapter 6** and **Appendix 5** in accordance with the Policy and Guidelines for fish habitat conservation and management (DPI 2013).



Map 3: Threatened fauna previously recorded within the locality of the proposal



Map 4: Migratory fauna previously recorded within the locality of the proposal



Map 5: Threatened flora previously recorded in the locality of the proposal

2.2.5 *DPI Noxious Weeds Declarations*

A search of the Department of Primary Industries (DPI) Noxious Weeds Declarations for Albury LGA was conducted. This search revealed 123 entries in that database (**Appendix 3**).

Noxious weeds are considered within **Section 3.3 and 4.4** of this BIA.

2.3 LITERATURE REVIEW

A literature review for any relevant local information was conducted on the 15 February 2016 using the internet (world wide web) using the following key words: Albury, Lake Hume Village, Riverina Highway, Biodiversity. These searches revealed the following documents:

- Albury City Biodiversity Strategy (ACC 2012)
- Albury Local Environmental Plan including relevant mapping (ACC 2010)
- Lake Hume: Land and On-water Management Plan (GMW 2008)
- Thurgoona Threatened Species Strategy (AWDC 2004)
- Albury Regional Crown Reserve and Environmental Lands - Plan of Management (GHD 2011).

A minor work review of environmental factors (MWREF) was prepared for the Riverina Highway (HW20) 2.3km West of Trout Farm Road Hazard Removal (Hawkesview) (NGH 2013). This work has been completed and adjoins the northern end of the Stage 1 project. Stage 1 is currently being constructed and was assessed and determined under an REF prepared by EnviroKey (2015).

Where appropriate, the contents of these documents are considered throughout this BIA.

2.4 SURVEY EFFORT

EnviroKey have carried out extensive field surveys to develop a comprehensive understanding of the flora, fauna, vegetation communities and fauna habitats in the vicinity of the proposal. This section provides the details of the survey effort completed while a summary is provided (**Table 2**). **Map 6** shows the spatial locations of relevant fauna surveys.

2.4.1 *Area of Investigation*

An 'Area of Investigation' was defined as the existing road reserve given that work would be mostly confined to that corridor and in some instances a buffer of up to 20 metres from the road reserve. Areas beyond the road reserve were not entered, but rather inspected from the road reserve. The 'Area of Investigation' is shown on **Map 2**. Where any area of threatened ecological community (TEC) was identified, further mapping was undertaken even if extended beyond the boundaries of the Area of Investigation.

2.4.2 Botanical Surveys

Botanical survey was undertaken over eight person hours on 1 February 2016. The vegetation communities of the study area were stratified into sampling units to ensure that the full range of potential vegetation types was systematically sampled. Within each unit, the 'random meander' method (Cropper 1993) was conducted to enable a classification to the latest vegetation mapping for the region (Benson 2006; 2008).

The methodology used to classify vegetation as native or non-native was in accordance with the definitions of the NSW *Native Vegetation Act 2003* and as used within the NSW Biometric/Biobanking assessment methodologies (DECC 2008; DECCW 2010) and the published benchmarks for each vegetation type. Vegetation was classified as native where at least one of the following criteria was met:

- Groundcover comprised greater than 50 percent live indigenous species, and 10 percent or more of the area has some form of vegetative cover whether dead or alive
- Indigenous species overstorey percent cover is at least 25 percent of the corresponding vegetation class benchmark.

Vegetation condition was assigned based on the Vegetation Communities Database and associated benchmarks (OEH 2016a). This BIA provides a quantitative assessment of vegetation condition in the study area to aid in the determination of potential impact of the proposal.

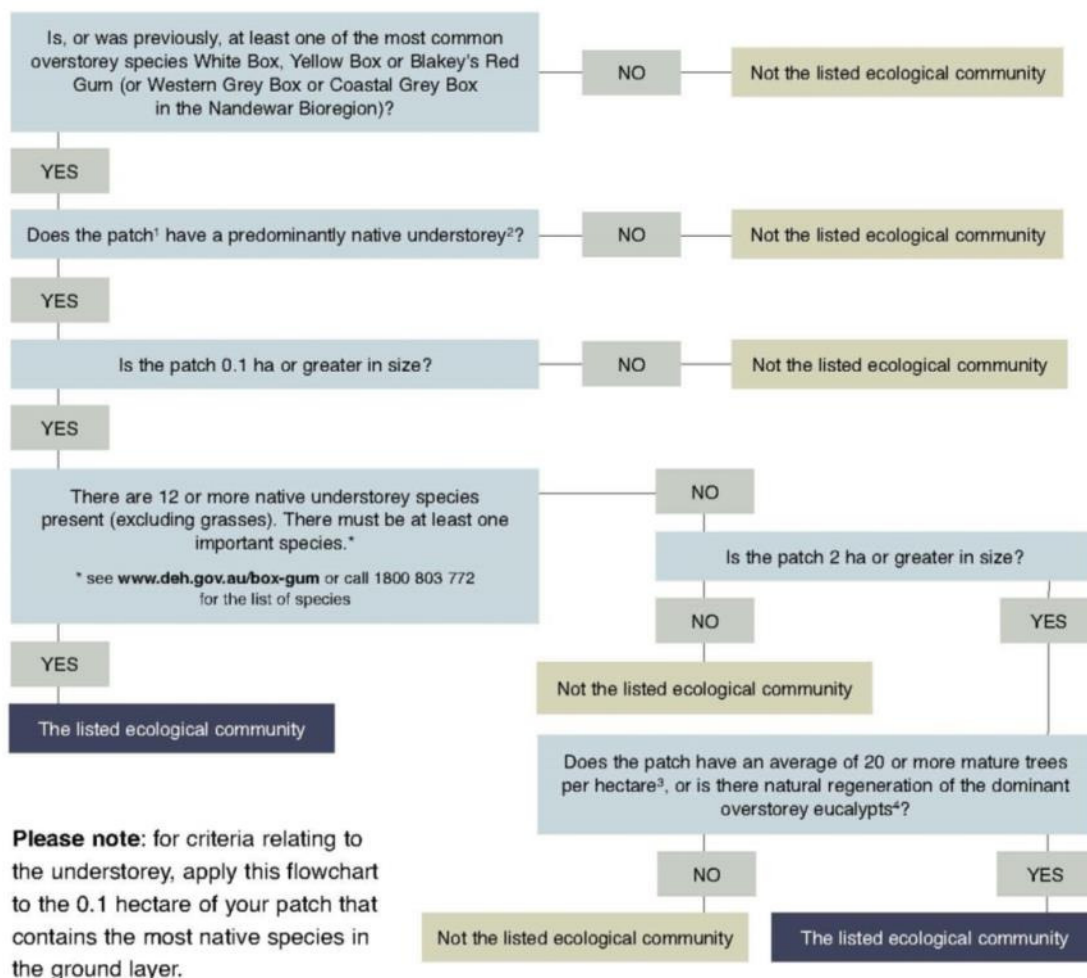
2.4.3 Threatened Ecological Communities

Vegetation communities were analysed and compared with the NSW Biometric Vegetation Communities database, determinations made by the NSW Scientific Committee in relation to the TSC Act, and information from Species Profile and Threats Database (SPRAT) (EPBC Act) to determine if any were part of a threatened ecological community (TEC). The *Threatened Species Conservation Act 1995* listed TEC White Box, Yellow Box, Blakely's Red Gum Woodland is well known from across the area and its presence was also determined for the study area.

Given that there are key differences between BGW TEC under the TSC Act and EPBC Act, the evaluation relied upon existing information from relevant agencies (**Table 1**; **Figure 1**) (DEH 2006; NPWS n.d).

Table 1: Key indicators for TSC Act listed Box-Gum Woodland TEC

1 The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions	Go to 2
1 The site is outside the above bioregions	The site is not Box-Gum Woodland
2 Understorey/groundcover has no native species in the understorey and the site is unlikely to respond to assisted natural regeneration	The site is not Box-Gum Woodland
2* The understorey is otherwise	Go to 3
3 The site has trees	Go to 4
3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing	Go to 5
4 White Box, Yellow Box or Blakely's Red Gum or a combination of these species, are or were present	Go to 5
4* White Box, Yellow Box or Blakely's Red Gum have never been present	The site is not Box-Gum Woodland
5 The site is predominately grassy	The site is Box-Gum Woodland
5* The understorey of the site is dominated by shrubs excluding pioneer species	The site is not Box-Gum Woodland



¹ Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:

- An area that contains five or more trees in which no tree is greater than 75 m from another tree; or
- The area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha or greater.

² A predominantly native ground layer is one where at least 50 percent of the perennial vegetation cover in the ground layer is made up of native species. The best time of year to determine this is late autumn when the annual species have died back and have not yet started to regrow.

³ Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

⁴ Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Figure 1: Rationale for identifying White Box- Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grasslands TEC listed under Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (DEH 2006).

The rationale for the determination of whether the vegetation is consistent with the TSC Act guidelines or the EPBC Act guidelines is included in **Section 3.5**.

2.4.4 Diurnal Birds

Diurnal bird surveys were conducted using the widely accepted 'standardised method' (Watson 2003). Within the vicinity of the proposal, seven 20 minute surveys were completed. Any species of bird observed or identified from call recognition, were recorded during the field survey period. Surveys were completed across a range of environmental variables including morning and afternoon periods to encompass the range of avifaunal assemblages and their periods of activity. Locations of diurnal bird surveys are provided in **Map 6**.

2.4.5 Nocturnal Fauna Surveys

Nocturnal fauna surveys consisted of call playback, spotlighting and echolocation call recording using an ANABAT SD1 detector unit. **Table 2** details the survey effort completed during the BIA. Call playback consisted of transmitting a pre-recorded call of an individual species, with a two minute listening period between each call. The call was transmitted using a MP3 player and FM modulator through a pair of 50W speakers. Spotlighting surveys were conducted by walking around the site looking for eye shine and any moving nocturnal fauna. One 50W handheld spotlight was used for the duration of the field surveys.

2.4.6 Systematic Reptile Search (Herpetofauna)

A systematic reptile search was conducted over the area of investigation. The survey consisted of searching for active and inactive reptiles within the road reserve. For active animals, any visible individuals were recorded. For inactive animals, hand searches comprised raking through leaf litter, inspections of cracks and crevices in rocks, trees and fallen timber, searches under rocks, and any other searchable items such as roadside litter. Survey effort totaled one person hour in the study area.

2.4.7 Amphibian Search

An amphibian search was conducted focusing on identifying areas which would be impacted by the proposal that would potentially provide habitat for amphibians. A search was completed after sunset with animals identified by aural identification and by spotlighting for any active animals. A total of one person hour was dedicated to this survey method.

2.4.8 Culvert Inspections

As culverts are known to harbor roosting locations for microchiropteran bats, all culverts within the vicinity of the proposal were visually inspected using 50W handheld spotlights in search of roosting bats, or evidence of their occupation.

2.4.9 Habitat Assessment

A general habitat assessment was conducted across the study area to develop an understanding of the proximate resources available to flora and fauna. A particular emphasis

was given to those resources that are most likely to influence the likelihood of occurrence for threatened and migratory species. These included potential movement corridors, clusters of hollow-bearing trees, native grasslands and exposed rock outcropping.

2.4.10 *Echolocation Call Analysis*

Echolocation calls recorded during the field survey (see **Table 2** for survey effort) were identified using Analoow software by visually comparing call traits with those within 'The Bat Calls of NSW: Region based guide to the echolocation calls of microchiropteran bats' (Pennay *et al.* 2004), 'Australian Bats 2nd Edition' (Churchill 2008) and a reference call collection held by EnviroKey. Analysis was completed by one of the authors (Steve Sass) given his extensive experience with the bats of the NSW south coast and microchiropteran bat call analysis. Due to the lack of 'local' reference calls, and the high level of intra-specific variability and inter-specific overlap in call characteristics, a conservative approach was taken when analysing calls. It should be noted that members of the *Nyctophilus* genus were unable to be identified to species level due to a lack of differentiation between species and are identified to genus level only.

A call was defined as a sequence of three or more consecutive pulses of similar frequency. A pulse separated from another sequence by a period of five seconds was considered to be a separate call. Scattered sequences, where intermittent pulses were not separated by more than five seconds, were recognised as a single pass. Due to variability in the quality of calls and the difficulty in distinguishing some species, each file was assigned a confidence rating as follows:

D = Definite: Species identification not in doubt.

PR = Probable: Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call types.

PO = Possible: Call characteristics are comparable with the species, but there exists a reasonable probability of confusion with one or more bat similar species or the quality or length of call prohibits a confident identification.

With regard to threatened species and in consideration of the precautionary principle, any file thought to be that of a threatened species regardless of confidence ranking was considered to be present.

2.4.11 *Squirrel Glider Survey*

During the desktop analysis, it was revealed that a known population of Squirrel Glider occurs next to the proposal. Known as the Lake Hume population, a Friends of the Spillway Gliders group was formed with the objective of maintaining and improving habitat in the Lake Hume area, as well as carry out monitoring of the population. Targeted surveys were undertaken for Squirrel Glider in areas of vegetation to be directly or indirectly affected by the proposal. The methods used included the establishment of four RECONYX PC900 HyperFire Professional High Output motion-activated infrared cameras, 10 arboreal Elliot

traps with a traditional attractant of oats, peanut butter and honey for three nights, and 10 tree mounted PVC tubes with bait attractants. The cameras and traps were removed without permission on the morning of Wednesday 16 March 2016; this was an unauthorised collection which disrupted the targeted survey method. The cameras and Elliot traps were reinstalled on Thursday 17 March 2016. Targeted nocturnal surveys were also undertaken consisting of stag watching and spotlighting which were carried out over four nights for a total of thirteen person hours. Stag watching and spotlighting are recognised survey methods for Squirrel Glider. Two 50W handheld spotlights were used for the duration of the nocturnal field surveys.

2.4.12 Nomenclature

Nomenclature for fauna was guided by the following texts: Birds (Morcombe 2004), Mammals (except microchiropteran bats) (Menkhorst and Knight 2010), Microchiropteran Bats (Churchill 2008), Frogs (Tyler and Knight 2009) and Reptiles (Swan *et al.* 2004) except where modified by recent taxonomic review (Sass 2011a; b; Swan 2013). Where no common name is provided within these texts, a generally accepted name is used. For flora, nomenclature follows that of the Flora of NSW (PlantNET 2016).

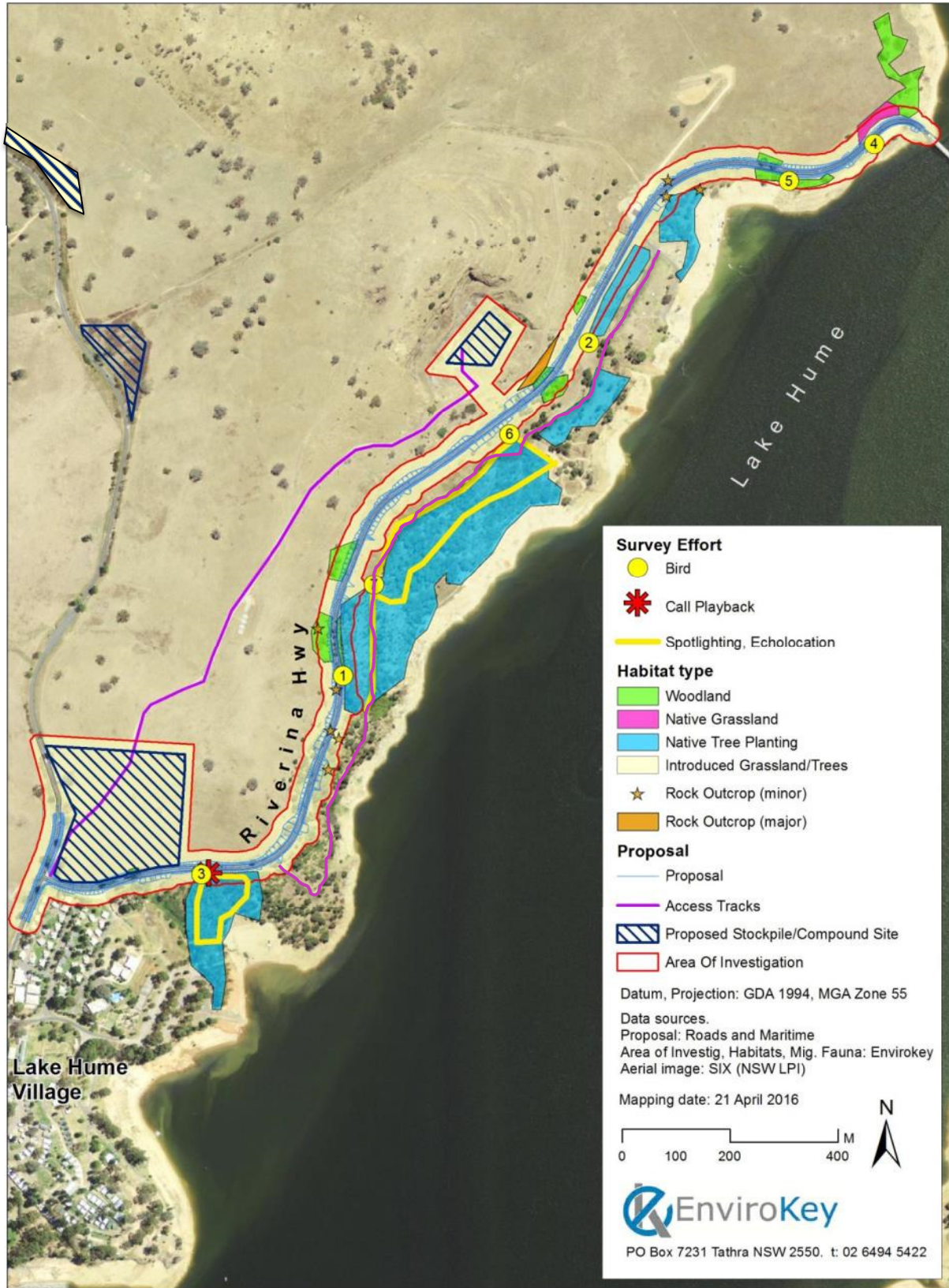
2.5 LIMITATIONS

A common limitation of many biodiversity studies is the short period of time in which they are conducted. When combined with a lack of seasonal sampling this can lead to either low detection rates or false absences being reported. This is also particularly relevant to highly mobile species that may not have been in the study area at the time of the survey. Given this, further analysis was conducted to evaluate which threatened and migratory biota were likely to occur within the vicinity of the proposal based on the presence of habitat. This is detailed within **Appendix 6**.

Table 2: Survey effort completed for this study.

Date	Survey type	Survey location and effort
01 February 2016	Botanical survey	One person x eight hours
10-11 February 2016	Bird surveys	Six x 20 minute bird surveys.
10-11 February 2016	Nocturnal survey	One person x one hour for two nights including spotlighting, call playback (species targeted during call playback were Powerful Owl, Masked Owl, Barking Owl and Bush-stone Curlew) and echolocation call recording (calling frogs also recorded).
11 February 2016	Amphibian search	One person-hour.
11 February 2016	Systematic Reptile search.	One person hour in area of investigation.
11 February 2016	Habitat Surveys including sign and scat searches	One person x three hours along the length of the proposal.

Date	Survey type	Survey location and effort
11 February 2016	Culvert Inspection (using a 50W spotlight to inspect for microchiropteran bats).	As culverts were encountered within the Area of Investigation.
14-16 March 2016 17-18 March 2016	Squirrel Glider survey - motion-activated infrared cameras	Four cameras over three nights giving a total of 12 camera nights.
14-16 March 2016 17-18 March 2016	Squirrel Glider survey – 10 arboreal Elliot traps with bait attractant	Over three nights, 30 trap nights in total
14-16 March 2016 17-18 March 2016	Squirrel Glider survey – 10 PVC tube arboreal traps with bait attractant	Over three nights, 30 trap nights in total
14-18 March 2016	Squirrel Glider survey - stag watching and spotlighting	Two persons x 6.5 hours for a total of 13 person hours



Map 6: Survey effort within the area of investigation

3 EXISTING ENVIRONMENT

3.1 LANDSCAPE CONTEXT

The study area is located within the South Western Slopes Bioregion of NSW (Thackway and Creswell 1995). The bioregion extends from just south of the Murray River (in Victoria), north to Dubbo, west to Narrandera and east to Tumut, an area comprising some 84,278 square kilometres (Thackway and Creswell 1995). The study area is located within the Murray LLS Region (previously Murray CMA region (OEH 2016c) and the Upper Slopes sub-region (NPWS 2003a)).

The landscape is characterised by steep, hilly and undulating ranges with lower slopes toward river valleys and terrace remnants (NPWS 2003a). Open forests and woodlands dominated by Red Stringybark occur on upper slopes while White Box, Yellow Box and Blakely's Red Gum occurs on lower slopes and valley floors (NPWS 2001; 2003a). Widespread clearing across the bioregion has occurred mostly on the more fertile soils that occur on the lower slopes and valley floors. This has resulted in landscape scale fragmentation of vegetation communities and fauna habitats with as little as three per cent of native vegetation remaining in some areas (Driscoll 2004; Fischer *et al.* 2004; NPWS 2001).

The study area is similar to other portions of the bioregion in that large portions of valley floors are extensively cleared, likely a result of past agricultural practices (Lindenmayer *et al.* 2005; Lindenmayer and Fischer 2006). Remnant vegetation remains in generally small isolated patches often in linear arrangements, paper roads and small, minor roads (Burrows 1999; Spooner and Lunt 2004; Walker 1997; Walker *et al.* 2001).

3.2 LANDUSE

Land use adjoining this section of the Riverina Highway consisted of agricultural activity predominately in the form of grazing. Agricultural land use is typical of the Albury area with sheep and cattle forming the majority of grazing stock observed during field surveys. A tourist resort is at the southern end of the proposal. There are also several large areas of native tree plantings adjacent to Lake Hume along the eastern side of the proposal. Lake Hume, created by the Hume Dam, is a water reservoir that captures winter and spring rainfall from the Australian Alps and is used to regulate the flow of the Murray River. It provides irrigation, stock and household needs for towns along the Murray River and is also used for flood mitigation and hydro-electricity (<http://www.waternsw.com.au>).

3.3 FLORA & VEGETATION COMMUNITIES

3.3.1 *Flora Species Richness*

The field survey identified a total of 104 flora species. These comprised:

- 35 native species (including five species that were planted or not native to the area)
- 69 introduced species.

No threatened flora were identified during the field survey.

A full list of flora species recorded during the field survey is detailed within **Appendix 4**.

3.3.2 Vegetation Communities

In the vicinity of the proposal, one native vegetation community is present in addition to planted native species which are not endemic to the area, as well as non-native vegetation consisting of introduced grasslands and trees. This section provides details of only the native vegetation community present.

Biometric Vegetation Type MU550 Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion

The native vegetation community present is most likely 'Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion' given the dominance of White Box (*Eucalyptus albens*) and the presence of Apple Box (*Eucalyptus bridgesiana*). This is listed as vegetation community MU550 in the NSW Vegetation Types Database (OEH 2016a) and is described as an 'tall grassy woodland. Occurs on clayey soils derived from fine grained sedimentary lithologies or colluvium' however within the proposal there has been significant disturbance and alteration of the community. This vegetation community is listed as a TEC in the OEH NSW Vegetation Types Database; the composition of the flora species indicates that this community fits the identification criteria for TSC Act listed White Box, Yellow Box Blakely's Red Gum Grassy Woodland (Box-Gum Woodland) and includes an area of grassland most likely derived from the clearing of the canopy species from this community. This TEC is also listed under the Commonwealth EPBC Act however it was determined that the community within the proposal does not fit the listing. The reasons for this determination are explored further in **Section 3.5**.

Table 3 provides a summary of this vegetation community within the study area. **Map 7** details the extent of the community while **Figure 2** shows photographic examples.

Table 3: Summary of BVT MU550 Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion.

Descriptor	Response
Extent within footprint (approx.)	0.208 hectares (0.207 hectares with canopy and 0.001 hectares of derived native grassland) of MU550 Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion occur within the proposal footprint and would be impacted by the proposal (detailed in Map 7). A total of 2.098 hectares occurs adjacent to and within the proposal with additional extent predicted given that mapping ceased.
Description	Canopy: A tall grassy woodland with White Box (<i>Eucalyptus albens</i>) canopy and scattered occurrences of Apple Box (<i>E. bridgesiana</i>). Where still present the canopy height ranged from 15 metres up to about a maximum of 20 metres tall.

Descriptor	Response
	<p>Understorey: There was no native shrub layer present. Some patches had regrowth White Box or introduced woody weeds such as broad-leaved Privet.</p> <p>Groundcover: This was most often dominated by introduced species, such as Paspalum, Oats and other grasses. The area of derived native grassland most likely created as a result of the removal of the canopy of this community, was mostly dominated by Kangaroo Grass (<i>Themeda triandra</i>).</p>
Condition	Moderate to good condition in accordance with BBAM. However, exotic flora dominates this BVT.
Threatened flora	None recorded however possible habitat for Small Scurf-pea (<i>Cullen parvum</i>) which has been recorded in grazed paddocks.
Threatened community?	Yes, this vegetation type is listed as a TEC. The flora present corresponds with the identification guidelines for Box-Gum Woodland (NPWS undated). This TEC is listed under the TSC Act and the EPBC Act however the community onsite does not fit with the criteria for the EPBC Act TEC.



Map 7: Vegetation communities present within and connected to the study area



Figure 2: Examples of BVT MU550, including derived native grassland, within the proposal

3.4 FAUNA AND THEIR HABITATS

3.4.1 *Fauna Species Richness*

A total of 61 fauna species were recorded during the field surveys which comprised:

- 47 species of bird

- 14 species of mammal (including eight species of microchiropteran bat).

The fauna species detected in the surveys are typical of those occurring in disturbed landscapes, woodlands without connectivity corridors and water reservoirs such as in the vicinity of the proposal.

A total of 151 files were analysed from the microchiropteran bat echolocation call recording surveys undertaken for the BIA. The species of bats recorded and the analysis confidence level of each call recorded for each species is included in **Table 4**. Calls recorded as 'unknown' did not have enough attributes to identify properly. Calls recorded as 'not bat' were not of bat origin and may include insects or other sources.

A list of all fauna species recorded during surveys is detailed within **Appendix 5**.

Table 4: Confidence level of echolocation call analysis

Species Name	Common Name	Confidence Level		
		Possible	Probable	Definite
<i>Chalinobolus gouldii</i>	Gould's Wattled Bat	5	21	27
<i>Chalinobolus morio</i>	Chocolate Wattled Bat	1	1	0
<i>Mormopterus ridei</i>	Eastern Freetail Bat	4	0	0
<i>Nyctophilus sp.</i>		1	0	5
<i>Scotorepens greyii</i>	Little Broad-nosed Bat	1	1	0
<i>Vespadelus darlingtoni</i>	Large Forest Bat	6	7	1
<i>Vespadelus regulus</i>	Southern Forest Bat	3	10	4
<i>Vespadelus vulturnus</i>	Little Forest Bat	1	13	8
Unknown		1	0	25
Not of bat origin		0	0	5
Total		23	53	75

3.4.2 Fauna Habitats

Four general fauna habitats are present within the study area (woodland, native tree planting, rock outcrops and introduced grassland/trees) (**Map 8**). This section provides discussion on each of these fauna habitats.

Woodland

Woodland habitat comprises a small proportion adjacent to and within the existing road reserve and portions of the area of investigation. Given the size, quality and condition, these habitats are unlikely to provide important resources for woodland fauna at the landscape scale (Lindenmayer and Fischer 2006). Key microhabitat resources such as fallen timber are mostly absent (see **Figure 3**) and while some leaf litter is present, it adds little in habitat

quality given the absence of fallen timber. Though there were some hollows in these trees, they were most often small and in the form of vertical crevices in the trunks therefore the habitat present is at best, in low condition for fauna.



Figure 3: Woodland habitat within the vicinity of the proposal

Derived Native Grassland

This habitat type is most likely derived from the clearing of the canopy species from the woodland habitat for agricultural purposes. In this habitat, some native grasses persist, usually those grasses that benefit from disturbance or often form dense swards and exclude most other species. The grassland within the area of investigation was mostly dominated by Kangaroo Grass (*Themeda australis*) and had very low diversity. Key microhabitat resources such as fallen timber and leaf litter are mostly absent (see **Figure 4**) therefore the habitat present is at best, in low condition for fauna.



Figure 4: Derived native grassland habitat within the area of investigation

Native Tree Planting

The native tree planting comprises a reasonable portion adjacent to and within the existing road reserve and portions of the area of investigation. The planting contains mostly Spotted Gum (*Corymbia maculata*) and Lemon Gum (*C. citriodora*) with some Ironbarks (*Eucalyptus*

sp.) and Wattles (*Acacia sp.*). Some of the trees within the plantings are of a significant size and it is estimated that the plantings are over 30 years of age. There was evidence of tidying being undertaken within the patches however this was mostly removal of woody weed species. In most cases, key habitat features such as any fallen timber had been retained on the ground along with leaf litter which remains at a moderately good level. Some small hollows were observed in the trees within these plantings, most probably due to some sort of damage sustained when the trees were just saplings. Nest boxes had also been installed. The native tree plantings are shown in **Figure 5**.



Figure 5: Native tree planting habitat within the vicinity of the proposal

Rock Outcrops

Rock outcrops were reasonably common along the length of the proposal and within the disused quarry. These were a combination of large, partially submerged rocks with large cracks or crevices and some smaller surface rocks. Most of these features were small and isolated from other outcrops and dominated by introduced species such as grasses or woody weeds such as Privet or Pine Trees. One significant rock outcrop was located within the area of investigation (see **Figure 6**) however this was most likely created by the quarry next to the road reserve. Though it is probably not a natural feature, the amount of loose surface rock could potentially provide significant habitat to many reptiles and small mammals.



Figure 6: Rock outcrop habitat within the vicinity of the proposal

Introduced Grassland/Trees

These areas of habitat consist mostly of common introduced grasses such as Bearded Oat (*Avena fatua*), Tall Fescue (*Festuca arundacea*), Caterpillar Grass (*Paspalum dilatatum*), Kikuyu (*Pennisetum clandestinum*) and Phalaris (*Phalaris aquatica*). These grasses sometimes occur as a mixture or in dense stands totally dominated by one species. Additionally scattered throughout the road reserve and area of investigation were introduced trees such as Radiata Pine (*Pinus radiata*), Large-leaved Privet (*Ligustrum lucidum*) and various fruits (Apple, Nectarine, see **Appendix 4**). Generally these types of habitat do not provide habitat for threatened species known from the wider locality. Introduced fauna was common, and included Rabbit. Common native farmland birds including Australian Magpie were also present.



Figure 7: Introduced grassland/tree habitat within the vicinity of the proposal

Hollow-bearing trees

A total of 16 hollow-bearing trees were identified within the area of investigation. These comprised 23 hollows of which 20 were small, two medium and one large (**Table 5**). A total of nine nest boxes were recorded in the native tree planting adjacent to the proposal area

which contain nine small sized openings. The size class of the hollows was determined as follows:

- Small - less than 10 centimetres in diameter
- Medium - 10 to 20 centimetres in diameter
- Large - 20 to 30 centimetres in diameter
- Extra-large - greater than 30 centimetres in diameter.

Though none of the nest boxes are within the potential impact area, they are considered an important habitat resource. The spatial extent of all hollow-bearing trees and nest boxes is identified on **Map 8**. A photographic example of HBTs from within the study area and also the nest boxes identified is included in **Figure 8**.

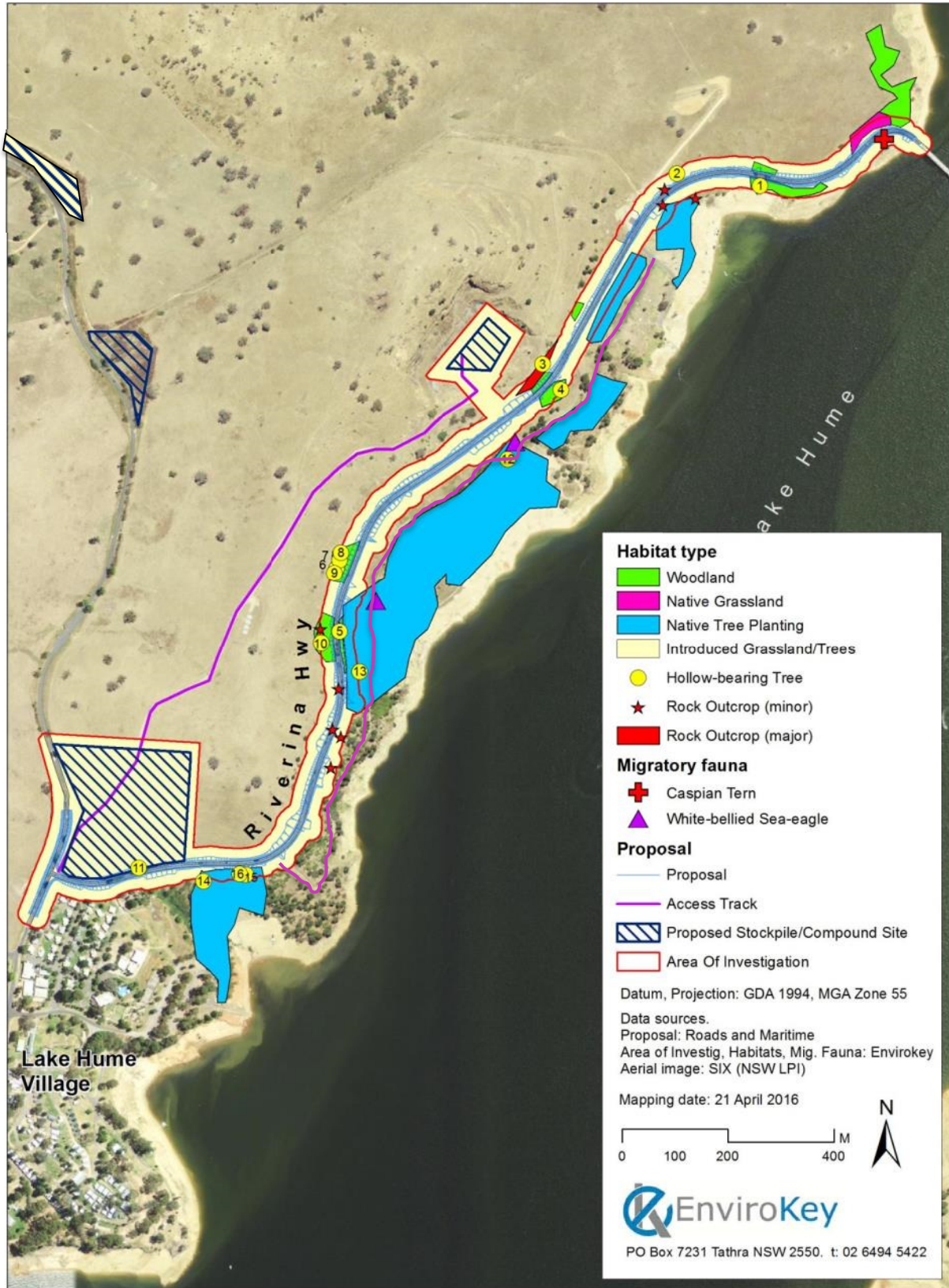
Table 5: Hollow-bearing trees and their attributes within the vicinity of the proposal.

HBT ID	Description	Small	Medium	Large	X-Lge
1	Alive, White Box with crevices	2	-	-	-
2	Large dead tree, in private property	1	-	-	-
3	Dead stag with epicormics growth at base, White Box	2	-	-	-
4	Alive, White Box	1	-	-	-
5	Alive, White Box	2	-	-	-
6	Alive, White Box with crevices, in private property	1	-	-	-
7	Alive, White Box, in private property	1	2	-	-
8	Alive, White Box with crevices, in private property	3	-	-	-
9	Dead stag with crevices, in private property	1	-	-	-
10	Alive, White Box with crevices	2	-	-	-
11	Alive, Long-leaved Bundy, hollow with bees	1	-	-	-
12	Nest box in native tree planting	1	-	-	-
13	Spotted Gum in native tree planting with	1	-	-	-

HBT ID	Description	Small	Medium	Large	X-Lge
	crevices				
14	Spotted Gum in native tree planting	1	-	-	-
15	Spotted Gum in native tree planting with large crevice	-	-	1	-
16	Spotted Gum in native tree planting with crevice	1	-	-	-
17 - 24	Nest box in native tree planting	8	-	-	-
Totals		29 (9 nest boxes)	2	1	0



Figure 8: HBT and nest box habitat within the vicinity of the proposal



Map 8: Fauna Habitats within the vicinity of the proposal

3.5 THREATENED ECOLOGICAL COMMUNITIES

Biometric vegetation type MU550 Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion is listed as a TEC within the NSW Vegetation Types Database (OEH 2016a) and qualifies as the TEC White Box, Yellow Box Blakely's Red Gum Grassy Woodland as listed under the TSC Act. This was determined using the Identification Guidelines for Endangered Ecological Communities (NPWS n.d.). These 'Key Indicators' for White Box, Yellow Box Blakely's Red Gum Grassy Woodland listed within the identification guidelines are represented in **Table 1** and how the patches of vegetation onsite meet the criteria in **Table 6**.

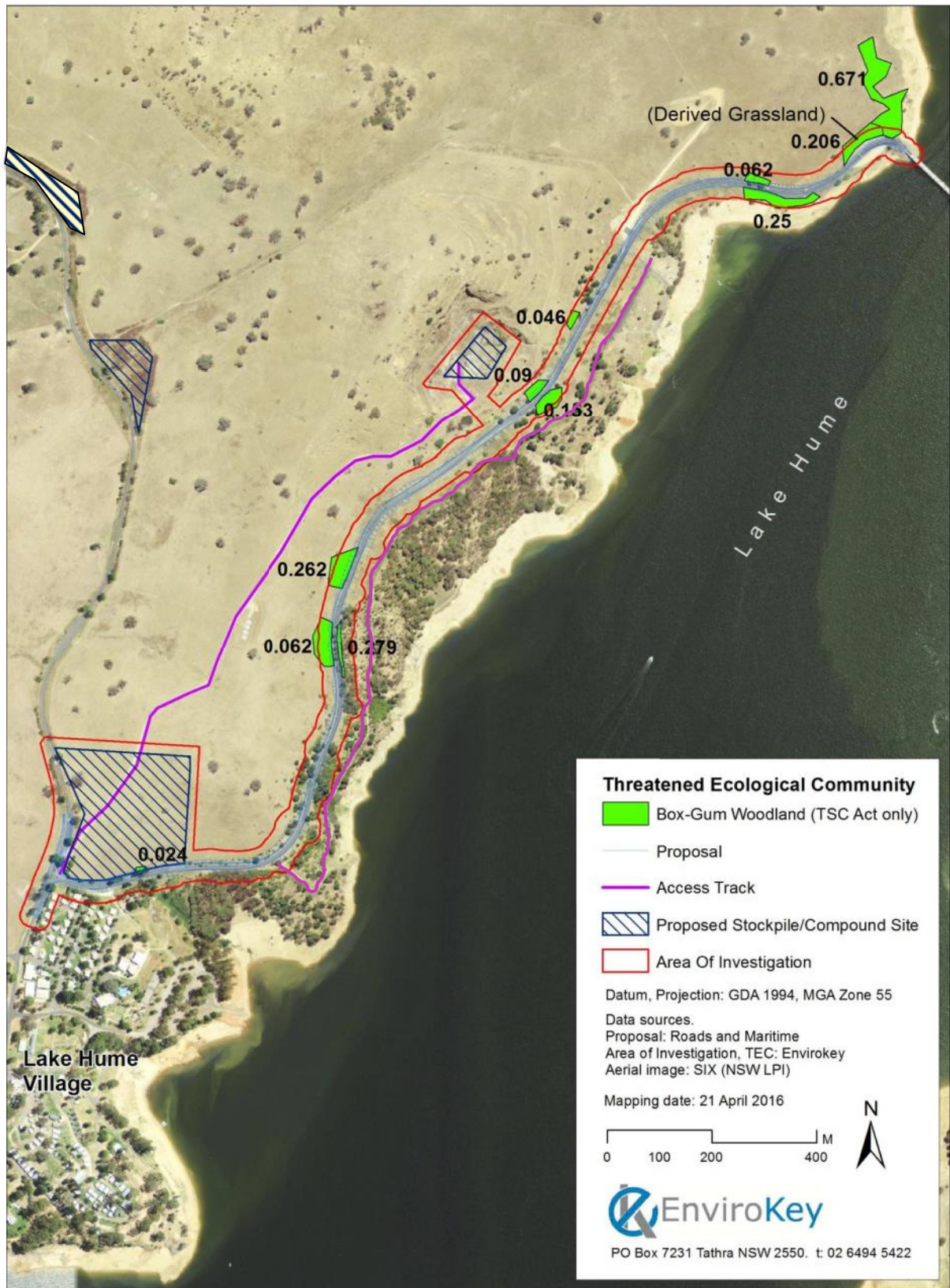
Table 6: How vegetation within the area of investigation meets the key indicators for TSC Act listed Box-Gum Woodland.

Key Indicator	Site Characteristics
The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions.	The site is located in the South Western Slopes.
There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration. NB: This would normally indicate that the vegetation <u>is not</u> Box-Gum Woodland, see opposite.	The definition of the Box-Gum Woodland explicitly recognises that some remnants are degraded. Highly disturbed sites that have few if any native species in the understorey are specifically included in the community provided " <i>vegetation, either understorey or overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.</i> " The vegetation patches within and next to the area of investigation have not been subject to intensive cropping and therefore it is assumed that a natural seed bank is still present. It was determined that the patches would respond to assisted natural regeneration due to presence of mature canopy trees and therefore fits the criteria.
The site has trees? Or The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing?	Both of these conditions occur onsite with some patches with canopy trees mostly consisting of White Box, however there are also patches of native grassland most likely derived from clearing of this community.
White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present?	White Box present.

Key Indicator	Site Characteristics
The site is predominantly grassy?	The patches of vegetation are predominately grassy however due to disturbance most are dominated by introduced species on the ground. However there are no shrubs dominant.

White Box, Yellow Box Blakely's Red Gum Grassy Woodland threatened ecological community (TEC) is listed as 'endangered' under the NSW *Threatened Species Conservation Act 1995*. The extent (in hectares) and condition of TEC within the vicinity of the proposal is detailed in **Map 9**.

The patches of vegetation within the area of investigation do not meet the criteria for listing under the EPBC Act. The patch meets the first criteria in **Figure 1**, in that one of the most common overstorey species was White Box, however the patches do not have a predominately native understorey. Additionally, some of the patches are smaller than 0.1 hectare (see **Map 9**) which does not meet the EPBC Act requirement for a patch which is a continuous area containing the ecological community, assessed at a scale of 0.1 hectares or greater.



Map 9: Extent of threatened ecological communities within the study area including where they extend beyond the study area. Patch size shown in hectares (ha)

3.6 GROUNDWATER DEPENDENT ECOSYSTEMS

Groundwater dependent ecosystems (GDE) are generally defined as natural ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their ecological processes.

A search of the Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems maps, indicate that there is a billabong located about 1.5 kilometres to the south-west of the proposal, which is a floodplain water body and is highly reliant on surface expression of groundwater. This water body would not be impacted by this proposal.

The Murray River, in the proximity of the proposal, is an open water body and is a combination of low and moderate reliance on surface expression of groundwater (BOM 2014). Though the Murray River feeds Lake Hume, in this location next to the proposal the river is incorporated into Lake Hume.

3.7 THREATENED SPECIES AND ENDANGERED POPULATIONS

The desktop analysis and literature review found that threatened biota are regularly recorded in the locality. Field surveys confirmed the presence of Squirrel Glider, listed as vulnerable under the TSC Act. One *Nyctophilus* sp. was recorded, however due to the difficulty of determining this genus to species level from the calls, it was identified to genus level only. This *Nyctophilus* sp. was treated as though it was a threatened species for the assessment of significance undertaken in **Appendix 7 & 8**.

Map 3 indicates the location of threatened species that have been recorded within the locality. Threatened species from Bionet (2016) records previously identified in the locality (within a 10 kilometre radius) include the following fauna species:

- Sloane's Froglet (*Crinia sloanei*) Vulnerable, TSC Act
- Southern Bell Frog (*Litoria raniformis*) Endangered, TSC Act, Vulnerable, EPBC Act
- Regent Honeyeater (*Anthochaera phrygia*) Endangered, TSC Act, Critically Endangered, EPBC Act
- Bush Stone-curlew (*Burhinus grallarius*) Endangered, TSC Act
- Gang Gang Cockatoo (*Callocephalon fimbriatum*) Vulnerable, TSC Act
- Speckled Warbler (*Chthonicola sagittata*) Vulnerable, TSC Act
- Brown Treecreeper (*Climacteris picumnus victoriae*) Vulnerable, TSC Act
- Varied Sittella (*Daphoenositta chrysoptera*) Vulnerable, TSC Act
- Little Lorikeet (*Glossopsitta pusilla*) Vulnerable, TSC Act
- Swift Parrot (*Lathamus discolor*) Endangered, TSC Act, Endangered, EPBC Act
- Hooded Robin (*Melanodryas cucullata cucullata*) Vulnerable, TSC Act
- Black-chinned Honeyeater (*Melithreptus gularis gularis*) Vulnerable, TSC Act
- Barking Owl (*Ninox connivens*) Vulnerable, TSC Act
- Scarlet Robin (*Petroica boodang*) Vulnerable, TSC Act
- Flame Robin (*Petroica phoenicea*) Vulnerable, TSC Act

- Diamond Firetail (*Stagonopleura guttata*) Vulnerable, TSC Act
- Squirrel Glider (*Petaurus norfolcensis*) Vulnerable, TSC Act.

Threatened species from Bionet (2016) records previously identified in the locality (within a 10 kilometre radius) include the following flora species:

- River Swamp Wallaby-grass (*Amphibromus fluitans*) Vulnerable, TSC Act, Vulnerable, EPBC Act.

Threatened species records from the DPI Threatened and Protected Species - Records Viewer revealed the following records within a 10 kilometre radius:

- Murray Jollytail (*Galaxias rostratus*), Critically Endangered, FM Act
- Silver Perch (*Bidyanus bidyanus*), Vulnerable, FM Act.

No endangered populations are listed within the Albury LGA by the TSC Act, and none were identified during the field surveys. During the field surveys, a number of nest boxes were observed within the native tree plantings next to Lake Hume. Subsequent research determined that the Woolshed Thurgoona Landcare Group installed the nest boxes and have recorded Squirrel Gliders (*Petaurus norfolcensis*), listed as vulnerable under the TSC Act, within this area.

EnviroKey carried out additional targeted surveys for this species to determine its absence or presence and provide more current information. A Squirrel Glider was recorded by remote sensing camera using one of the nest boxes onsite (see **Map 8** and **Figure 9**). According to Stuart Lucas, OEH (pers.com), from the Friends of the Spillway Gliders Group (affiliated with the Woolshed Thurgoona Landcare Group), there are about 30 nest boxes spread out over the native tree plantings in the area between Bethanga Bridge and the Hume Dam spillway next to Lake Hume Village. About four individuals have been observed in the native tree planting next to the proposal however none were recorded in this planting in the last two monitoring events undertaken by that group. The last monitoring undertaken indicated that up to 15 of the 30 nest boxes were being used by the gliders across the area.



Figure 9: Squirrel Glider captured by remote sensing camera

One other threatened species was also recorded during the field surveys, Grey-headed Flying Fox (*Pteropus poliocephalus*). These were recorded feeding on flowering eucalypts.

An assessment for the potential of other threatened species to occur within the vicinity of the proposal, but went undetected in surveys, is provided in **Appendix 6**. This revealed that a total of 21 threatened biota (including 16 species listed under the TSC Act and two vulnerable species and four migratory species listed under the EPBC Act, Superb Parrot is listed under both) could occur in the vicinity of the proposal.

3.8 MIGRATORY AND MARINE SPECIES

The desktop analysis and literature review found that migratory biota have been previously recorded in the locality. Three migratory fauna species listed by the EPBC Act were recorded during the field surveys (see **Map 8**). These were White-bellied Sea-eagle (*Haliaeetus leucogaster*), Caspian Tern (*Hydroprogne caspia*) and Rainbow Bee-eater (*Merops ornatus*), all of which have been recorded at Lake Hume previously. Three White-bellied Sea-eagles were observed including two adults and one juvenile which suggests that these animals could be breeding somewhere in the locality around Lake Hume.

Map 4 indicates the location of migratory species that have been recorded within the locality. Migratory species from Bionet (2016) records previously identified in the locality (within a 10 kilometre radius) include the following fauna species:

- Cattle Egret (*Ardea ibis*), CAMBA, JAMBA, EPBC Act
- Latham's Snipe (*Gallinago hardwicki*), CAMBA, JAMBA, ROKAMBA, EPBC Act
- White-bellied Sea-eagle (*Haliaeetus leucogaster*), CAMBA, EPBC Act
- Caspian Tern (*Hydroprogne caspia*), CAMBA, JAMBA, EPBC Act
- Rainbow Bee-eater (*Merops ornatus*), JAMBA, EPBC Act
- Glossy Ibis (*Plegadis falcinellus*), CAMBA, EPBC Act

An assessment for the potential for other migratory species to occur within the vicinity of the proposal but went undetected is provided in **Appendix 5**.

No marine species are expected to occur given the absence of habitat.

3.9 WILDLIFE CONNECTIVITY CORRIDORS

Current connectivity between vegetation on either side of the existing pavement is very low. Higher quality corridors (where canopy vegetation provides connectivity between larger patches and forms patches of greater width than those within the road corridor) are not present elsewhere in the locality including of the proposal. Therefore it was determined that the proposal is likely to have no negative affect on the potential wildlife corridors or markedly increase habitat fragmentation. However it has been revealed that there was large scale removal of pine trees between the native tree plantings present next to the site. These plantings are now separated by large open areas where once large trees were present. It is believed that these trees were providing a means of movement between native tree plantings for the threatened Squirrel Glider which have been previously recorded there and subsequently recorded during targeted surveys for this BIA. Additionally, individual Squirrel Gliders have been observed crossing the Riverina Highway from the tree plantings to the opposite side of the highway (in the central portion of the proposal) (pers. comm. Stuart Lucas), likely to be either dispersing or feeding on isolated paddock trees. This existing canopy gap is about 10 metres across the Riverina Highway in this area where gliders have been observed crossing.

3.10 STATE ENVIRONMENTAL PLANNING POLICY NO. 44

State Environmental Planning Policy (SEPP 44) encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free-living populations will be maintained over their present range across 107 council areas. SEPP 44 aims to identify areas of *potential* and *core* Koala Habitat. These are described as follows:

- *Potential Koala Habitat* is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component; and
- *Core Koala Habitat* is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

Albury LGA is not listed within schedule 1 of this planning instrument/policy however the canopy species present onsite, White Box (*Eucalyptus albens*) is listed under schedule 2 of SEPP 44 as a feed tree species, therefore this proposal requires consideration of SEPP 44. This is undertaken in **Section 4.11** of this BIA.

4 POTENTIAL IMPACT

Road construction and operation can have a range of potential impacts to biodiversity. The potential impacts as a result of this proposal are summarised below and in the following sections. These include:

- Loss of native vegetation (including threatened ecological communities) and their habitats
- Loss of fauna habitats
- Direct mortality of protected and threatened fauna
- Loss of connectivity through the degradation of wildlife and habitat corridors
- Invasion and spread of weeds and pest fauna species
- Changes to water quality as a result of the work in or adjacent to aquatic habitats and alterations to natural hydrological flows
- Edge effects from noise, vibration and light
- Introduction or increased exposure to key threatening processes that may affect terrestrial and aquatic species, populations, ecological communities and their habitat (including threatened biota)
- Regional cumulative impact affecting the long-term viability and survival of common and threatened species, populations and ecological communities and their habitats.

The key principle of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) is that Roads and Maritime should aim to:

- Avoid and minimise impact
- Mitigate impact where avoidance is not possible
- Offset where residual impact cannot be avoided.

Measures to mitigate impact during the construction and operation of the proposal are presented in **Chapter 5**.

4.1 LOSS OF VEGETATION AND HABITAT

Clearing of native vegetation is a key threatening process listed under the TSC Act and the EPBC Act (also refer to **Section 4.10**).

The proposal would result in the clearing of about 0.208 hectares of native vegetation and habitat and about 0.037 hectares of native tree plantings and habitat. This estimate has been calculated based on the footprint of the proposal using a GIS shapefile (and the addition of a five metre clear zone) overlain onto vegetation community mapping completed during field surveys specific to this proposal. Additional impact of about 1.735 hectares would be confined to areas dominated by introduced trees, grasses and pasture species (see **Table 7**) and a further 0.011 hectares in highly disturbed areas. No additional clearing is expected for potential ancillary facilities as these would be confined to existing stockpile and compound sites or highly disturbed areas. Up to two hollow-bearing trees would also be

removed resulting in the loss of about three small hollows. However no impact is expected to trees with previously installed nest boxes or HBTs within the native tree plantings.

Table 7: Summary of vegetation loss for the proposal by biometric vegetation type and area.

Biometric Vegetation Type	Quantity Present (hectares)	Direct loss (hectares)
BVT MU550 Grassy White Box - Blakely's Red Gum - Yellow Box Woodland of the NSW South Western Slopes Bioregion	1.894 (0.734 outside AOI)	0.207
BVT MU550 Grassy White Box - Blakely's Red Gum - Yellow Box Woodland of the NSW South Western Slopes Bioregion - Derived Native Grassland	0.204 (0.054 outside AOI)	0.001
Native tree planting	11.313	0.037
Introduced grassland/trees	14.281	1.735
Highly disturbed/cleared	0.288	0.011
Total	27.98	1.991

With consideration of BBAM, the vegetation that would be removed as a result of the proposal is in moderate-good condition as native overstorey percent foliage cover is within 25 percent of the lower benchmark value for that vegetation type.

4.1.1 *Threatened Ecological Communities*

Of the 0.208 hectares of native vegetation to be cleared, all of this comprises a threatened ecological community (TEC) listed under the TSC Act. The TEC type and impact are present in **Table 8**, and additional to the impact there would be likely indirect impact from edge effects.

Table 8: Summary of impact on threatened ecological communities.

Threatened Ecological Community	Direct impact (hectares) (TSC Act only)
Box-Gum Woodland	0.207
Box-Gum Woodland - Derived Native Grassland	0.001
Total	0.208

4.1.2 *Threatened Species Habitat*

One threatened species, Squirrel Glider, was observed using nest boxes which are an artificial habitat installed in the trees within the native tree planting next to the proposal. According to the Thurgoona Woolshed Landcare Group, Squirrel Gliders have been regularly recorded within these native tree plantings. Therefore the native tree planting which

would be impacted by the proposal would be considered habitat for this threatened species. The loss of fauna habitat according to habitat type is summarised in **Table 9**.

As discussed, the proposal would result in the clearing of about 0.208 hectares of native vegetation and about 0.037 hectares of native tree plantings. Two hollow-bearing trees would be removed (HBT5 and HBT 11, **Table 5**).

There were two threatened species detected during the field surveys, Squirrel Glider and Grey-headed Flying Fox, with another 13 threatened fauna species predicted to have a moderate to high potential to occur in the study area. The significance of the impact is assessed further in **Appendix 7 and 8**. No impact to any aquatic fauna species listed under the FM Act are anticipated.

Table 9: Summary of impact on threatened species habitat.

Habitat Type	Direct loss (Hectares or Quantity)
Woodland	0.207
Native tree planting	0.037
Derived Native Grassland	0.001
Non-native vegetation	1.735
Disturbed/cleared	0.011
Total	1.991

4.2 WILDLIFE CONNECTIVITY AND HABITAT FRAGMENTATION

Current connectivity between vegetation on either side of the existing pavement is very low for the majority of the proposal. Higher quality corridors (where canopy vegetation provides connectivity between larger patches and forms patches of greater width than those within the road corridor) are not present elsewhere in the locality including of the proposal. However large scale removal of pine trees between the native tree plantings has occurred reducing general connectivity across this landscape. These plantings are now separated by large open areas where once large trees were present. It is believed that these trees were providing a means of movement between native tree plantings for the threatened Squirrel Glider which have been previously recorded there and subsequently recorded during targeted surveys for this BIA. Further, individual Squirrel Gliders have been observed crossing Riverina Highway from the tree plantings to the opposite side of the highway to Box-Gum Woodland (pers. comm. Stuart Lucas, OEH), likely to be either dispersing or feeding on isolated paddock trees. The proposal will increase the existing canopy gap from 10 metres to up to 25 metres in the central portion of the study area, where gliders have been observed crossing. This does not represent a risk for any gliders remaining in this landscape given that the new gaps are considered well below the general threshold of the gliding ability for this species (around 40 metres) (Van der Ree 2002).

4.3 INJURY AND MORTALITY

Fauna injury or mortality can occur during the clearing phase of construction during the removal of habitat and from collision with vehicles during the operation of the proposal.

4.3.1 Construction Impact

It is anticipated that some diurnal and mobile fauna species such as birds and larger reptiles may be able to move from the path of construction equipment during any clearing operations, other fauna species such as those that are less mobile and nocturnal, are less likely to move away from clearing activity.

4.3.2 Operational Impact

Operational impact is not expected to increase above mortality pre-existing on the Riverina Highway.

4.4 WEEDS

A total of 69 weed species were recorded from field surveys within the vicinity of the proposal. Of these, five were listed as declared noxious weeds in the Albury LGA; (DPI 2015). These were African Lovegrass (*Eragrostis curvula*), Blackberry (*Rubus fruticosus* agg.), St. John's Wort (*Hypericum perforatum*), Sweet Briar (*Rosa rubiginosa*) and Tree-of-heaven (*Ailanthus altissima*). The Tree-of-heaven and Sweet Briar were mapped as they were located in discrete areas (see **Map 7**) whereas the African Lovegrass, Blackberry and St. John's Wort were scattered throughout the area of investigation.

There is some potential to disperse noxious and environmental weed plant material into retained areas of native vegetation, the most likely cause would be through the movement of soil by construction vehicles and machinery involved with the initial clearing and earthworks. However due to the absence of good quality native vegetation in close proximity to the proposal, the potential for and significance of this impact in adjacent grazing land is low due to the already existing potential for exposure to these weeds.

All of the above species are listed as Class 4 noxious weeds. This means that the growth of these species must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.

The woody weeds present also pose a significant threat, in particular the Broad and Small-leaved Privet (*Ligustrum spp.*), English Elm (*Ulmus procera*) and Tree-of-heaven (*Ailanthus altissima*). The Privets are common throughout the study area while the English Elm and Tree-of-heaven are yet to become widely established. Though there was evidence of large scale removal of some of the other common woody weeds such as Radiata Pine (*Pinus radiata*) these weeds could become a problem due to their ability to spread quickly and create dense stands that exclude the growth of native species. English Elm and Tree-of-heaven is particularly problematic due to its ability to resprout from damaged stem and root

sections. Privet is also problematic due to the large amount of berries formed during fruiting which are spread easily by birds. The proposal has the potential to spread these species as seeds or roots in the soil and by creating conditions of disturbance which are often beneficial to many introduced species.

4.5 PESTS AND PATHOGENS

Rabbits were observed within the area of investigation. Rabbits along with Red foxes and Cats are all known from the locality. Three key threatening processes (KTP) as listed by the TSC Act and the EPBC Act relate to the invasion and establishment of these species. It is unlikely that the proposal, given the relatively minor nature of the clearing of native vegetation, would lead to increased levels of predation or competition by these species.

Pathogens result in disease in flora and fauna and can be found living in organisms such as fungus, bacteria and virus. Two pathogens are known from inland NSW and these are listed as KTP. These being:

- Dieback caused by *Phytophthora* (TSC Act and EPBC Act)
- Infection of frogs by amphibian chytrid fungus causing the disease *chytridiomycosis* (TSC Act and EPBC Act).

Pathogen management should be implemented throughout all stages of the proposal where appropriate and accordance with the *RTA Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

4.6 CHANGED HYDROLOGY

Changes to hydrology can be temporary or long-term. These may include the temporary diversion of a waterway and barriers that impede water flow. The proposal is unlikely to change the hydrology within the area of investigation. Though some culverts would require extension to facilitate the widening of the Riverina Highway these culverts only channel water from minor drainage lines, no work would be required within any significant drainage lines or permanent water bodies.

4.7 GROUNDWATER DEPENDENT ECOSYSTEMS

According to the Groundwater Dependent Ecosystems (GDE) Atlas, the Murray River is identified as a GDE with a low to moderate reliance on surface expression of groundwater. The Murray River in this location is incorporated into the Lake Hume reservoir as it has been dammed by the Hume Dam. Though several minor drainage lines would be temporarily impacted by the proposal given the nature of the proposed work requiring culvert extension, it is unlikely that the proposal would result in a significant reduction in both the water flow and water table height given the proposed work methodology. The proposal is unlikely to have an adverse effect on any GDE within the vicinity of the proposal or in the locality.

4.8 NOISE, VIBRATION AND LIGHT

Noise, vibration and light impact already pre-exist on the Riverina Highway from vehicular movements and the existing tourist village and Lake Hume Village so potential impact is restricted to construction impact.

Construction noise and vibration are likely to result from the proposal but would be limited to the construction period and mostly during daylight hours. While it is important to remember that no multi-species study has found all species to be sensitive to noise and vibration, it is generally agreed that for species that vocalise frequently such as birds and amphibians, there is some potential for negative effects over the long-term. In the context of the proposal, the work is expected to be conducted over a relatively short time frame and confined to a short section of the Riverina Highway. Potential impact, if any, is therefore considered to be relatively minor and temporary with extensive areas of the existing road reserve of the Riverina Highway and habitat in the locality remaining unaffected by increases in noise and vibration.

The proposal would not require the use of construction lighting, and it is likely that the proposal would not exacerbate existing light impact from current vehicle movements.

4.9 IMPACT ON RELEVANT KEY THREATENING PROCESSES

Key threatening processes are listed under the TSC Act, FM Act and EPBC Act that have the potential to either:

- Adversely affect threatened species, populations or ecological communities
- Causes common species, populations or ecological communities to become threatened.

There are a number of listed key threatening processes that are of relevance to aspects of the proposal. These are provided in summary in **Table 10**.

Table 10: Key threatening processes relevant to the proposal.

Key threatening process	Listed Act	Type of threat	Potential impact
Bushrock removal	TSC Act	Habitat loss/change	The proposal would result in impacts to some rock outcrops along the length of the proposal.
Clearing of native vegetation	TSC Act EPBC Act	Habitat loss/change	The proposal would result in the clearing of up to 0.194 hectares of native vegetation and 0.037 hectares of native tree planting.
Infection of native plants by <i>Phytophthora cinnamom</i>	TSC Act EPBC Act	Pathogen	Infected root material can be dispersed by earth moving equipment and other vehicles.
Increased sedimentation and erosion during construction	FM Act	Habitat loss/change	There is some potential for sediment to reach Lake Hume as a result of the

Key threatening process	Listed Act	Type of threat	Potential impact
			construction activity.
Loss of Hollow Bearing Trees	TSC Act	Habitat loss/change	Two hollow bearing trees would be removed as a result of the proposal.
Removal of dead wood and dead trees	TSC Act	Habitat loss/change	Some dead wood would be removed from the road reserve.

4.10 CUMULATIVE IMPACT

There is one Roads and Maritime project currently being constructed on the Riverina Highway. This is the Riverina Highway Stage 1 Safety Improvement Work (3.22 to 5.56 km west of Bethanga Bridge). Another project was carried out in 2013 at the Albury end of the Stage 1 project, Riverina Highway (HW20) 2.3 kilometres west of Trout Farm Road Hazard Removal (Hawksview) – adjoining the north western point of the Stage 1 work.

The current proposal for Stage 2 Safety Improvement Work would join with the Stage 1 work at Lake Hume Village.

The Albury City Council Biodiversity Strategy 2012 - 2016 indicates that only 1.25 per cent of native vegetation remains in the Albury area since European colonisation. Additionally, according to the order conferring Biodiversity Certification on the Albury Local Environmental Plan 2010, Albury City Council must develop and implement a Biodiversity Strategy for all lands owned or managed by Albury City Council including road reserves. The native vegetation to be cleared by the proposal is a threatened ecological community and therefore an over-cleared vegetation type. By design, the proposal would have a minimal impact on the extent of this community in the wider locality however should additional projects be proposed along HW20; a cumulative approach to offsets should be considered. As projects reach the thresholds (cumulatively) identified within Table 1 of the *Roads and Maritime Guidelines for biodiversity offsets*, a regional approach to offsets should be developed.

The following major project that could potentially be undertaken or are being undertaken in the region, as listed on the NSW Department of Planning website in the Albury LGA:

- Albury Paper Mill Upgrade

This project would not impact directly on the Riverina Highway. There is not expected to be any cumulative impact as a result of large scale road work construction on the Riverina Highway in the region. Should additional projects be carried out in the region, a cumulative approach to offsets should be considered where required.

A total of 13.59 hectares were approved for clearing within the Murray CMA under the NSW Native Vegetation Act 2003 until the end of 2015, however, no specific information for the Albury LGA was provided.

The native vegetation to be cleared by the proposal is a threatened ecological community and therefore, an over-cleared vegetation type. By design, the proposal would have a minimal impact on the extent of this community in the wider locality even with consideration of known projects in the vicinity of this proposal. Cleared land is the dominant landscape feature in the region and the locality of the proposal. This is associated with historic land practices such as clearing of land for agricultural purposes. Therefore the potential for cumulative impact to Box-Gum Woodland is low.

4.11 SEPP 44 KOALA HABITAT

As detailed in **Section 3.10**, Albury LGA is not listed within Schedule 1 of SEPP 44 and the canopy species, White Box (*Eucalyptus albens*) present in the study area is listed under Schedule 2 of SEPP 44. SEPP 44 aims to identify areas of *potential* and *core* Koala Habitat. These are described as follows:

- *Potential Koala Habitat* is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component
- *Core Koala Habitat* is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

With the presence of White Box, the vegetation in the vicinity of the proposal is considered *Potential Koala Habitat*. A review of existing BioNet records indicated that there is only one Koala record within the Albury LGA. This record was about 14 kilometres to the north of the area of investigation. Given this, *Core Koala Habitat* as defined by SEPP 44 is not considered to occur. Further, no evidence of koala occupation was identified during the field survey.

Nonetheless, the proposal would result in the removal of up to 0.207 hectares of woodland that is considered *Potential Koala Habitat* as defined by SEPP 44 due to the presence of White Box as a canopy species that constitutes 15 per cent of the tree component. However, in the context of the existing fragmentation of the landscape and that widespread clearing has already occurred in the valley floors and lower slopes of these landscapes, it is unlikely that Koala would even persist in the vicinity of the proposal despite potential habitat occurring.

5 MITIGATION MEASURES

EnviroKey propose a series of mitigation measures designed to address the potential impacts identified in **Chapter 4** which can be summarised as follows:

- Loss of vegetation and fauna habitat
- Fauna mortality during construction
- Spread of weeds
- Impact on aquatic habitat.

In addressing the potential impact, the objectives of these mitigation measures are to:

- Maintain and protect biodiversity where possible including the minimisation of the loss of native vegetation and habitat
- Maintain existing water quality
- Minimise the potential for weed incursion
- Minimise fauna mortality.

The Roads and Maritime has developed *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects* (RTA 2011) which are intended for Roads and Maritime Project Managers, Staff and Contractors to help minimise impact on biodiversity during construction projects such as the proposal. These guidelines are divided into 10 guides and these have been used to identify specific mitigation measures considered necessary for this proposal as follows:

Guide 1: Pre-clearing process

- If any unexpected threatened fauna or flora are discovered, work would stop and the RMS Unexpected Threatened Species Find Procedure within the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 1: Pre-clearing* process be followed. This would only apply to the existing woodland and derived native grassland and native tree planting areas
- All fauna handling should be carried out by licensed wildlife carers and/or ecologists and in accordance with *Guide 9: Fauna Handling*
- Carry out staged habitat removal as outlined in *Guide 4: Clearing of vegetation and removal of bushrock* where fauna habitat features have been identified and marked.

Guide 2: Exclusion Zones

- Any clearing required would be the smallest extent required to undertake the proposal
- All retained vegetation would be clearly identified as an exclusion zone and that all machinery, persons and equipment would not enter these areas without the expressed permission of the Roads and Maritime Environmental Officer. A fence will be established in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 2: Exclusion zones*.

Guide 3: Re-establishment of native vegetation

- Any revegetation work should be based on sound ecological principles and be undertaken in accordance with Roads and Maritime Landscape Guidelines.
- Roads and Maritime will contact the local landcare group to determine if they can assist with any revegetation

Guide 4: Clearing of vegetation and removal of bushrock

- All clearing including hollow-bearing trees would be conducted in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 4: Clearing of vegetation and removal of bushrock*
- Non-habitat vegetation should be removed first (e.g. shrubs, regrowth, groundcover and non-habitat trees). Allow fauna at least 24 hours to vacate remaining habitat. Ensure that a wildlife carer and/or ecologist inspects trees before and after felling. Capture and relocate non-injured fauna that are found in any felled trees to pre-determined habitat identified for fauna release.

Guide 5: Re-use of woody debris and bushrock

- Woody debris re-use and retaining of bushrock vegetation should be conducted in accordance with the Roads and Maritime document *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects Guide 5: Re-use of woody debris and bushrock*

Guide 6: Weed management

- Five noxious weeds listed in the Albury LGA were present within the area of investigation. Noxious weeds should be removed, where possible, to an appropriate waste management facility in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects Guide 6: Weed Management*.

Guide 7: Pathogen Management

- Work should be minimised during excessively wet or muddy conditions
- Exclusion zones established to protect retained vegetation (Guide 2) would restrict access
- Vehicles and machinery should be free from dirt when entering the site
- Pathogen management would be undertaken in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS projects Guide 7: Pathogen Management*.

The Roads and Maritime *Guidelines for Biodiversity Offsets* provides the framework for when biodiversity offsets should be considered and cumulative approaches to biodiversity offsetting (RMS 2011b). Given the nature of the proposal in that it involves the clearing of less than one hectare of an over-cleared vegetation type, biodiversity offsets for vegetation do not require consideration by Roads and Maritime.

6 SIGNIFICANCE ASSESSMENTS

6.1 THREATENED AND MIGRATORY BIOTA EVALUATION

When evaluating which threatened and migratory biota are likely to occur within the study area, the following factors were taken into consideration:

- The presence of potential habitat
- Condition of and approximate extent of potential habitat
- Species occurrence within study area and wider locality
- Knowledge and experience of the Principal Ecologist.

An evaluation of the threatened and migratory fauna that are known to, or predicted to occur within the study area compiled from the following sources of threatened and migratory species data in the locality during the desktop analysis:

- OEH BioNET database using a 10 kilometre radius of the study area as the search area (OEH 2016b)
- OEH Threatened Species Predictor database using the Upper Slopes CMA sub-region as the search parameter (OEH 2016c)
- EPBC Act Protected Matters Search Tool using a 10 kilometre buffer of the study area (DotE 2016).

Using the data collected during the desktop analysis and field surveys, the following criteria were applied to each entity to determine the likelihood of threatened and migratory species occurring within the study area:

- No (no suitable habitat present and the species not previously recorded within the locality; or in the case of flora, study area extensively searched during the appropriate time of year for detection and species not present)
- Unlikely (no suitable habitat is present, but previously recorded within the locality)
- Low (some suitable habitat present and the species known from the locality. Species may infrequently visit the study area enroute to foraging resources, but do not depend on the habitats of the study area for survival)
- Moderate (Study area contains habitat that could support a population of a species)
- High (Study area contains habitat that is likely to support a population of the species including roosting, breeding and foraging habitat)
- Yes (Species recorded during the field survey, or recently recorded in the study area).

Those biota with a moderate to high potential of occurrence within the vicinity of the proposal would be the subject of more detailed assessment.

Habitat and Ecology information was obtained from OEH, DoE and other various sources.

The evaluation is provided in full within **Appendix 6**.

Based on that evaluation, 21 threatened biota (including 16 species listed under the TSC Act and two vulnerable species and four migratory species listed under the EPBC Act, Superb Parrot is listed under both) were found to occur, or have a moderate to high potential to occur within the study area. Given this known or potential occurrence, further assessment of these biota is completed (**Appendix 7 & 8**).

6.2 SUMMARY OF SIGNIFICANCE ASSESSMENT (TSC ACT)

The EP&A Act includes in Section 5A, seven factors which are to be considered when determining if a proposed development or activity *'is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats'*. These seven factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species and hence if a Species Impact Statement is required (DECC 2007).

The Assessment of Significance (provided in **Appendix 7**) has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on species assessed as having a moderate to high potential of occurring in the study area. They include Southern Myotis, Corben's Long-eared Bat, Little Lorikeet, Little Eagle, Swift Parrot, Black-chinned Honeyeater, Turquoise Parrot, Barking Owl, Diamond Firetail, Superb Parrot, Flame Robin, Murray Jollytail, Southern Pygmy Perch, Squirrel Glider, Small Scurf Pea and White Box, Yellow Box, Blakely's Red Gum Woodland Threatened Ecological Community and their habitats. Given this conclusion, a Species Impact Statement is not warranted.

A summary of the results of the Assessment of Significance is provided in **Table 11**.

Table 11: Summary of the findings of the TSC Act significance assessments.

TSC Act significance assessments								
Threatened species, or communities	Significance assessment question ¹							Likely significant Impact?
	a	b	c	d	e	f	g	
Southern Myotis	N	X	X	Y	N	N	Y	No
Corben's Long-eared Bat	N	X	X	Y	N	N	Y	No
Little Lorikeet	N	X	X	Y	N	N	Y	No
Little Eagle	N	X	X	Y	N	N	Y	No
Swift Parrot	N	X	X	Y	N	N	Y	No
Black-chinned Honeyeater	N	X	X	Y	N	N	Y	No
Turquoise Parrot	N	X	X	Y	N	N	Y	No
Barking Owl	N	X	X	Y	N	N	Y	No
Diamond Firetail	N	X	X	Y	N	N	Y	No

TSC Act significance assessments

Threatened species, or communities	Significance assessment question ¹							Likely significant
	a	b	c	d	e	f	g	Impact?
Flame Robin	N	X	X	Y	N	N	Y	No
Superb Parrot	N	X	X	Y	N	N	Y	No
Murray Jollytail	N	X	X	Y	N	N	Y	No
Southern Pygmy Perch	N	X	X	Y	N	N	Y	No
Squirrel Glider	N	X	X	Y	N	N	Y	No
Small Scurf Pea	N	X	X	Y	N	N	Y	No
Box-Gum Woodland	X	X	Y	Y	N	N	Y	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ? = unknown impact.

Significance Assessment Questions as set out in the *Threatened Species Conservation Act 1995/ Environmental Planning and Assessment Act 1979*.

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

b in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

c in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

d in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

e whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

f whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

g whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

6.3 SUMMARY OF ASSESSMENT OF SIGNIFICANCE (EPBC ACT)

With consideration of the assessments completed within **Appendix 8**, the proposed activity is *unlikely* to have a significant effect on threatened or migratory species, populations, communities or their habitats as listed by the EPBC Act.

The proposal itself, with the adoption of mitigation measures outlined within **Chapter 5** and further consideration of potential impact, is considered low risk. Based on this, referral to the Commonwealth Minister is not warranted.

A summary of the results of this assessment is provided in **Table 12**.

Table 12: Summary of the findings of the EPBC Act significance assessments.

EPBC Act Assessments		
Threatened species, or communities	Important population ²	Likely significant impact?
Cattle Egret	No	No
White-bellied Sea-eagle	No	No
Rainbow Bee-eater	No	No
Caspian Tern	No	No
Superb Parrot	No	No
Murray Cod	No	No

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

- a is likely to be key source populations either for breeding or dispersal
- b is likely to be necessary for maintaining genetic diversity
- c is at or near the limit of the species range.

6.4 OTHER MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

As detailed within **Section 6.3** and **Appendix 8** of this BIA, the proposed activity is *unlikely* to have a significant effect on threatened or migratory species, populations, communities or their habitats listed under the EPBC Act. However, the Protected Matters Search Tool identified a number of matters that warrant consideration. These being:

- One National Heritage Place
- Seven Wetlands of International Importance
- Four areas of Commonwealth land
- Five State or Territory Reserves
- One Regional Forest Agreement
- Two nationally important wetlands
- 34 invasive species.

The National Heritage Place is Bonegilla Migrant Camp - Block 19 located near Bonegilla in Victoria, about four kilometres south-west of the proposal.

The wetlands of international importance (Ramsar) include the following:

- Banrock Station Wetland Complex
- Barmah Forest
- Gunbower Forest
- Hattah-kulkyne Lakes

- NSW Central Murray State Forests
- Riverland
- The Coorong and Lakes Alexandria and Albert Wetland

The five state or territory reserves include:

- Bonegilla N.C.R.
- Bonegilla Wetland B.R.
- River Murray Reserve
- River Murray Reserve (non-PV)
- Ryans Lagoon N.C.R.

The proposed activity is *unlikely* to have a significant effect on places on the Register of the National Estate or any state or territory reserve given the following:

- It is relatively minor in nature (0.208 hectares of native vegetation clearing and 0.037 hectares of native tree planting)
- Would be conducted in a highly modified landscape and well clear of any of these items.

Invasive species are considered throughout various sections of this BIA and are *unlikely* to have a significant effect on any matter of NES.

7 CONCLUSION

This BIA has adequately considered the biodiversity within the vicinity of the proposal by:

- Conducting a desktop analysis to consider biodiversity across the locality
- Conducting a field assessment that is consistent with OEH guidelines
- Adopting the precautionary principle in the assessment of impact
- Providing appropriate recommendations to mitigate potential impact to an acceptable level.

This BIA has determined that the proposed activity is *unlikely* to have a '*significant effect*' on any listed threatened species, communities, populations and their habitats in accordance with s5A of the NSW *Environmental Planning & Assessment Act 1979*. Therefore, a species impact statement is not required. Mitigation Measures detailed within **Chapter 5** should be adopted, implemented and maintained where appropriate.

This BIA has also determined that the proposed activity is *unlikely* to have a '*significant effect*' on any EPBC Act listed biota and their habitats or other matters of National Environmental Significance.



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9 APPENDICES

APPENDIX 1 – QUALIFICATIONS AND EXPERIENCE OF PERSONNEL

Name and Qualifications	Experience
<p>Steve Sass B.App.Sci (Env.Sci) (Hons) Director / Principal Ecologist</p> <p>Certified Environmental Practitioner, EIANZ OEH Accredited Biobanking Assessor Member, Ecological Consultants Association of NSW Member, Australian Society of Herpetologists</p>	<p>Steve is a highly experienced Ecologist having undertaken hundreds of terrestrial and aquatic ecological surveys and assessments across Australia since 1992. He has an in-depth working knowledge of environmental and biodiversity legislation across all states and territories which allows him to provide detailed and accurate assessments and formulate practical solutions to clients and specific projects on a case-by-case basis.</p> <p>Steve is a past Councillor of the Ecological Consultants Association of NSW. Steve was recently invited by OEH to become a sitting member of a team to develop Priority Action Statements for a number of species listed as Endangered under the NSW <i>Threatened Species Conservation Act 1995</i>.</p> <p>Previous and current research holds Steve in high regard within both the scientific and ecological consultants' community. To date, Steve has published, submitted or has in preparation, twenty-nine manuscripts within peer-reviewed scientific journals, many of which are related to threatened reptile species survey, monitoring or management.</p> <p>Steve has extensive experience in southern NSW. Over the past eight years, he has completed or provided specialist biodiversity advice to more than 800 environmental assessments for projects such as residential and industrial developments, highway upgrades and telecommunications, water, sewerage, energy, mining and electricity network infrastructure projects..</p> <p>Steve is the Principal Ecologist of EnviroKey. For the BIA, he was the primary author and lead the ecology survey.</p>
<p>Joshua Wellington B. Sc (Environmental) Senior Project Officer/Ecologist</p>	<p>Joshua is an experienced Botanist and Field Ecologist having completed surveys in NSW, QLD and VIC since 2008.</p> <p>In the field, Joshua's botanical skills make him a valuable part of the ecological impact assessment team. He is highly conversant with the flora and vegetation communities of NSW and Victoria but his knowledge of plant families and genera enable him to undertake botanical surveys in all states of Australia.</p> <p>Joshua is also an experienced Ecologist having completed surveys in NSW, QLD and VIC. In the field, Joshua's fauna skills make him a valuable part of the ecological impact assessment team. He is highly conversant with the fauna of various regions of NSW, in particular woodlands of the southern highlands and south-west slopes.</p> <p>Joshua's experience includes the field assessment and reporting for Review of Environmental Factors and Environmental Management Plans for various infrastructure projects within government and private industry.</p> <p>For this study, Joshua carried out the fauna surveys and assisted with the preparation of this report.</p>
<p>Simone Harvey</p>	<p>Simone recently joined the EnviroKey team after working with</p>

Name and Qualifications	Experience
<p>B. Env. Sc. (Wildlife and Conservation Biology) Senior Ecologist</p>	<p>the Australian Research Centre for Urban Ecology at the University of Melbourne. Here, Simone worked on a number of projects including collecting data on the impacts of large infrastructure development, which included the Hume Highway duplication in relation to forest and woodland birds, Squirrel Glider and microchiropteran bats.</p> <p>For this project, Simone undertook the targeted Squirrel Glider survey.</p>
<p>Jai Carter Field Assistant</p>	<p>Jai has a variety of field experience and has been working under the direct supervision of Principal Ecologist on numerous occasions. He has a keen interest in fauna and his experience as a zookeeper, provides him with excellent animal handling and identification skills. For this project, Jai assisted with the targeted Squirrel Glider survey.</p>
<p>Mark Harris B.App.Sci (Env Res Mgt) Senior Botanist / GIS Analyst</p> <p>Member, Ecological Consultants Association of NSW Biobanking Assessor, OEH</p>	<p>Mark is a highly experienced Botanist having undertaken flora surveys across eastern and central Australia and has more than 12 years' experience in Biodiversity Assessment and Planning. Mark has extensive experience with the flora and vegetation communities of the region confirmed by his two year tenure with the State-wide Native Vegetation Mapping Project and his engagement by the Murray CMA in a landcare facilitation role at Holbrook. His expertise in the flora and vegetation communities of the NSW south west slopes including condition assessments resulted in Mark becoming accredited as a Biobanking Assessor (Accred. No. 0062) by the NSW Office of Environment & Heritage.</p> <p>Mark completed the GIS mapping contained within this report given his extensive experience in ArcGIS and mapping of infrastructure and development projects.</p>
<p>Linda Sass B. Gn.St (Sci) (on-going), B.A, Dip. Ed (Sec) Director / Senior Ecologist Member, Ecological Consultants Association of NSW (ECA)</p>	<p>Linda is an experienced ecologist having conducted flora and fauna surveys across NSW over the past 9 years.</p> <p>Linda has extensive experience with the flora and fauna of southern and western NSW. In recent years, she has completed flora surveys for a proposed water pipeline in western NSW, a biodiversity study of an existing mining operation on the Cobar Peneplain, and as part of an REF for the proposed Quidong reconstruction along Gocup Road.</p> <p>Linda conducted an internal review of the BIA.</p>

APPENDIX 2 – PROTECTED MATTERS SEARCH TOOL RESULTS

APPENDIX 3 – NOXIOUS WEED DECLARATIONS

APPENDIX 4 – FLORA SPECIES RECORDED DURING THE FIELD SURVEY

Key: * = introduced species; + = Planted native, not native to the area; C = Common; O = Occasional; U = Uncommon; **Bold** = Listed noxious weed.

Scientific Name	Common Name	Family	Abundance
Native Species			
<i>Acacia baileyana</i> ⁺	Cootamundra Wattle	Fabaceae	U
<i>Acacia dealbata</i>	Silver Wattle	Fabaceae	O
<i>Acacia sp.</i> ⁺	Various Acacias (planted)	Fabaceae	U
<i>Acacia implexa</i>	Hickory Wattle	Fabaceae	U
<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	U
<i>Austrostipa scabra</i>	Speargrass	Poaceae	O
<i>Bothriochloa macra</i>	Red-leg Grass	Poaceae	O
<i>Brachychiton populneus</i>	Kurrajong	Malvaceae	U
<i>Callitris glaucophylla</i>	White Cypress Pine	Cupressaceae	U
<i>Carex appressa</i>	Tall Sedge	Cyperaceae	O
<i>Carex inversa</i>	Knob Sedge	Cyperaceae	U
<i>Cheilanthes sp.</i>	Fern	Pteridiaceae	U
<i>Chloris truncata</i>	Windmill Grass	Poaceae	O
<i>Convolvulus angustissimus</i>	Bindweed	Convolvulaceae	U
<i>Corymbia citriodora</i> ⁺	Lemon Scented Gum	Myrtaceae	U
<i>Corymbia maculata</i> ⁺	Spotted Gum	Myrtaceae	U
<i>Enneapogon nigricans</i>	Nineawn Grass	Poaceae	U
<i>Eragrostis sp.</i>	Lovegrass	Poaceae	U
<i>Eucalyptus albens</i>	White Box	Myrtaceae	U
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	Myrtaceae	U
<i>Eucalyptus bridgesiana</i>	Apple Box	Myrtaceae	U
<i>Eucalyptus melliodora</i>	Yellow Box	Myrtaceae	U
<i>Eucalyptus goniocalyx</i>	Long-leaved Bundy	Myrtaceae	U
<i>Eucalyptus sp.</i> ⁺	Various Ironbarks	Myrtaceae	U
<i>Galium gaudichaudii</i>	Rough Bedstraw	Rubiaceae	U
<i>Glycine tabacina</i>	Variable Glycine	Fabaceae	O
<i>Juncus usitatus</i>	Rush	Juncaceae	U
<i>Lomandra filiformis subsp. coriacea</i>	Wattle Mat Rush	Xanthoraceae	U
<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	O

Scientific Name	Common Name	Family	Abundance
<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	U
<i>Rytidosperma sp.</i>	Wallaby Grass	Poaceae	U
<i>Sporobolus sp.</i>	Rat's Tail Grass	Poaceae	O
<i>Themeda australis</i>	Kangaroo Grass	Poaceae	O
<i>Tricoryne elatior</i>	Yellow Autumn-lily	Antheriaceae	U
<i>Wahlenbergia stricta</i>	Australian Blubell	Campanulaceae	O
Introduced Species			
<i>Acetosella vulgaris</i> *	Sorrel	Polygonaceae	C
<i>Ailanthus altissima</i> *	Tree of Heaven	Simaroubaceae	O
<i>Arctotheca calendula</i> *	Capeweed	Asteraceae	O
<i>Avena barbata</i> *	Bearded Oat	Poaceae	C
<i>Briza maxima</i> *	Quaking Grass	Poaceae	C
<i>Briza minor</i> *	Shivery Grass	Poaceae	C
<i>Bromus catharticus</i> *	Prairie Grass	Poaceae	C
<i>Bromus diandrus</i> *	Great Brome	Poaceae	C
<i>Bromus hordaceus</i> *	Soft Brome	Poaceae	C
<i>Cirsium vulgare</i> *	Spear Thistle	Asteraceae	O
<i>Conyza bonariensis</i> *	Tall Fleabane	Asteraceae	C
<i>Cotoneaster glaucohyllus</i> *	Large-leaf Cotoneaster	Malaceae	U
<i>Cynodon dactylon</i> *	Couch	Poaceae	O
<i>Cyperus eragrostis</i> *	Flat Sedge	Cyperaceae	U
<i>Dactylis glomeratus</i> *	Cocksfoot	Poaceae	C
<i>Echium plantagineum</i> *	Patterson's Curse	Boraginaceae	C
<i>Ehrharta longiflora</i> *	Annual Veldgrass	Poaceae	C
<i>Eragrostis curvula</i>*	African Lovegrass	Poaceae	O
<i>Euphorbia peplus</i> *	Petty Spurge	Euphorbiaceae	U
<i>Festuca arundinacea</i> *	Tall Fescue	Poaceae	O
<i>Ficus carica</i> *	Fig	Moraceae	O
<i>Fumaria capreolata</i> *	Climbing Fumitory	Fumariaceae	U
<i>Gallium aparine</i> *	Cleavers	Rubiaceae	C
<i>Holcus lanatus</i> *	Yorkshire Fog	Poaceae	O
<i>Hordeum hystrix</i> *	Mediterranean Barley Grass	Poaceae	O

Scientific Name	Common Name	Family	Abundance
<i>Hypericum perforatum</i> *	St. John's Wort	Hypericaceae	O
<i>Hypochaeris radicata</i> *	Catsear	Asteraceae	C
<i>Juglans regia</i> *	English Walnut	Juglandaceae	U
<i>Lactuca serriola</i> *	Prickly Lettuce	Asteraceae	O
<i>Lepidium africanum</i> *	Common Peppergrass	Brassicaceae	U
<i>Ligustrum lucidum</i> *	Large-leaved Privet	Oleaceae	O
<i>Ligustrum sinsense</i> *	Small-leaved Privet	Oleaceae	O
<i>Lolium sp.</i> *	Ryegrass	Poaceae	C
<i>Malus pumila</i> *	Apple	Malaceae	U
<i>Malva parviflora</i> *	Small-flowered Mallow	Malvaceae	O
<i>Modiola caroliniana</i> *	Red-flowered Mallow	Malvaceae	O
<i>Oenothera stricta</i> *	Common Evening Primrose	Onagraceae	U
<i>Orobanche ramosa</i> *	Branched Broomrape	Orobanchaceae	U
<i>Parentucellia latifolia</i> *	Red Bartsia	Scrophulariaceae	U
<i>Paulownia ?kawakamii</i> *	Powton Tree	<i>Paulowniaceae</i>	O
<i>Paspalum dilatatum</i> *	Caterpillar Grass	Poaceae	O
<i>Pennisetum clandestinum</i> *	Kikuyu	Poaceae	O
<i>Petrorhagia nanteuillii</i> *	Proliferous Pink	Caryophyllaceae	O
<i>Phalaris aquatic</i> *	Phalaris	Poaceae	C
<i>Plantago lanceolata</i> *	Lamb's Tongues	Plantaginaceae	C
<i>Platanus x acerifolia</i> *	London Plane Tree	Platanus	C
<i>Pinus radiata</i> *	Radiata Pine	Pineace	C
<i>Polycarpon tetraphyllum</i> *	Four-leaved Allseed	Caryophyllaceae	U
<i>Prunus cerasifera</i> *	Cherry Plum	Rosaceae	O
<i>Prunus cerasifera 'Pissardii'</i> *	Purple-leaved Plum	Rosaceae	O
<i>Prunus persica</i> *	Nectarine	Rosaceae	O
<i>Romulea australis var. australis</i> *	Onion Grass	Iridaceae	O
<i>Rosa rubiginosa</i>*	Sweet Briar	Rosaceae	U
<i>Rubus fruticosus (aggregate)</i>*	Blackberry	Rosaceae	U
<i>Rumex crispus</i> *	Curled Dock	Polygonaceae	U
<i>Salvia verbenaca</i> *	Vervain	Lamiaceae	O
<i>Setaria sp.</i> *	Pigeon Grass	Poaceae	O

Scientific Name	Common Name	Family	Abundance
<i>Sisymbrium officinale</i> *	Hedge Mustard	Brassicaceae	U
<i>Solanum nigrum</i> *	Black-berry Nightshade	Solanaceae	U
<i>Sonchus oleraceus</i> *	Common Sowthistle	Asteraceae	O
<i>Trifolium angustifolium</i> *	Narrow Leaf Clover	Fabaceae	C
<i>Trifolium arvense</i> *	Hare's Foot Clover	Fabaceae	C
<i>Trifolium campestre</i> *	Hop Clover	Fabaceae	C
<i>Trifolium repens</i> *	White Clover	Fabaceae	O
<i>Ulmus ?procera</i> *	English Elm	Ulmaceae	C
<i>Verbascum virgatum</i> *	Twiggy Mullein	Scrophulariaceae	O
<i>Verbena bonariensis</i> *	Purpletop	Verbenaceae	U
<i>Vicia sativa subsp. sativa</i> *	Common Vetch	Fabaceae	U
<i>Vulpia bromoides</i> *	Squirrel Tail Fescue	Poaceae	C

APPENDIX 5 – FAUNA SPECIES RECORDED DURING THE FIELD SURVEY

Legend

DB1 Diurnal bird survey
 Opp Opportunistically observed
 Noct Nocturnal survey
 Anabat Echolocation call recording
 RSC Remote sensing camera

Bold = Listed under the schedules of the TSC Act and/or EPBC Act as threatened or migratory.

† = Introduced species

Taxa	Scientific Name	Common Name	DB1	DB2	DB3	DB4	DB5	DB6	DB7	Opp	Noct	Anabat	RSC
Aves	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		*			*			*			
Aves	<i>Acanthiza lineata</i>	Striated Thornbill		*									
Aves	<i>Acanthiza pusilla</i>	Brown Thornbill	*										
Aves	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill						*					
Aves	<i>Accipiter fasciatus</i>	Brown Goshawk								*			
Aves	<i>Anthochaera carunculata</i>	Red Wattlebird							*				
Aves	<i>Aquila audax</i>	Wedge-tailed Eagle				*							
Aves	<i>Ardea intermedia</i>	Intermediate Egret			*								
Aves	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		*									
Aves	<i>Carduelis carduelis</i> [†]	European Goldfinch [†]		*									
Aves	<i>Chenonetta jubata</i>	Australian Wood Duck		*									

Taxa	Scientific Name	Common Name	DB1	DB2	DB3	DB4	DB5	DB6	DB7	Opp	Noct	Anabat	RSC
Aves	<i>Chroicocephalus novaehollandiae</i>	Silver Gull					*						
Aves	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	*										
Aves	<i>Corcorax melanorhamphos</i>	White-winged Chough	*										
Aves	<i>Corvus coronoides</i>	Australian Raven		*									
Aves	<i>Corvus mellori</i>	Little Raven					*						
Aves	<i>Cracticus tibicen</i>	Australian Magpie	*	*		*	*	*					
Aves	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	*	*				*					
Aves	<i>Egretta novaehollandiae</i>	White-faced Heron		*									
Aves	<i>Elanus axillaris</i>	Black-shouldered Kite								*			
Aves	<i>Eolophus roseicapillus</i>	Galah	*	*	*								
Aves	<i>Eopsaltria australis</i>	Eastern Yellow Robin	*							*			
Aves	<i>Falco berigora</i>	Brown Falcon								*			
Aves	<i>Falco cenchroides</i>	Nankeen Kestrel		*									
Aves	<i>Grallina cyanoleuca</i>	Magpie-lark		*		*	*						
Aves	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle						*	*				
Aves	<i>Hirundo neoxena</i>	Welcome Swallow	*										
Aves	<i>Hydroprogne caspia</i>	Caspian Tern								*			

Taxa	Scientific Name	Common Name	DB1	DB2	DB3	DB4	DB5	DB6	DB7	Opp	Noct	Anabat	RSC
Aves	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	*			*		*	*				
Aves	<i>Malurus cyaneus</i>	Superb Fairy-wren	*	*	*	*		*	*				
Aves	<i>Merops ornatus</i>	Rainbow Bee-eater								*			
Aves	<i>Neochmia temporalis</i>	Red-browed Finch	*		*								
Aves	<i>Pachycephala rufiventris</i>	Rufous Whistler	*										
Aves	<i>Pardalotus punctatus</i>	Spotted Pardalote	*		*					*			
Aves	<i>Passer domesticus</i> [†]	House Sparrow [†]			*								
Aves	<i>Pelecanus conspicillatus</i>	Australian Pelican		*			*						
Aves	<i>Platycercus elegans</i>	Crimson Rosella	*	*									
Aves	<i>Platycercus elegans</i>	Crimson Rosella (yellow form)								*			
Aves	<i>Podargus strigoides</i>	Tawny Frogmouth									*		
Aves	<i>Psephotus haematonotus</i>	Red-rumped Parrot				*							
Aves	<i>Rhipidura albiscapa</i>	Grey Fantail			*			*	*				
Aves	<i>Rhipidura leucophrys</i>	Willie Wagtail				*	*						
Aves	<i>Sericornis frontalis</i>	White-browed Scrubwren							*				
Aves	<i>Sturnus vulgaris</i> [†]	Common Starling [†]		*									
Aves	<i>Todiramphus sanctus</i>	Sacred Kingfisher				*							
Aves	<i>Turdus merula</i> [†]	Common Blackbird [†]		*	*								

Taxa	Scientific Name	Common Name	DB1	DB2	DB3	DB4	DB5	DB6	DB7	Opp	Noct	Anabat	RSC
Aves	<i>Zosterops lateralis</i>	Silvereeye			*								
Mammalia	<i>Austronomus australis</i>	White-striped Free-tailed Bat											
Mammalia	<i>Chalinobolus gouldii</i>	Gould's Wattled Bat										*	
Mammalia	<i>Chalinobolus morio</i>	Chocolate Wattled Bat										*	
Mammalia	<i>Mormopterus ridei</i>	Eastern Freetail Bat										*	
Mammalia	<i>Nyctophilus sp.</i>											*	
Mammalia	<i>Oryctolagus cuniculus</i> [†]	Rabbit [†]								*			
Mammalia	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum									*		
Mammalia	<i>Petaurus norfolcencis</i>	Squirrel Glider											*
Mammalia	<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox								*			
Mammalia	<i>Scotorepens greyii</i>	Little Broad-nosed Bat										*	
Mammalia	<i>Trichosurus vulpecula</i>	Common Brushtail Possum									*		
Mammalia	<i>Vespadelus darlingtoni</i>	Large Forest Bat										*	
Mammalia	<i>Vespadelus regulus</i>	Southern Forest Bat										*	
Mammalia	<i>Vespadelus vulturnus</i>	Little Forest Bat										*	
Mammalia	<i>Vulpes vulpes</i>	Fox									*		

APPENDIX 6 – THREATENED AND MIGRATORY BIOTA EVALUATION

Legend for Table 13

V = Vulnerable

E = Endangered

CE = Critically Endangered

M = Migratory

POP = Endangered Population

TSC = NSW *Threatened Species Conservation Act 1995*EPBC = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*FM = NSW *Fisheries Management Act 1994*

The following (**Table 13**) provides an evaluation of the threatened and migratory biota that have been previously recorded within the locality, for their likelihood of occurrence within the study area using the following rationale:

- No (no suitable habitat present and the species not previously recorded within the locality; or in the case of flora, study area extensively searched during the appropriate time of year for detection and species not present)
- Unlikely (no suitable habitat is present, but previously recorded within the locality)
- Low (some suitable habitat present and the species known from the locality. Species may infrequently visit the study area enroute to foraging resources, but do not depend on the habitats of the study area for survival)
- Moderate (Study area contains habitat that could support a population of a species)
- High (Study area contains habitat that is likely to support a population of the species including roosting, breeding and foraging habitat)
- Yes (Species recorded during the field survey, or recently recorded in the study area).

Those biota with a moderate to high potential of occurrence within the vicinity of the proposal would be the subject of more detailed assessment.

Table 13: Threatened and migratory biota evaluation.

Species Scientific Name Legal Status	Habitat	Recorded during field surveys	Recorded previously in locality	Potential to occur within the vicinity of the proposal
AMPHIBIANS				
Sloane's Froglet <i>Crinia sloanei</i> V TSC	Sloane's Froglet is found in woodlands, grasslands and disturbed areas. Usually associated with areas inundated with water.	No	Yes	Unlikely. No potential habitat in woodland, grassland or Lake Hume.
Booroolong Frog <i>Litoria booroolongensis</i> E TSC E EPBC	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	No	No	No. No habitat present.

Species Scientific Name Legal Status	Habitat	Recorded during field surveys	Recorded previously in locality	Potential to occur within the vicinity of the proposal
Southern Bell Frog <i>Litoria raniformis</i> E TSC V EPBC	Found mostly amongst emergent vegetation, in or at the edge of still flowing water bodies such as wetlands, lagoons, swamps and montane lakes.	No	Yes	Unlikely. No potential habitat in Lake Hume.
MICROCHIROPTERAN BATS				
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> V TSC	Prefers moist habitats, with trees taller than 20m. Generally roosting in eucalypt hollows, but has also been found under loose bark on trees and buildings.	No	No	No. Habitat not present.
Southern Myotis <i>Myotis macropus</i> V TSC	Generally roost in groups of 10 – 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over freshwater streams and pools catching insects and small fish by raking their feet across the water surface.	No	No	Moderate. Presence of Lake Hume and HBTs. Two HBT impacted.
Corben's Long-eared Bat <i>Nyctophilus corbeni</i> V TSC V EPBC	Occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands.	No	No	Moderate. <i>Nyctophilus sp.</i> Recorded during field surveys.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i> V TSC V EPBC	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (OEH 2014).	Yes	No	Unlikely. Not using area as roost and highly mobile species.
Yellow-bellied Sheath-tail Bat <i>Saccolaimus flaviventris</i> V TSC	Occurs in eucalypt forest and open habitats and roosts in hollow trees.	No	No	Unlikely. Habitat not present.
AVES				
Regent Honeyeater	Regent Honeyeaters inhabit woodlands that support a	No	Yes	Unlikely given lack of

Species Scientific Name Legal Status	Habitat	Recorded during field surveys	Recorded previously in locality	Potential to occur within the vicinity of the proposal
<i>Anthochaera phrygia</i> CE TSC E EPBC M EPBC	significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.			diversity in woodland present.
Fork-tailed Swift <i>Apus pacificus</i> M EPBC	Mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea.	No	No	Unlikely. Highly mobile species.
Great Egret <i>Ardea alba</i> M EPBC	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area.	No	No	Unlikely. Potential habitat adjacent to Lake Hume not directly impacted.
Cattle Egret <i>Ardea ibis</i> M EPBC	The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. It will also forage at garbage dumps, and is often seen with cattle and other stock.	No	Yes	Moderate. May use site for forage.
Australasian Bittern <i>Botaurus poiciloptilus</i> E TSC E EPBC	Favours permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. and spikerushes (<i>Eleocharis</i> spp.).	No	No	Unlikely. Potential habitat adjacent to Lake Hume not directly impacted.
Bush Stone-curlew <i>Burhinus grallarius</i> E TSC	Occurs of in open woodland, lightly timbered country, Mallee and Mulga, with groundcover of small sparse shrubs, grasses or leaf litter.	No	Yes	Unlikely. Habitat not present.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature	No	Yes	Unlikely. Highly mobile species.

Species Scientific Name Legal Status	Habitat	Recorded during field surveys	Recorded previously in locality	Potential to occur within the vicinity of the proposal
V TSC	wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.			
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i> V TSC	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur.	No	No	No. Habitat not present.
Speckled Warbler <i>Chthonicola sagittata</i> V TSC	Occurs in open eucalypt woodlands with rocky gullies, ridges, tussocky grass, and sparse shrubbery. Forages on the ground.	No	Yes	No. Habitat not present.
Spotted Harrier <i>Circus assimilis</i> V TSC	Occurs in open country with dense ground cover. Habitats includes grasslands, spinifex, open shrublands, saltbush and very open woodlands.	No	No	Unlikely. Habitat dominated by introduced species, native tree planting too dense.
Brown Treecreeper <i>Climacteris picumnus victoriae</i> V TSC	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum. Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in	No	Yes	No. Remnant woodland patch does not contain HBTs which this species requires for breeding. Two HBT impacted which occur in isolation. Species needs numerous HBT and connectivity between patches which are not

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	woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.			present.
Varied Sittella <i>Daphoenositta chrysoptera</i> V TSC	Occurs in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees e.g. stringybarks and iron barks.	No	Yes	Unlikely. Habitat not present.
White-fronted Chat <i>Epthianura albifrons</i> V TSC	Occurs in open country of inland salt lakes, estuaries, salt marshes, open low heath, and remanent low vegetation on farms.	No	No	Unlikely. habitat not present
Grey Falcon <i>Falco hypoleucos</i> E TSC	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range (OEH 2014). Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	No	No	Unlikely. Highly mobile species unlikely to rely on habitat resources onsite.
Black Falcon <i>Falco subniger</i> V TSC	The Black Falcon is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day.	No	No	Unlikely. Remnant vegetation not large enough to support this species.
Latham's Snipe <i>Gallinago hardwickii</i> M EPBC	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They	No	Yes	Unlikely, no habitat present.

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	are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.			
Purple-crowned Lorikeet <i>Glossopsitta porphyrocephala</i> V TSC	It is uncommon in NSW, with records scattered across the box-ironbark woodlands of the Riverina and south west slopes, the River Red Gum forests and mallee of the Murray Valley as far west as the South Australian border, and, more rarely, the forests of the South Coast. The species is nomadic and most, if not all, records from NSW are associated with flowering events. Found in open forests and woodlands, particularly where there are large flowering eucalypts. Also recorded from mallee habitats (OEH 2014).	No	No	Unlikely. Nomadic, highly mobile, unlikely to rely on forage resources onsite.
Little Lorikeet <i>Glossopsitta pusilla</i> V TSC	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	No	Yes	Moderate. Previously recorded in the locality, potential forage habitat.
Painted Honeyeater <i>Grantiella picta</i> V TSC V EPBC	Occurs in Forest, Woodland, Dry Scrub, often with abundant mistletoe.	No	No	Unlikely. No Mistletoe recorded.
Brolga <i>Grus rubicunda</i> V TSC	Occurs in freshwater swamps, flooded grassland, margin billabongs, lagoons, dry grasslands, floodplain, and irrigation pastures	No	No	Unlikely. Edge of Lake Hume only marginal habitat and unlikely to be impacted.

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White-bellied Sea-eagle <i>Haliaeetus leucogaster</i> M EPBC	The species is normally seen perched high in a tree, or soaring over waterways and adjacent land, particularly along coastlines, lakes and rivers.	Yes	Yes	Yes
Little Eagle <i>Hieraaetus morphnoides</i> V TSC	Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	No	No	Moderate. Potential forage, species previously recorded in region.
White-throated Needletail <i>Hirundapus caudacutus</i> M EPBC	For a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.	No	No	Unlikely. Highly mobile species.
Caspian Tern <i>Hydroprogne caspia</i> M EPBC	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks.	Yes	Yes	Yes
Swift Parrot <i>Lathamus discolor</i> E TSC E EPBC	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp	No	Yes	Moderate. White Box present onsite, previously recorded in

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	(from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia culeate</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .			the locality.
Pink Cockatoo <i>Lophochroa leadbeateri</i> V TSC	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water (OEH 2014).	No	No	Unlikely. Potential forage however highly mobile species.
Square-tailed Kite <i>Lophoictinia isura</i> V TSC	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	No	No	Unlikely. Potential forage however highly mobile species.
Hooded Robin <i>Melanodryas cucullata cucullata</i> V TSC	Occurs in structurally diverse and large woodlands, Mallee and Mulga shrublands.	No	Yes	Unlikely. Woodlands not large or structurally diverse.
Black-chinned Honeyeater <i>Melithreptus gularis gularis</i> V TSC	Occurs in eucalypt woodlands, paperbarks, and inland tree-lined watercourses generally foraging high in the canopy.	No	Yes	Moderate. Previously recorded in the region and a woodland species.
Rainbow Bee-eater <i>Merops ornatus</i> M EPBC	It is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	Yes	Yes	Yes. Also recorded Previously recorded in the locality.
Black-faced Monarch	The Black-faced Monarch mainly occurs in rainforest	No	No	No. Habitat

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<i>Monarcha melanopsis</i> M EPBC	ecosystems, including semi-deciduous vine-thickets (DoE 2014).			not present.
Yellow Wagtail <i>Motacilla flava</i> M EPBC	The Yellow Wagtail occurs in a variety of damp or wet habitats with low vegetation, from rushy pastures, meadows, hay fields and marshes	No	No	No
Satin Flycatcher <i>Myiagra cyanoleuca</i> M EPBC	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	No	No	No. Habitat not present.
Turquoise Parrot <i>Neophema pulchella</i> V TSC	Favours open, grassy woodland with dead trees near permanent water. The species also inhabits coastal heath and pastures with exotic grasses and weeds, along roadsides and in orchids.	No	No	Moderate. Some dead trees, located near permanent water.
Barking Owl <i>Ninox connivens</i> V TSC	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.	No	Yes	Moderate. Previously recorded in locality, potential foraging or roosting habitat.
Powerful Owl <i>Ninox strenua</i> V TSC	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well (OEH 2014).	No	No	Unlikely. Habitat insufficient to support this species.
Blue-billed Duck <i>Oxyura australis</i>	Occurs in deep, densely vegetated freshwater lakes,	No	No	Unlikely. Lake Hume not

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V TSC	swamps during breeding then moves to more open water during winter.			densely vegetated.
Olive Whistler <i>Pachycephala olivacea</i> V TSC	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes.	No	No	No. Habitat not present.
Plains-wanderer <i>Pedionomus torquatus</i> E TSC CE EPBC	Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses.	No	No	No
Scarlet Robin <i>Petroica boodang</i> V TSC	The Scarlet Robin is primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.	No	Yes	No. Woodland patch not large enough to support this species.
Flame Robin <i>Petroica phoenicea</i> V TSC	Flame Robins prefer forests and woodlands up to about 1800 m above sea level but are often recorded in fragmented landscapes foraging in open farmland adjoining box-gum woodlands.	No	Yes	Moderate. Known to use open agricultural landscapes, previously observed in locality.
Pink Robin <i>Petroica rodinogaster</i> V TSC	Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies (OEH 2014).	No	No	No. Habitat not present.
Glossy Ibis	Preferred habitat for foraging and breeding are fresh water	No	Yes	Unlikely. Potential

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<i>Plegadis falcinellus</i> M EPBC	marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation (DoE 2014).			habitat adjacent to billabong and Murray River to remain unaffected.
Superb Parrot <i>Polytelis swainsonii</i> V TSC V EPBC	Occurs along timbered waterways and nearby well watered woodlands especially in River Red Gums along the Murray and Murrumbidgee Rivers.	No	No	Moderate. May use site for foraging.
Grey-crowned Babbler <i>Pomatostomus temporalis temporalis</i> V TSC	Occurs in open forests, woodlands, favouring inland plains with open shrub layer, little ground cover and plenty fallen timber and leaf litter.	No	No	Unlikely. Habitat does not feature open shrub layer.
Rufous Fantail <i>Rhipidura rufifrons</i> M EPBC	A rainforest and wet sclerophyll inhabitant.	No	No	No. Habitat not present.
Australian Painted Snipe <i>Rostratula australis</i> E TSC E EPBC M EPBC	Australian Painted Snipe are found in shallow inland wetlands, either freshwater or brackish, that are either permanent or temporarily filled.	No	No	Unlikely. Lake Hume deep reservoir.
Painted Snipe <i>Rostratula benghalensis s. Lat</i> M EPBC E EPBC	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	No	No	Unlikely. Lake Hume does not have fringing vegetation at this location.
Diamond Firetail <i>Stagonopleura guttata</i> V TSC	Inhabits grassy ground cover underneath Open Forest, Woodland, Mallee, Acacia scrub and timber belts along watercourses and roadsides.	No	Yes	Moderate. Previously recorded in the region, known to use

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				open agricultural landscapes.
Freckled Duck <i>Stictonetta naevosa</i> V TSC	Occurs in densely vegetated freshwater swamps, creeks or temporary floodwaters.	No	No	Unlikely. Lake Hume not densely vegetated
Masked Owl <i>Tyto novaehollandiae</i> V TSC	Lives in dry eucalypt forests and woodlands from sea level to 1100 m (OEH 2014).	No	No	Unlikely. Habitat insufficient to support this species.
Common Greenshank <i>Tringa nebularia</i> M EPBC	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	No	No	No
FISH				
Murray Jollytail <i>Galaxias rostratus</i> CE FM Act	Murray Jollytail are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation (DPI 2014).	No	Yes	Moderate
Murray Cod <i>Maccullochella peelii</i> V EPBC	Occurs in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	No	No	Moderate
Macquarie Perch <i>Macquaria australasica</i> E FM E EPBC	Occurs in clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.	No	No	No. Habitat not present.

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Southern Pygmy Perch <i>Nannoperca australis</i> E FM Act	The Southern Pygmy Perch is found in well vegetated, slow-flowing or still waters including streams, lakes, billabongs and other types of wetlands.	No	Yes	Unlikely. Lake Hume not well vegetated.
MAMMALS				
Eastern Pygmy-possum <i>Cercartetus nanus</i> V TSC	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands with a healthy understorey appear to be preferred.	No	No	No. Habitat unlikely to support this species.
Spotted-tailed Quoll <i>Dasyurus maculatus</i> V TSC E EPBC	Recorded across a range of habitat types where large areas occur, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No	No. Potential den features absent.
Squirrel Glider <i>Petaurus norfolcensis</i> V TSC	Inhabits dry sclerophyll forest and woodlands. Potential habitats include Box-Ironbark, River Red Gum and eucalypt forest. The Squirrel Glider requires abundant hollow-bearing trees and a mix of eucalypts, acacias and banksias.	Yes	Yes	Yes
Brush-tailed Phascogale <i>Phascogale tapoatafa</i> V TSC	Occurs in dry sclerophyll open forest, with a sparse ground cover of herbs, grasses, shrubs or leaf litter and dependent on presence of large numbers of HBT (>40) within their home range.	No	No	No. Habitat not present, HBTs isolated in agricultural farm land.
Koala <i>Phascolarctos cinereus</i> V TSC V EPBC (Combined)	Inhabit eucalypt woodlands and forests. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	No	No	No. Highly modified landscape, no connectivity with large patches of

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pop. Of QLD, NSW and ACT)				vegetation.
REPTILES				
Pink-tailed Legless Lizard <i>Aprasia parapulchella</i> V TSC V EPBC	Occur in open grassland and woodland habitats that have a substantial cover of small rocks.	No	No	No. Habitat not present.
Striped Legless Lizard <i>Delma impar</i> V TSC V EPBC	Occurs in native grasslands where they are known to shelter in the soil, within tussocks or beneath rocks.	No	No	No. While native grassland is present in a small patch (0.204 ha), patch is small, highly fragmented, and unlikely to sustain any individuals of this species.
Rosenberg's Goanna <i>Varanus rosenbergi</i> V TSC	Found in coastal heaths, humid woodlands, and wet and dry sclerophyll forests.	No	No	No. Habitat not present.
INSECTS				
Golden Sun Moth <i>Synemon plana</i> E TSC CE EPBC	Occurs in native temperate grasslands, and open grassy woodlands where the ground layer is dominated by wallaby grass.	No	No	No. Derived Native Grassland small and highly modified. Also not dominated by wallaby grass.
FLORA				
Phantom Wattle <i>Acacia phasmoides</i> V TSC V EPBC	The species is only known from one location in NSW: Woomagarma National Park in Greater Hume Shire. Grows in shrubby woodland on sandy, granitic soil near creeks or in rocky crevices (OEH 2014).	No	No	No. Habitat not present, outside of known population.

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Floating Swamp Wallaby-grass <i>Amphibromus fluitans</i> V TSC V EPBC	This species grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels (OEH 2014).	No	Yes	No. Habitat not present.
Crimson Spider Orchid <i>Caladenia concolor</i> E TSC V EPBC	Box gum woodlands. Also known from regrowth woodland on granite ridge country in the Nail Can Hill Crown Reserve outside of Albury.	No	No	No. Study area highly modified.
Rosella Spider Orchid <i>Caladenia rosella</i> PE TSC E EPBC	The single NSW collection of the Rosella Spider Orchid (located in Albury) is undated, but is estimated to have been collected before 1896. Today the species is found near Melbourne in Victoria, but is listed as endangered because less than 200 plants are known to exist.	No	No	No. Study area highly modified.
Greencomb Spider Orchid <i>Caladenia tensa</i> E EPBC	Historically, the Greencomb Spider-orchid was widespread on aeolian sand deposits surrounding, and including, the Little Desert in western Victoria and south-east South Australia (DoE 2014).	No	No	No. Habitat not present.
Small Scurf-pea <i>Cullen parvum</i> E TSC	In known populations in Victoria and NSW, plants are found in grassland, River Red Gum (<i>Eucalyptus camaldulensis</i>) Woodland and even grazing country and table drains, in areas with rainfall of between 450 and 700 mm.	No	No	Moderate. Species sometimes found in grazing country.
Small Snake Orchid <i>Diuris pedunculata</i> E TSC	Confined to north east NSW. It was originally found scattered from Tenterfield south to the Hawkesbury River, but is now mainly	No	No	No. Habitat not present.

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E EPBC	found on the New England Tablelands. The Small Snake Orchid grows on grassy slopes or flats (OEH 2014).			
Clover Glycine <i>Glycine Latrobeana</i> CE TSC V EPBC	The Clover Glycine occurs mainly in grassland and grassy woodland habitats, less often in dry forests, and only rarely in heathland. Populations occur from sea level to c. 1,200 m altitude 6 (900 m in Tasmania). In Victoria, plants grow in a range of soil types including alluvial soils, and those derived from sandstones, mudstones, granite and basalt. Soils are usually clay, but may also have high loam content. Tasmanian populations occur on a well-drained basalt, dolerite or sandstone substrates (Lynch 1994). The NSW population is in subalpine grassland (at about 1300 m asl).	No	No	No
Austral Pillwort <i>Pilularia novae-hollandiae</i> E TSC	The species grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous.	No	No	No. Habitat not present.
Dwarf Bush-pea <i>Pultenaea humilis</i> V TSC	Found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes. Occurs on a variety of soils ranging from sandy loams to clays.	No	No	No. Study area searched at appropriate time of year and species not present.
Woolly Ragwort <i>Senecio garlandii</i> V TSC	Woolly Ragwort occurs on sheltered slopes of rocky outcrops.	No	No	No. Habitat not present.
Small Purple-pea <i>Swainsona recta</i>	Occurs in the grassy understorey of woodlands and open-forests dominated	No	No	No. Study area searched at appropriate

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E TSC E EPBC	by Blakely's Red Gum <i>Eucalyptus blakelyi</i> , Yellow Box <i>E. melliodora</i> , Candlebark Gum <i>E. rubida</i> and Long-leaf Box <i>E. goniacalyx</i> . Grows in association with understorey dominants that include Kangaroo Grass <i>Themeda australis</i> , poa tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp.			time of year and species not present.
Silky Swainson-pea <i>Swainsona sericea</i> V TSC	Known from Box-Gum Woodland in the South West Slopes.	No	No	No. Study area searched at appropriate time of year and species not present.
ENDANGERED POPULATIONS				
Eel Tailed Catfish (<i>Tandanus tandanus</i>) in the Murray Darling Basin Endangered Population FM Act	The western population of <i>Tandanus tandanus</i> was originally widely distributed throughout the Murray-Darling River System in NSW, Queensland, Victoria and South Australia. is non migratory and lives in a wide range of habitats including rivers, creeks, lakes, billabongs and lagoons, and although it inhabits flowing streams, prefers sluggish or still waters. It can be found in clear to turbid waters, and over substrates ranging from mud to gravel and rock. Catfish are now rare or absent from all rivers and creeks in Victoria as well as many of the major tributaries in NSW including the Murray.	No	No	Unlikely
THREATENED ECOLOGICAL COMMUNITIES				
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native	Inland Grey Box Woodland occurs predominately within the Riverina and South West Slopes regions of NSW down to the Victorian border.	No	No	No. Community not present.

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Grasslands of South-eastern Australia (Known in NSW as Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions) EEC TSC EEC EPBC	It includes Albury to the east and may extend out west towards Hay. Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, <i>Eucalyptus microcarpa</i> (Inland Grey Box), is often found in association with <i>E. populnea subsp. bimbil</i> (Bimble or Poplar Box), <i>Callitris glaucophylla</i> (White Cypress Pine), <i>Brachychiton populneus</i> (Kurrajong), <i>Allocasuarina luehmannii</i> (Bulloak) or <i>E. melliodora</i> (Yellow Box), and sometimes with <i>E. albens</i> (White Box) (OEH 2014).			
Lowlands Murray River Aquatic Ecological Community EEC FM Act	Included are all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir. Excluded are man made/artificial canals, water distribution and drainage work, farm dams and off-stream reservoirs	No	Yes	Unlikely. Community occurs down stream of Hume Dam/Weir.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions EEC TSC	Characterised by the presence or prior occurrence of Snow Gum, Candlebark, Ribbon Gum and/or Black Sallee trees. Commonly co-occurring eucalypts include Apple Box (<i>Eucalyptus bridgesiana</i>), Swamp Gum (<i>E. ovata</i>), Black Gum (<i>E. aggregata</i>), Mountain Gum (<i>E. dalrympleana</i>), Broad-leaved Peppermint (<i>E. dives</i>) and Narrow-leaved Peppermint (<i>E. radiata</i>) and commonly occurring tree-layer or mid-layer wattles include Blackwood (<i>Acacia</i>	No	No	No. Community not present.

Species Scientific Name Legal Status	Habitat	Recorded during field surveys	Recorded previously in locality	Potential to occur within the vicinity of the proposal
	<i>melanoxylon</i>) and Silver Wattle (<i>A. dealbata</i>).			
White Box Yellow Box Blakely's Red Gum Woodland and Derived Grassland TEC TSC CE EPBC	Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure strands, mixtures of the three species or in mixtures with other trees, including wattles.	No	Yes	Yes. Community present onsite.
Weeping Myall Woodlands (Known in NSW as Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions) EEC TSC EEC EPBC	This community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils. The structure varies from low woodland to open shrubland. The tree layer includes <i>Acacia pendula</i> (Weeping Myall or Boree) as one of the dominant species or the only tree species present.	No	No	No. Community not present.

APPENDIX 7 – ASSESSMENT OF SIGNIFICANCE (TSC/FM ACT)

In Section 5A of the EP&A Act are seven factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats*'. These seven factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species and hence if a Species Impact Statement is required (DECC 2007).

Table 13 (Appendix 6) found that 16 threatened biota or threatened ecological communities were known to, or have a moderate to high potential to occur within the study area based on the evaluation completed. Given this, further assessment by application of the 7-part test is completed on the following biota:

- Southern Myotis
- Corben's Long-eared Bat
- Little Lorikeet
- Little Eagle
- Swift Parrot
- Black-chinned Honeyeater
- Turquoise Parrot
- Barking Owl
- Diamond Firetail
- Flame Robin
- Superb Parrot
- Murray Jollytail
- Southern Pygmy Perch
- Squirrel Glider
- Small Scurf Pea
- White Box, Yellow Box, Blakely's Red Gum Woodland.

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

Southern Myotis and Corben's Long-eared Bat

Southern Myotis and Corben's Long-eared Bat are known to roost in caves, culverts, old buildings, bridges and mine shafts and tree hollows (Churchill 2008). Despite field surveys completed, this species was not detected along the length of the proposal. Indeed, microchiropteran bats are generally regarded as highly mobile fauna extending their foraging ranges over tens of kilometres from their roosting sites (Barclay *et al.* 2000; Pavey 1998; Pavey and Burwell 2004; Pennay and Freeman 2005). In the context of their ecology, the study area could form only potential foraging habitat given that visual inspections of culverts

and ANABAT recordings adjacent to the HBTs to be impacted failed to identify any past or present microchiropteran bat roosts.

OEH (2016c) identify that the main threats to these species are disturbance to known roost and maternity sites, and clearing of habitat. Two HBTs which could be considered potential habitat for this species would be impacted by the proposal. However, Southern Myotis was not recorded during the surveys and therefore with adequate management measures, the potential for impact to this species can be adequately mitigated. A *Nyctophilus sp.* was recorded during the field surveys. Due to the difficulty in identifying this genus to a species level, it is unknown whether this was Corben's Long-eared Bat, however, with adequate management measures, the potential for impact to this species should it occur within the area of investigation can be adequately mitigated.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of this species such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This species is not listed as an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

These species are not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

- i. The proposed work would remove about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) of potential foraging habitat. This species prefers to forage over water and no water bodies would be impacted by this proposal.
- ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the agricultural surroundings, small extent of existing woodland and the existing road.
- iii. Given the highly mobile nature of these species, Hume Reservoir and the Murray River may provide a foraging resource in the locality. These features would remain unaffected by the proposal with the appropriate mitigation measures described in this BIA. Given this, it is unlikely that the habitat to be affected is important to the long-term survival of the species in the locality particularly in the context that no roosting sites were identified.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for these species, or within the Albury LGA under TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There are currently no recovery plans or threatened abatement plans listed for these species. However, the document, *The Action Plan for Australian Bats* (DoE 1999) outlines what is required to conserve Australian Bats in their natural habitat. Threatening processes identified include habitat loss and roost disturbance with recommendations to minimise threatening processes including funding for habitat creation programs to mitigate effects of habitat clearance, increased survey and research and protection of roosting sites. The proposal is considered to be consistent with this plan, in that targeted surveys were conducted and did not record these species, the small area of potential habitat is considered to be of low quality as a result of the proximity to the existing road and historical vegetation clearance and the hollows onsite were not identified as roosting sites.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and safety upgrades – are not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, *Clearing of native vegetation, Loss of hollow-bearing trees and Removal of dead wood and dead trees* is of relevance to this species.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of approximately 0.208 hectares of Box-Gum Woodland (BGW) including 0.001 hectares of derived native grassland and about 0.037 hectares of native tree planting. A total of 2.098 hectares of BGW occurs within or directly adjoins the proposal (see **Map 9**) therefore there is about 1.89 hectares that would remain unaffected by the proposal. This relatively minor loss of vegetation is considered negligible in the context of the extent of BGW remaining.

The 'loss of hollow-bearing trees' is one factor affecting the distribution and long-term survival of hollow-dependant fauna such as microchiropteran bats, arboreal mammals and many bird species. Up to two hollow-bearing trees would be removed as part of the proposal resulting in the loss of about three small hollows. One of these hollows was observed to be occupied by bees during the field surveys and would not be used by bats. Due to the high mobility of these species, the loss of two small hollows is unlikely to create a significant impact should mitigation measures described in this BIA be followed.

The 'removal of dead wood and dead trees' includes the removal of fallen branches and litter as general tidying up and the removal of standing dead trees. Dead wood and dead trees provide essential habitat for a wide variety of native animals. It is acknowledged that some dead wood may be relocated. However, in areas of retained vegetation, no dead wood would be removed by the proposal.

With consideration of these factors, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is '*unlikely*' to have a '*significant effect*' on Southern Myotis and Corben's Long-eared Bat or their habitats. Therefore, the proposed activity would not require a Species Impact Statement.

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

Little Eagle

The Little Eagle is found across mainland Australia except in densely forested areas. They nest in tall, living trees, where a large stick nest is built in winter. The species lays two or three eggs during spring, and young fledge in early summer. Field surveys within the vicinity of the proposal, have not detected this species. In addition, no past or current nesting site

has been identified in these surveys, suggesting that the woodland and large farm trees adjacent to the road are of little importance to this species.

OEH (2016c) identify the following threats to Little Eagle:

- Secondary poisoning from rabbit baiting
- Rural-residential subdivision and associated land uses (e.g. horse and goat grazing)
- Urban expansion
- Clearing and degradation of foraging and breeding habitat.

Of these, only the last threat is of potential relevance when considering the impact of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) and about 1.735 hectares of non-native vegetation. However, this is not considered breeding habitat given the lack of past or current nesting sites. In terms of potential foraging habitat, given an absence of any sightings of this species adjacent to the proposal and its position directly adjacent to the road corridor, it can be strongly inferred that the woodland to be removed by the proposal is of little value to Little Eagle. With consideration of these points, and the relatively mobility of this species, the minor loss of potential habitat loss is considered negligible in the context of the woodlands of the locality which include the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal.

With consideration of these factors, it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Little Eagle, such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of Little Eagle listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Little Eagle are not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**
 - i. The proposed work would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) of potential foraging habitat.
 - ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the agricultural surroundings, small extent of existing woodland and the existing road.
 - iii. Given the highly mobile nature of this species, the woodland habitat is likely to provide a foraging resource in the locality, as do other woodland patches beyond the road reserve boundaries in the region including the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal. Given this, it is unlikely that the habitat to be removed is important to the long-term survival of Little Eagle in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for these species within the Albury LGA under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan or threatened abatement plan listed for this species. However, the Little Eagle has been assigned to the 'Landscape-managed species stream' by the OEH. The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease. The nature and extent of the proposal is likely to be consistent the management stream given that it would remove only a small area of woodland habitat.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and realignment – is not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, the *Clearing of native vegetation* and *Removal of dead wood and dead trees* is of relevance to this species.

The ‘clearing of native vegetation’ is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of about 0.208 hectares of Box-Gum Woodland (BGW) including 0.001 hectares of derived native grassland and about 0.037 hectares of native tree planting. A total of 2.098 hectares of BGW occurs within or directly adjoins the proposal (see **Map 9**) therefore there is about 1.89 hectares that would remain unaffected by the proposal. This relatively minor loss of vegetation is considered negligible in the context of the extent of BGW remaining.

The ‘removal of dead wood and dead trees’ includes the removal of fallen branches and litter as general tidying up and the removal of standing dead trees. Dead wood and dead trees provide essential habitat for a wide variety of native animals. It is acknowledged that some dead wood may be relocated. However, in areas of retained vegetation, no dead wood would be removed by the proposal.

With consideration of these factors, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is ‘*unlikely*’ to have a ‘*significant effect*’ on Little Eagle or its habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

Woodland Birds (Little Lorikeet, Swift Parrot, Black-chinned Honeyeater, Turquoise Parrot, Diamond Firetail, Flame Robin, Superb Parrot)

Little Lorikeet

The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia (OEH 2016c). NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.

Little Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including paperbarks and mistletoes. Little Lorikeets nest in hollow-bearing trees typically of smooth-barked eucalypts but also they also nest in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts and in riparian trees, species such as *Allocasuarina* spp. are used. No individuals of Little Lorikeet were detected during the field surveys for this proposal.

OEH (2016c) identify the following threats to Little Lorikeet:

- Given that large old *Eucalyptus* trees on fertile soils produce more nectar, the extensive clearing of woodlands for agriculture has significantly decreased food for the lorikeet, thus reducing survival and reproduction. Small scale clearing, such as during roadwork and fence construction, continues to destroy habitat and it would be decades before revegetated areas supply adequate forage sites.
- The loss of old hollow bearing trees has reduced nest sites, and increased competition with other native and exotic species that need large hollows with small entrances to avoid predation. Felling of hollow trees for firewood collection or other human demands increases this competition
- Competition with the introduced Honeybee for both nectar and hollows exacerbates these resource limitations.

Of these, the first and second threats are of potential relevance when considering the impact of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) and two hollow-bearing trees. However, in the context of the isolation of the woodland features in the surrounding landscape, these habitat features are considered to be of little importance. Further, and in consideration of the relatively mobility of this species, the loss of 0.244 hectares of woodland is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal.

Swift Parrot

Swift Parrot is a winter (March-September) visitor to southern and eastern New South Wales, where it inhabits eucalypt forests and woodlands (Brereton *et al.* 2004; Mac Nally

and Horrocks 2000; OEH 2016c). It feeds mostly on the flowers of eucalypts (particularly prolifically flowering species), but also eats psyllids and exotic fruits (Brereton *et al.* 2004; Mac Nally and Horrocks 2000). This species is highly nomadic and relatively large numbers can arrive at and vacate areas depending on local and regional flowering of favoured species (Mac Nally and Horrocks 2000). No Swift Parrots were recorded during the field surveys for this proposal.

OEH (2016c) identify the following threats to Swift Parrot:

- On the mainland the main threat is loss of habitat through clearing for agriculture, and urban and industrial development
- Collisions with wire netting fences, windows and cars, during the breeding season and winter migration (especially where such obstacles are in close proximity to suitable habitat).

Of these, only the first threat is of relevance when considering the potential impact of the proposal. Any area containing box-gum woodland is considered potential foraging habitat along HW20. However, given the relatively minor nature of the proposal in that it would remove only a small lineal strip of Box-Gum Woodland within the existing road reserve, the minor loss of vegetation is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal and the relative mobility of this species to exploit foraging habitat across a wide area.

Black-chinned Honeyeater

The Black-chinned Honeyeater is found in dry open forests and woodlands dominated by box or ironbark eucalypts (OEH 2016c). The species is often seen in pairs but also in small groups as many as a dozen or more individuals. Foraging ranges are generally at least five hectares making this species locally nomadic to exploit food resources. The Black-chinned Honeyeater was not recorded as part of the field surveys for this proposal however it has been recorded in the locality.

OEH (2016c) identify the following threats to Black-chinned Honeyeater:

- Clearing of remnant open forest and woodland habitat
- Poor regeneration of open forest and woodland habitats because of intense grazing
- May be excluded from smaller remnants by aggressive species such as the Noisy Miner (*Manorina melanocephala*).

Of these, only the first threat is of relevance when considering the potential impact of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) within the road reserve and next to HW20. This minor loss of vegetation is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares),

Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal and the relative mobility of the species to exploit feeding resources.

Turquoise Parrot

The Turquoise Parrot occurs from southern Queensland through to northern Victoria where it is known from woodland and riparian habitats particularly those with a grassy or shrubby understorey (OEH 2016c). The species is often seen at the ecotone between woodland and open farmland, along timbered ridges and watercourses. No Turquoise Parrots were recorded during the field surveys for this proposal however it has been recorded within the locality.

OEH (2016c) identify the following threats to Turquoise Parrot:

- Clearing of grassy-woodland and open forest habitat
- Loss of hollow-bearing trees
- Degradation of habitat through heavy grazing, firewood collection and establishment of exotic pastures
- Predation by foxes and cats
- Illegal trapping of birds and collection of eggs which also often results in the destruction of hollows.

Of these, only the first threat is of relevance when considering the potential impact of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) of potential foraging habitat along HW20 which given their apparent absence, is likely to be of little, if any importance to this species. Nonetheless, the minor loss of vegetation is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal. Two hollow-bearing trees would be removed. These trees are unlikely to provide any habitat for this species given its current position directly adjacent to HW20 where it is significantly disturbed by road noise.

Flame Robin

Flame Robin breeds in upland, moist eucalypt forests and woodlands spending winter in more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains (OEH 2016c). They often occur in recently burnt areas, however habitat becomes unsuitable as vegetation closes up following regeneration (OEH 2016c). Flame Robin was not recorded during the field surveys for this proposal however it has been recorded in the locality.

OEH (2016c) identify the following threats to Flame Robin:

- Clearing and degradation of breeding habitat
- Degradation of wintering habitat
- Degradation and simplification of habitat by overgrazing and removal of standing dead timber, logs and coarse woody debris
- Nest predation by native and exotic predators, including artificially large populations of Pied Currawong (*Strepera graculina*) in some areas
- Habitat for this species may become unsuitable if dense regeneration occurs after bushfires or other disturbances.

Of these, only the second threat is of relevance when considering the potential impact of the proposal given that the wintering habitat is present. The proposal would result in the removal of an area of exotic grassland which may be considered wintering habitat. Open farmland habitats are not a limiting resource in the locality given the extensive clearing for agricultural that has taken place over the past 100 years.

Superb Parrot

Superb Parrots are known to nest in box-gum woodland, riparian woodland and isolated paddock trees, where they may travel as far as 10 kilometres to suitable foraging habitat (CSU 2006; OEH 2016c). In the south-west slopes, their core breeding habitat has been identified as roughly bordered by the towns of Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Other known breeding sites are located within the corridors of the Murrumbidgee, Murray and Edward Rivers. Migration of these populations occurs at the end of the breeding season, when birds move north toward the Upper Namoi and Gwydir River regions. No Superb Parrots were recorded during the field surveys for this proposal however they have been previously recorded in the locality.

OEH (2016c) identify the following threats to Superb Parrot:

- Removal of hollow-bearing trees
- Clearing of woodland remnants
- Poor regeneration of nesting trees and food resources
- Feeding on grain spills and subsequently being struck by vehicles
- Loss of hollows to feral bees and native and exotic hollow-nesting birds.
- Illegal trapping.

Of these, only the first and second threats are of relevance when considering the potential impact of the proposal. The proposal would result in the removal of two hollow-bearing trees (HBT) and approximately 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) hectare of potential foraging habitat. As the field surveys were undertaken during the known breeding season and none were present, it is likely that the study area is of little, if any, importance to the species. Nonetheless, the minor loss of

vegetation is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal. Additionally, the removal of three HBT are also unlikely to be of relevance given that Superb Parrot usually nest in River Red Gum along major rivers in the wider locality and forage in BGW. Given this, Superb Parrot are unlikely to be using the HBT within the study area.

Diamond Firetail

Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South-western Slopes and the North-west Plains and Riverina (Morcombe 2004; OEH 2016c). Although they are not commonly found in coastal districts, there are records from near Sydney, the Hunter Valley and the Bega Valley (OEH 2016c). They are considered relatively sedentary; however, many populations are known to disperse, especially during drought periods. They are known to build bottle-shaped nests in trees and bushes and preferentially choose mistletoe as a nest site (Cooney and Watson 2005). It has declined in numbers in many areas and has disappeared from parts of its former range with Reid (1999) identifying it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt. Field surveys did not detect Diamond Firetail within the vicinity of the proposal. However, this species has been detected in the locality of the proposal.

OEH (2016c) identify the following threats to Diamond Firetail:

- Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection
- Poor regeneration of open forest and woodland habitats
- Invasion of weeds, resulting in the loss of important food plants
- Modification and destruction of ground- and shrub layers within habitat through: removal of native plants, litter and fallen timber; introduction of exotic pasture grasses; heavy grazing and compaction by stock; and frequent fire
- Predation of eggs and nestlings by increased populations of native predators such as the Pied Currawong *Strepera graculina*
- Risk of local extinction due to small, isolated populations.

Of these, only the first threat is of relevance when considering the potential impact of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) native vegetation and about 1.735 hectares of non-native vegetation (introduced grassland/trees) along HW20. Despite field surveys, Diamond Firetail has not been detected within the vicinity of the proposal suggesting that the site may be of little, if any, importance to the species particularly in the context of habitat quality. Nonetheless, the minor loss of vegetation is considered negligible in the context of the woodlands of the region which includes the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount

Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal.

With consideration of all these factors, it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Varied Sittella, Little Lorikeet, Swift Parrot, Black-chinned Honeyeater, Turquoise Parrot, Flame Robin, Superb Parrot and Diamond Firetail or their habitats such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of these species listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

These species are not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**
- i. The proposed work would result in the removal of two HBTs about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) of potential foraging habitat.
 - ii. The proposal would not isolate or fragment other areas of habitats further than those impacts that pre-exists given the existing agricultural landscape, the isolated nature of the woodland and the existing road.

- iii. None of these species were recorded during the field surveys in the vicinity of the proposal despite targeted surveys. This suggests that the potential habitat to be removed is of little importance to their long-term in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for these species, or within the Albury LGA under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan or threat abatement plan listed for the majority of these species. However, should one exist in the future, the nature and extent of the proposal is likely to be consistent with such a plan given that it would remove only a small area of woodland habitat. The Little Lorikeet, Black-chinned Honeyeater, Turquoise Parrot, Diamond Firetail and Flame Robin have been assigned to the 'Landscape species management stream' by the OEH. The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease. The nature and extent of the proposal is likely to be consistent the management stream given that it would remove only a small area of woodland habitat. For the Swift Parrot and Superb Parrot, a national recovery plan exists (BakerDabb 2011; BirdsAustralia 2011). The extent and nature of proposal and the quality of habitat that would be affected, as discussed in point d), indicate that the proposed work would be consistent with the objectives of these plans.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and realignment work – is not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, the *Clearing of native vegetation*, *Loss of hollow bearing trees* and *Removal of dead wood and dead trees* is of relevance to most of these species.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of approximately 2.08 hectares of Box-Gum Woodland (BGW) including 0.001 hectares of derived native grassland. A total of 2.098 hectares of BGW occurs within or directly adjoins the proposal (see **Map 9**) therefore there is about 1.89 hectares that would remain unaffected by the proposal. This relatively minor loss of vegetation is considered negligible in the context of the extent of BGW remaining.

The 'loss of hollow-bearing trees' is one factor affecting the distribution and long-term survival of hollow-dependant fauna such as many woodland bird species and arboreal mammals. Up to two hollow-bearing trees would be removed as part of the proposal resulting in the loss of about three small hollows. One of these hollows was observed to be occupied by bees during the field surveys and would not be used by birds. Due to the high mobility of these species, the loss of two small hollows is unlikely to create a significant impact should mitigation measures described in this BIA be followed.

The 'removal of dead wood and dead trees' includes the removal of fallen branches and litter as general tidying up and the removal of standing dead trees. Dead wood and dead trees provide essential habitat for a wide variety of native animals. It is acknowledged that some dead wood may be relocated. However, in areas of retained vegetation, no dead wood will be removed by the proposal.

With consideration of these factors, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is '*unlikely*' to have a '*significant effect*' on Little Lorikeet, Swift Parrot, Black-chinned Honeyeater, Turquoise Parrot, Diamond Firetail and Flame Robin or their habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

Barking Owl

The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils (OEH 2014). This species was not detected during field surveys for this proposal however it has been recorded previously in the locality.

OEH (2014c) identify the following threats to Barking Owl:

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the establishment of exotic pastures
- Inappropriate forest harvesting practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth

- Too-frequent fire leading to degradation of understorey vegetation which provides shelter and foraging substrates for prey species
- Disturbance of nesting and excessive disturbance of foraging by inappropriate use of call-playback surveys.

Of these, the first threat is of potential relevance when considering the impacts of the proposal. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) of native vegetation and about 1.735 hectares of non-native vegetation (introduced grassland/trees) along HW20 that is near the Murray River (likely a primary foraging resource). This minor loss of potential but marginal habitat is considered negligible considering the small extent of the woodland and in the context of the woodlands remaining in the region which would remain unaffected by this proposal, which include the nearby Baranduda Range Regional Park (3847 hectares), Jarvis Creek Plateau Regional Park (2480 hectares), Mount Granya State Park (6140 hectares) and parts of Woomagarma National Park which would remain unaffected by this proposal..

Given this it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Barking Owl, such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of Barking Owl listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Barking Owl is not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

- i. The proposed work would result in removal of up to 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) and about 1.735 hectares of non-native vegetation which may provide marginal potential habitat.
- ii. The proposal would not isolate or fragment other areas of habitats than is pre-existing.
- iii. Given the highly mobile nature of this species, the woodland habitat is likely to provide a potential foraging resource in the locality. The isolation and small size of hollows of the HBTs and lack of records during field surveys at the HBTs indicate that it is unlikely that the habitat present is important to the long-term survival of Barking Owl in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for this species, or within the Albury LGA under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is a draft recovery plan for Barking Owl (NPWS 2003b). The nature and extent of the proposal is consistent with this plan given that it avoids high quality habitat for the species.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and realignment work – is not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, the *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* is of relevance to these species.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact on biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) and about 1.735 hectares of non-native along HW20. This minor loss of potential habitat is considered negligible in the context of the woodlands remaining in the region which would remain unaffected by this proposal.

The 'loss of hollow-bearing trees' is one factor affecting the distribution and long-term survival of hollow-dependant fauna such as microchiropteran bats, arboreal mammals and many bird species. Up to two hollow-bearing trees would be removed as part of the proposal.

The 'removal of dead wood and dead trees' includes the removal of fallen branches and litter as general tidying up and the removal of standing dead trees. Dead wood and dead trees provide essential habitat for a wide variety of native animals. It is acknowledged that some dead wood may be relocated. However, in areas of retained vegetation, no dead wood would be removed by the proposal.

With consideration of these factors, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is '*unlikely*' to have a '*significant effect*' on Barking Owl or their habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

Fish (Murray Jollytail and Southern Pygmy Perch)

Murray Jollytail

Murray Jollytail or Flathead Galaxias, is endemic to the southern tributaries of the Murray Darling River system; the Murray, Murrumbidgee and Lachlan Rivers and their tributaries and the upper Macquarie River catchment. It is generally found mid-water in still and gently moving waters of small streams, lakes, lagoons, billabongs and backwaters. Its habitat consists of coarse sand or mud substrate and aquatic vegetation (DPI 2014). This species has been recorded in South Albury, about 9.5 kilometres west of the proposal, in the Murray River.

DPI (2014) lists the following threats to the Murray Jollytail:

- Spawning or recruitment failure due to water regulation and cold water release from impoundments.
- Loss of or altered connectivity between rivers and floodplains.

- Loss of or degradation of habitats in lakes, wetlands and billabongs such as the loss of aquatic vegetation like Ribbon Weed (*Vallisneria spp.*)
- Predatory and competitive interactions with introduced species such as Carp (*Cyprinus carpio*), Redfin Perch (*Perca fluviatilis*) and Gambusia (*Gambusia holbrooki*).
- Construction of barriers to migration and recolonisation such as weirs and dams without fish ways.
- Habitat modifications as a result of agricultural practices including siltation and loss of riparian vegetation.
- Pollution from domestic, agricultural and industrial sources.

Of these, the second last threat is of potential relevance when considering the impacts of the proposal. Though the habitat modification would be as a result of road work instead of agricultural practices, it is still relevant. The proposal would result in the removal of native vegetation and non-native vegetation next to Lake Hume which could be considered riparian vegetation. Though this is very marginal and often a significant distance from the water due to the fluctuations in water levels in the lake as a result of poor rainfall and downstream requirements. Additionally there is very little aquatic vegetation in Lake Hume that would be considered good quality habitat, again most likely as a result of water level fluctuations. The potential for sedimentation would be high for this proposal due to the large quantities of material required to build up the level of the widened fill batters. During heavy rainfall periods, the potential for increased runoff causing erosion and sedimentation in Lake Hume would high. Mitigation measures including sediment basins and the deployment of emergency sedimentation boom within Lake Hume when and where required, are detailed in **Chapter 5**. Due to the marginal nature of the habitat for Murray Jollytail and the mitigation measures detailed, this is unlikely to significantly impact Murray Jollytail.

Southern Pygmy Perch

The Southern Pygmy Perch was once widely distributed throughout the Lachlan, Murrumbidgee and Murray River systems, as well as coastal streams in South Australia, Victoria, north-eastern Tasmania and King and Flinders Islands in Bass Strait. The Southern Pygmy Perch is found in well vegetated, slow-flowing or still waters including streams, lakes, billabongs and other types of wetlands (DPI 2013). This species has been recorded about 9.5 kilometres west of the proposal, in South Albury in the Murray River.

DPI (2013) list the following as reasons why the Southern Pygmy Perch is threatened:

- Habitat degradation including loss of aquatic and riparian (riverbank) vegetation.
- Loss or modification of floodplain wetland habitats by flood mitigation work, such as levees and wetland drainage.
- Modification of natural river flows and temperatures as a result of river regulation, leading to drying and fragmentation of wetland habitats and spawning failures.
- Predation by, and competition with, introduced fish species, such as Redfin Perch (*Perca fluviatilis*) and Eastern Gambusia (*Gambusia holbrooki*).

Of these, the first threat is of potential relevance when considering the potential impacts of the proposal. Habitat degradation would be as a result of the removal of native vegetation and non-native vegetation next to Lake Hume which could be considered riparian vegetation. Though this is very marginal and often a significant distance from the water due to the fluctuations in water levels in the lake as a result of poor rainfall and downstream requirements. Additionally there is very little aquatic vegetation in Lake Hume that would be considered good quality habitat, again most likely as a result of water level fluctuations. There is also the potential for sedimentation resulting in aquatic vegetation degradation due to the large quantities of material required to build up the level of the widened fill batters. During heavy rainfall periods, the potential for increased runoff causing erosion and sedimentation in Lake Hume would high. Mitigation measures including sediment basins and the deployment of emergency sedimentation boom within Lake Hume when and where required, are detailed in **Chapter 5**. Due to the marginal nature of the habitat for Southern Pygmy Perch and the mitigation measures detailed, this is unlikely to significantly impact Southern Pygmy Perch.

Given this it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Murray Jollytail and Southern Pygmy Perch, such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of Murray Jollytail or Southern Pygmy Perch listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Murray Jollytail and Southern Pygmy Perch are not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

- i. The proposed work would result in removal of up to 0.245 hectares (0.207 hectares of woodland, 0.001 hectares of derived native grassland and 0.037 hectares of native tree planting) and about 1.735 hectares of non-native vegetation next to Lake Hume which would be considered marginal riparian habitat and no aquatic vegetation would be directly impact however the proposal could result in sedimentation indirectly impacting aquatic vegetation.
- ii. The proposal would not isolate or fragment other areas of habitats than is pre-existing.
- iii. The vegetation impacted is unlikely to be habitat important to the long-term survival of Murray Jollytail or Southern Pygmy Perch in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for these species, or within the Albury LGA under the FM Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Priorities Action Statements for both the Murray Jollytail and Southern Pygmy Perch listed on the NSW DPI Fisheries and Aquaculture website. These statements list a number of recovery actions for both species which include:

- Advice to consent and determining authorities
- Collate and review existing information
- Community and stakeholder liaison, awareness and education
- Compliance/enforcement
- Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species
- Habitat rehabilitation
- Pest eradication and control
- Stocking / translocation
- Survey/mapping

The nature and extent of the proposal is consistent with this plan given that it avoids high quality habitat for the species.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and safety upgrades – is not recognised as a key threatening process (KTP) under schedule 6 of the FM Act, the *Degradation of native riparian vegetation along New South Wales water courses* is of relevance to these species.

The ‘degradation of native riparian vegetation along New South Wales water courses’ is listed as a KTP because of its negative impacts on threatened species, populations and ecological communities listed under the FM Act. Riparian vegetation is vegetation on land that adjoins, directly influences or is influenced by, a body of water. Riparian vegetation is found alongside creeks and rivers, areas around lakes, wetlands and on river floodplains. It is part of a healthy functioning ecosystem and has numerous ecological benefits. Riparian vegetation is degraded by the complete removal or modification of native plants by processes such as clearing, gravel extraction, cropping, livestock grazing, trampling and introduction of, or invasion by, non-native species (DPI 2005). The vegetation that would be impacted by the proposal would only be considered marginal riparian vegetation due to the extensive modification through past land practices, most of the vegetation is dominated by introduced species. Also it is located next to an artificial reservoir. The current position of Riverina Highway would have been a significant distance from the original path of the Murray River before it was dammed. At the time of the field surveys, there was a large area of bare earth between the level of the water and the start of any vegetation. This is due to the fluctuating level of the water resulting in an area that is sometimes inundated and other times dry which does not allow aquatic or terrestrial vegetation to grow.

With consideration of these factors and the mitigation measures described in **Chapter 5**, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is ‘*unlikely*’ to have a ‘*significant effect*’ on Murray Jollytail or Southern Pygmy Perch or their habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

Squirrel Glider

Squirrel Glider is known to occur in mature Box-Gum/Box Ironbark woodlands and River Red Gum forests west of the Great Dividing Range and in Blackbutt/Bloodwood forests with a heathy understory in coastal areas (OEH 2016) where they utilise hollow-bearing trees for

denning purposes. Squirrel Glider has been recorded extensively to the west and north-west of the proposal, around the township of Thurgoona and the Charles Sturt University campus (see **Map 3**). Friends of the Spillway Gliders (FSG) have been actively maintaining and enhancing Squirrel Glider habitat in the Lake Hume area for many years. More recently, they have been monitoring nest boxes that they have previously installed. Monitoring to date by FSG confirms the presence of a Squirrel Glider population in Lake Hume village, below the spillway along the Murray River, and along the Riverina Highway east of Lake Hume Village toward Bethanga Bridge (within the study area and adjacent). A targeted field survey using recognised techniques such as motion-activated cameras, spotlighting and trapping (aboreal Elliot traps and PVC tube pipes – both with bait attractants) (Goldingay and Sharpe 2004) detected Squirrel Glider using a nest box within the planted native vegetation in the central portion of the proposal.

OEH (2016c) identify the following threats to this species:

- Loss, fragmentation and degradation of habitat.
- Loss of hollow-bearing trees.
- Loss of flowering understorey and midstorey shrubs in forests.
- Individuals can get caught in barbed wire fences while gliding.
- Loss of hollow availability due to takeover by feral honeybees and exotic birds.

Of these, the first and second threats are of relevance when considering the potential impacts of the proposal. The proposal would result in the removal of approximately 0.244 hectares (0.207 hectares of woodland, and 0.037 hectares of native tree planting) and about 1.735 hectares of non-native vegetation and two hollow-bearing trees resulting in the loss of three small hollows. This species was recorded through the use of infrared motion activated cameras within the native tree planting next to the site. It is recognised that Squirrel Glider can persist in lineal remnants such as those on Riverina Highway (Holland *et al.* 2007; Van der Ree 2002). A study carried out by the Southern Cross University (Sharpe and Goldingay 2007) into the home range of Squirrel Gliders indicates that the average home range area for Squirrel Gliders is about 6.2 hectares with the minimum recorded 2.4 hectares and the maximum being 9.2 hectares. The existing native tree planting where the Squirrel Glider was recorded is about 6.719 hectares with about 0.037 hectares to be impacted (0.6%). This level of impact would appear to be relatively minor in the context of the known habitat remaining.

There is a relatively low risk for the proposal to reduce connectivity across the highway to the detriment of this species. Squirrel Gliders have been observed crossing Riverina Highway (Stuart Lucas, OEH, pers.com) and this proposal would increase the distance that would need to be travelled by individuals attempting the crossing. Currently, the existing canopy gap is around 10 metres in width. The proposal is likely to increase this gap to about 25 metres. This is well under the general threshold of the minimum gliding capabilities of this species (around 40 metres).

With consideration of these factors, it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Squirrel Glider, such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of Squirrel Glider listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Squirrel Glider is not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**
- i. The proposed work would result in the removal of about 0.244 hectares (0.207 hectares of woodland and 0.037 hectares of native tree planting) and two hollow-bearing trees.
 - ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the agricultural surroundings, small extent of existing woodland and the existing road. Additionally the lineal nature of the impact would only take vegetation from the edge of existing patches.

- iii. The vegetation impacted is likely to be habitat important to the long-term survival of Squirrel Glider in the locality. However, connectivity remaining for this species will remain.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for this species, or within the Albury LGA under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan or threatened abatement plan listed for this species. However, the Squirrel Glider has been assigned to the 'Landscape-managed species stream' by OEH. The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease. The nature and extent of the proposal is likely to be consistent the management stream given that it would remove only a small area of woodland habitat.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and safety upgrades – are not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, *Clearing of native vegetation*, *Loss of hollow-bearing trees* and *Removal of dead wood and dead trees* is of relevance to this species.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of approximately 0.208 hectares of Box-Gum Woodland (BGW) including 0.001 hectares of derived native grassland and about 0.37 hectares of native tree planting. A total of 2.098 hectares of BGW occurs within or directly adjoins the proposal (see **Map 9**) therefore there is about 1.89 hectares that would remain unaffected by the proposal. This relatively minor loss of vegetation is considered negligible in the context of the extent of BGW remaining. In terms of any home range, the proposal would affect only 0.6% of an occupied area of habitat.

The 'loss of hollow-bearing trees' is one factor affecting the distribution and long-term survival of hollow-dependant fauna such as microchiropteran bats, arboreal mammals and many bird species. Up to two hollow-bearing trees would be removed as part of the proposal resulting in the loss of three small hollows. One of these hollows was observed to have bees in it so this would not be used by Squirrel Gliders. The other two could potentially be used by

this species. The Squirrel Gliders which have been observed onsite appear to utilise the artificial habitat, which is installed nest boxes; none of these would be directly impacted by the proposal.

The 'removal of dead wood and dead trees' includes the removal of fallen branches and litter as general tidying up and the removal of standing dead trees. Dead wood and dead trees provide essential habitat for a wide variety of native animals. It is acknowledged that some dead wood may be relocated. However, in areas of retained vegetation, no dead wood would be removed by the proposal.

With consideration of these factors and the mitigation measures described in **Chapter 5**, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is '*unlikely*' to have a '*significant effect*' on Squirrel Glider or their habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

Small Scurf Pea

In known populations in Victoria and NSW, Small Scurf Pea plants are found in grassland, River Red Gum (*Eucalyptus camaldulensis*) Woodland or Box-Gum Woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall of between 450 and 700 mm. The Small Scurf-pea is known in NSW from only two herbarium collections; one from Wagga Wagga in 1884 and the other from Jindera (near Albury) in 1967. A small population was recently reported from near Jerilderie (although it has not been relocated). In recent years, two populations have been recorded in travelling stock reserves south-west of Wagga Wagga, and a population reputedly exists on a roadside near Galong. Another population has recently been discovered on private land near Young. Large populations have been recorded in grassy gaps in the Red Gum Woodlands of Barmah State Park, just across the border in Victoria. Extensive suitable habitat probably occurs across the border in NSW. There have been no records of this species within the locality of the proposal.

OEH (2016c) identify the following threats to this species:

- Intensive grazing by stock.
- Clearing of habitat.
- Changes to agricultural practices (e.g. introduction of cropping).

- Competition with invasive pasture grasses and other weeds.
- Poor knowledge of the species' population size and distribution.

Of these, the first threat is of relevance when considering the potential impacts of the proposal. The proposal would result in the removal of approximately 0.207 hectares of potential woodland habitat and 0.1 hectares of derived native grassland habitat. While it is recognised that there is potential for this species to occur in the area, the likelihood is low as there are no known populations in the area. Additionally the area of investigation for this proposal was surveyed extensively in January 2016 which is in the flowering and fruiting period for this species (October - April) and it was not recorded. Mitigation measures recommended in **Chapter 5** should minimize the potential for impact to this species.

With consideration of these factors, it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Small Scurf Pea, such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no endangered populations of Small Scurf Pea listed within the boundaries of the Albury LGA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Small Scurf Pea is not listed as an endangered ecological community or critically endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

- i. The proposed work would result in the removal of about 0.208 hectares of potential habitat (0.207 hectares being native vegetation and 0.001 hectares of derived native grassland).
- ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the agricultural surroundings, small extent of existing woodland and the existing road. Additionally the lineal nature of the impact would only take vegetation from the edge of existing patches.
- iii. The vegetation impacted is unlikely to be habitat important to the long-term survival of Small Scurf Pea in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for this species, or within the Albury LGA under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan or threatened abatement plan listed for this species. However, the Small Scurf Pea has been assigned to the 'Site-managed species stream' by the OEH. The OEH has established four management sites where conservation activities need to take place to ensure the conservation of this species. The proposal is not located in close proximity to one of these sites.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and safety upgrades – are not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, *Clearing of native vegetation* is of relevance to this species.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of about 0.208 hectares of Box-Gum Woodland (BGW) including 0.001 hectares of derived native grassland and about 0.037 hectares of native tree planting. A total of 2.098 hectares of BGW occurs within or directly adjoins the proposal (see **Map 9**) therefore there is about 1.89 hectares that would remain unaffected by the proposal.

This relatively minor loss of vegetation is considered negligible in the context of the extent of BGW remaining.

With consideration of these factors and the mitigation measures described in **Chapter 5**, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process with consideration of the mitigation measures proposed.

Conclusion

This Assessment of Significance has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on Small Scurf Pea Glider or their habitat. Therefore, the proposed activity would not require a Species Impact Statement.

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

White Box, Yellow Box, Blakely's Red Gum Woodland Threatened Ecological Community (Box-Gum Woodland – BGW)

BGW is not a threatened species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

BGW is not listed as an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

BGW is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*). Intact sites contain a high diversity of plant species including some shrub species, several climbing plant species, many grasses and a very high diversity of herbs (OEH 2014c). It generally occurs on fertile lower parts of the landscape where resources such as water and nutrients are abundant (OEH 2014c). Sites that retain only a grassy ground layer, with few or no trees remaining are

considered important for rehabilitation and to rebuild connections between sites of better quality (OEH 2016c).

OEH (2014c) identify the following threats to BGW:

- Clearing, degradation and fragmentation of remnants for agricultural, forestry, infrastructure and residential development
- Continuous heavy grazing and trampling of remnants by grazing stock, resulting in losses of plant species (simplification of the understorey and ground layer and suppression of overstorey), erosion and other soil changes (including increased nutrient status)
- Invasion of remnants by non-native plant species, including noxious weeds, pasture species and environmental weeds, including garden escapes, olives and pines
- Invasion of remnants by feral animals resulting in the loss or modification of habitat
- Disturbance and clearance of remnants during road, rail and infrastructure maintenance and upgrades
- Harvesting of firewood (either living or standing dead, including material on the ground)
- Collection of on-ground woody debris in the guise of a 'clean-up'.

Of these threats, the first and fifth threats are of likely relevance when considering the potential impact of the proposal. The proposal would result in the removal of about 0.208 hectares of BGW including 0.207 hectares with canopy consisting of White Box and 0.001 hectares of derived native grassland.

This TEC occurs adjacent to the existing road reserve however it is in low condition due to the lack of structural and species diversity. The derived grassland is also characterised by a low diversity, mostly dominated by native grasses that respond reasonably well to disturbance or have managed to persist in a landscape dominated by exotic species.

Most of the vegetation removal is minor and only a small section of one patch of woodland with canopy would be impacted. This patch of woodland is isolated from other patches due to the existing agricultural landscape and historical land practices. Additionally, in the areas adjacent to the patch there is a high level of introduced groundcover species and low biodiversity due to historic land use practices. This is the case within the study area, where exotic flora dominates and hollow-bearing trees are largely absent or isolated as farm trees confirming both disturbance and a lack of regrowth history.

The loss of about 0.208 hectares of BGW is considered negligible in the context of the quality of the woodland and the potential habitat it represents. However, EnviroKey recommend mitigation measures to minimise impacts to the TEC. These would include establishing temporary exclusion fencing around areas not affected by the proposal but within direct vicinity. Mitigation measures detailed within **Chapter 5** would ensure that potential impact to the Box-Gum Woodland are minimised to the greatest extent possible.

Therefore, the proposal is *unlikely* to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**
 - i. The proposed work would result in the removal of about 0.208 hectares of BGW (including 0.001 hectares of derived native grassland).
 - ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the agricultural surroundings, small extent of existing woodland and the existing road. Additionally the lineal nature of the impact would only take vegetation from the edge of existing patches.
 - iii. It is *unlikely* that the removal of this portion of habitat is of importance to the long-term survival of this community in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for BGW under the TSC Act.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

At the time of writing, a national recovery plan has been prepared for the EPBC Act critically endangered ecological ecosystem, White Box, Yellow Box, Blakely's Red Gum Woodland (DECCW 2011). The objectives of this plan are relevant to the TSC Act listed endangered ecological community present within the study area and subject to this proposal. The extent and nature of proposal and the quality of vegetation that would be affected, as discussed in point d), indicate that the proposed work would be consistent with the objectives of this plan.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

While the proposed activity – road widening and realignment work – is not recognised as a key threatening process (KTP) under schedule 3 of the TSC Act, *Clearing of native vegetation* is.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact on biological diversity

such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change. The proposal would result in the removal of about 0.245 hectares (0.207 hectares of woodland, 0.001 hectares of derived native grassland and 0.037 hectares of native tree planting) of native vegetation along HW20. This minor loss of vegetation is considered negligible in the context of the woodlands remaining in the locality.

With consideration of these factors, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process.

Conclusion

This Assessment of Significance has determined that the proposed activity is '*unlikely*' to have a '*significant effect*' on Box-Gum Woodland. Therefore, the proposed activity would not require a Species Impact Statement.

APPENDIX 8 – ASSESSMENT OF SIGNIFICANCE (EPBC ACT)

Migratory Species

Protected under several international agreements to which Australia is a signatory, Migratory species are considered Matters of National Environmental Significance under the EPBC Act.

Three migratory species were observed within the vicinity of the proposal and four are known to occur or have the potential to occur (**Table 13, Appendix 6**). These being the Cattle Egret, White-bellied Sea-eagle, Rainbow Bee-eater and Caspian Tern.

Under the EPBC Act, an action is likely to have a significant impact on a migratory species if it substantially modifies, destroys or isolated an area of 'important habitat' for the species (DotE 2013). For these species, the study area is not considered to comprise 'important habitat' as it does not contain:

- Habitat used by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species
- Habitat that is of critical importance to the species at particular life-cycle stages
- Habitat used by a migratory species that is at the limit of the species' range
- Habitat within an area where the species is declining.

Given this, the impact of the proposal on Cattle Egret, White-bellied Sea-eagle, Rainbow Bee-eater, and Caspian Tern are not likely to be regarded as significant and are not considered further.

Threatened Species

The study area and immediate surrounds could provide potential habitat for two biota listed as threatened under the EPBC Act; the Superb Parrot and Murray Cod (also assessed under the TSC Act in **Appendix 7**). The following section provides significance assessments for this species.

Vulnerable Species (Superb Parrot, Murray Cod)

Will the action lead to a long-term decrease in the size of an important population of a species?

No. There is no evidence to suggest that an important population exists.

Will the action reduce the area of occupancy of an important population?

No. All evidence suggests that an important population is unlikely to occur given that no Superb Parrot or Murray Cod were identified during the field survey in favourable survey conditions.

Will the action fragment an existing population into two or more populations?

No. The Superb Parrot is highly mobile and is known to traverse roads to access suitable habitat. The proposal is unlikely to directly impact aquatic habitats.

Will the action adversely affect habitat critical to the survival of a species?

No. The habitat present within proximity of the proposal could not be construed as habitat critical to the survival of this species. No evidence of occupation was detected during the field survey.

Will the action disrupt the breeding cycle of an important population?

No. the proposal would not disrupt the breeding cycle of an 'important population' even if one did occur there as no suitable breeding habitat is present.

Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No. The availability and quality of habitat remaining indicates that the proposed action is unlikely to impact habitat to the extent these species are likely to decline (even if it did occur there in the future).

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

No. Mitigation measures within **Chapter 5** provide a framework to minimise the risk of weed species becoming established as a result of this proposal.

Will the action introduce disease that may cause the species to decline?

No. Recommendations within **Chapter 5** provide a framework for managing potential risks to biodiversity.

Will the action interfere with the recovery of the species?

No. Mitigation measures outlined within **Chapter 5** suggest that it is unlikely that the proposed action would have an impact on the recovery of these species.

Conclusion

With consideration of the assessments completed within **Appendix 8**, the proposal is *unlikely* to have a significant effect on threatened or migratory species as listed by the EPBC Act.

Appendix 4

Construction and Operation Noise Impact Assessment



Transport
Roads & Maritime
Services

RIVERINA HIGHWAY (HW20) STAGE 2 SAFETY IMPROVEMENT WORKS

Construction Noise and Vibration
Impact Assessment

March 2016

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1.0 Introduction

Roads and Maritime Services (Roads and Maritime) propose to conduct safety improvement work on a 2.5 kilometre section of the Riverina Highway (HW20) between Bethanga Bridge and Lake Hume Village. The extent of the proposed work is shown in Figure 1.



Figure 1) Extent of the proposed work. Source: Roads and Maritime Services

The proposed safety improvement work has the potential to result in noise and vibration impacts on some sensitive receivers. A distance based noise and vibration assessment was conducted and this report details the findings and conclusions of the assessment. The assessment is appended to this report.

The noise assessment has been conducted in accordance with the Office of Environment and Heritage document *Interim Construction Noise Guideline (ICNG)* and Roads and Maritime's *Construction Noise and Vibration Guideline (CNVG)*. The vibration impacts for both building damage and human comfort have been expressed in terms of safe working distances based on the British Standard BS 7385-2 *Evaluation and measurement of vibration in buildings* and the Department of Environment and Conservation document *Assessing vibration: a technical guideline*.

2.0 Background

The Riverina Highway (HW20) is a state road that connects the Lake Hume Village at the Bethanga Bridge and Deniliquin via Albury. The road mainly serves a local access function with limited strategic importance.

The Minister for Roads and Freight has approved an allocation of \$11 Million over three financial years from 2015-2017 to conduct safety improvement work on the Riverina Highway. Roads and Maritime has consulted with the community in Albury, Lake Hume, Bethanga and other border communities and liaised with Albury City Council and local members of parliament, including the Member for Albury, Greg Alpin MP. Stage one of this project was commenced in October 2015, and scheduled to complete in April 2016. Stage two of the project is planned to be delivered in the 2016-2017 financial year.

Roads and Maritime proposes to carry out safety improvement works on a 2.5 kilometre section of the Riverina Highway (HW20). This proposal is the second stage of an overall proposal to improve road user safety on the existing alignment of the Riverina Highway. The proposed work would be undertaken between 0.7 and 3.3 kilometres west of the Bethanga Bridge within the Albury Local Government Area (LGA).

The proposal would improve the road surface along the Riverina Highway through formation widening, pavement reconstruction, culvert installation and minor curve realignment. The proposal would increase the current six and a half metre wide road formation to a seven metre formation

with one and a half metre sealed shoulders and half a metre verge where safety barriers are to be installed. Localised widening of the sealed shoulder by up to 2 metres would also be required on the back of curves. Safety barriers would be installed where batters exceed 1.5 metres in height and are steeper than 4:1.

Clearing and grubbing would be undertaken along the project area. Major cut and fill activities would be required to achieve the designed surface levels prior to pavement works. The proposal would expect to produce a gross cut of around 27,000m³ of material and require about 14,000m³ fill, leaving a surplus of 13,000m³ that would need to be either disposed of or reused off-site. Line marking and installation of road furniture would be undertaken as well as landscaping of adjacent areas.

Temporary construction ancillary facilities, including construction compounds, stockpile sites and haulage roads would be established and operated for construction. The road would be built under traffic, with a contraflow arrangement. The road may occasionally be closed to traffic but only for a short time during periods of low demand.

The general construction activities for the proposal are identified below:

- Installation of environmental controls including erosion and sediment controls
- Site establishment including establishment of compound and stockpile sites
- Removal of ground cover and trimming/removal of vegetation
- Cleaning and shaping of existing table drains
- Culvert extension and installation works
- Pavement overlay
- Widening of the existing road formation to accommodate a sealed pavement width of 10 metres (providing a 3.5 metre travel lane with a 1.5 metre sealed shoulder), widening would also include provision of a 0.5 metre verge, which in total provides a 10.5 - 11 metre formation width
- Site clean-up and rehabilitation of disturbed areas
- Potential reinstatement of private accesses
- Signage upgrades and Improvements to pavement superelevation with a typical 250mm nominal depth pavement overlay
- Acquisition of Land adjacent to highway
- Potential minor utility adjustments
- Potential blasting.

Construction equipment likely to be used includes:

- Excavators
- Dump trucks
- Bulldozers
- Scrapers
- Rollers
- Cranes
- Delivery trucks
- Graders
- Light vehicles
- Water-carts
- Bitumen trucks

Objectives of works:

- The objective of this project is to rehabilitate the existing narrow width sections to a safer standard and provide a new pavement with a 40 year design life.
- To provide minimal disruption to the travelling public, a safe working environment for road workers and road users and achieve this in the most efficient way practicable.

Figure 2 describes the extent of the proposed work, the location of the proposed site compounds and stockpile site.



Figure 2) Aerial photo of proposal including site compounds and stockpile sites

Work hours:

To provide flexibility and to meet project deadlines, work hours would be scheduled for 24 hour work. However night work would be uncommon and work next to sensitive receivers at Lake Hume Village would only occur during daytime hours to reduce noise impact.

Work is planned to begin in Spring 2016 and should be completed in winter 2017.

These periods of work come under standard construction hours and Period 1 and 2 of out of hours work (OOHW), as defined in the Transport Construction Authority (now Transport for NSW) document *Construction Noise Strategy*. The tables below illustrates when these different working periods occur.

Table 1 Noise-Related Working Hours: Visual

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Monday-Fridays	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Saturdays	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Sunday/Public Holidays	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Key:	<ul style="list-style-type: none"> Standard Hours OOHW Period 1 OOHW Period 2 																							

Table 2 Noise-Related Working Hours: Numerical

	Standard Hours	OOHW Period 1	OOHW Period 2
Mondays-Fridays	07:00 - 18:00	18:00 - 22:00	00:00 - 07:00, 22:00 - 00:00
Saturdays	08:00 - 13:00	07:00 - 08:00, 13:00 - 22:00	00:00 - 07:00, 22:00 - 00:00
Sundays/Public Holidays	-	08:00 - 18:00	00:00 - 08:00, 18:00 - 00:00

3.0 Construction Noise Management Levels

To predict the effect of increased noise due to construction on local receivers it is important to first examine the existing local environment. This will help to determine how easily noise propagates and to compare noise levels before and during construction.

3.1 Existing Noise Environment

There are two locations along the project length where sensitive receivers have been identified. The first is the Lake Hume Village, located on the corner of the Riverina Highway and Hume Road. The second is a reserve located about 600 metres along the highway from Bethanga Bridge. In addition, there are some receivers located close by to the stockpiles used in Stage 1 of the project that would be used at times during Stage 2.

Existing noise levels for Lake Hume Village have been taken from the *Operational Noise and Vibration Assessment* conducted by Muller Acoustic Consulting for Stage 1 of the project. The background noise level during the day, evening and night was found to be 34, 28 and 25 dB(A) respectively, however for Rating Background Levels (RBLs) of less than 30 dB(A) an RBL of 30 dB(A) can be applied, making the background noise levels 34, 30 and 30 dB(A). Stockpiles along Stage 1 have already been assessed in the Stage 1 *Operational Noise and Vibration Assessment*.

While noise data does not exist for the reserve, it is not required as there are no residential receivers within the area and NMLs for non-residential receivers are unaffected by the surrounding noise environment. The NML for this receiver is 65 dB(A) at all hours.

3.2 Existing Receiver Environment

Receivers at Lake Hume Village are mostly made up of cabins, campsites and rooms at the 'Lake Hume Tourist Park' and the 'Lake Hume Resort', while residences and offices make up the rest of the receivers. Because it mainly functions as a tourism centre, Lake Hume Village has far more receivers during peak holidays periods and as a consequence work would likely have the greatest noise and vibration impacts during these times.

The receivers surrounding the stockpile sites consist of rural residences and agricultural buildings. None of these receivers would be highly affected by the work owing to their distance from stockpiles, the hilly local topography and the fact that stockpiles would be used intermittently and have limited noise-generating activities.

People wishing to use the reserve and/or boat ramp located along Lake Hume near Bethanga Bridge may experience high noise disturbance depending on how close work activities are at the time.

3.3 Project Specific Noise Management Levels

The *ICNG* provides guidance on the assessment and management of construction noise. Section 4 of the *ICNG* details the quantitative assessment method involving predicting noise levels and comparing them with the noise management level (NML), which are important indicators of the level of construction noise impact. Table 3 on the following page sets out the *ICNG* recommended $L_{Aeq,(15\text{minute})}$ noise management levels and how they are applied.

Table 3 ICNG Noise Management Levels

Time of day	Management Level L _{Aeq} (15 minute) * (dBA)	How to apply
<p>Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays</p>	<p>Noise affected: RBL + 10 dBA</p>	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> Where the predicted or measured L_{Aeq} (15 minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details for enquiries or complaints.
	<p>Highly noise affected: 75 dBA</p>	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> – times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences – if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
<p>Outside recommended standard hours</p>	<p>Noise affected: RBL + 5 dBA</p>	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Based on the ICNG recommended noise management levels in Table 3 and the RBLs in Section 3.1, the Lake Hume Village residential noise management levels for each assessment period are presented in Table 4.

Table 4 $L_{Aeq,(15\text{minute})}$ **Noise Management Levels**

$L_{Aeq,(15\text{minute})}$ Noise Management Levels (dBA)						
Monday to Friday			Saturday, Sundays and public holidays			
Standard Hours	OOHW Evening	OOHW Night	Standard Hours	OOHW Day	OOHW Evening	OOHW Night
44	35	35	44	39	35	35

Note: (1) Standard hours = Monday to Friday 7am to 6pm. Saturday 8am to 1pm
 (2) OOHW day = Saturday 7am to 8am, Saturday 1pm to 6pm, Sunday 8am to 6pm
 (2) OOHW evening = 6pm to 10pm
 (3) OOHW night = Sunday to Friday 10pm to 7am, Saturday 10pm – 8am (Sunday)

For all non-residential receivers affected by the work, which may include offices/retail outlets, industrial premises and active recreation receivers, the noise management levels are 70, 75 and 65 dB(A) respectively during both weekday and weekend hours of operation.

4.0 Construction Noise Assessment

The following section details noise impacts from the proposed work by comparing the predicted noise levels at assessment locations with the NMLs identified in Section 3. In circumstances where noise levels are predicted to exceed the NMLs, additional mitigation measures have also been identified.

4.1 Methodology and Assumptions

This noise assessment was undertaken using the Roads and Maritime Construction Noise Estimator. As the proposal is greater than 3 weeks in length a scenario-based assessment was deemed the most appropriate noise assessment tool. The area ground type, which affects the propagation of sound waves, has been taken as 'rural' as this most accurately reflects the setting.

The Construction Noise Estimator predicts the distance from the work that different categories of sound power levels are likely to be found, and identifies additional noise mitigation measures where NMLs are exceeded.

The work activities along the proposal length fall under three main categories, these being road pavement construction, corridor clearing and bulk earthworks. Each activity has different levels of noise impact and would occur at various stages of the project, for example, corridor clearing is required before new road can be constructed.

While a number of stockpiles and compounds have been identified for use along Stage 2 of the proposal, their noise impacts would be less than those generated by the former three activities identified and therefore noise impacts from ancillary sites along Stage 2 have not been assessed. Stockpiles along Stage 1 of the proposal would also be considered for use and are shown below in Figure 3. The assessment of these stockpiles has already been conducted in the *Operational Noise and Vibration Assessment* for Stage 1 of the proposal.



Figure 3) Stage 1 stockpiles (shown in red) to be used in the proposal. Source: Google Maps

There is the potential for greater noise impacts to occur due to changed traffic levels from construction. The road would be built under traffic, with traffic flowing one way at a time. Road closures would be rare and short. Construction road traffic noise is assessed under the NSW *Road Noise Policy*.

4.2 Noise Assessment Results

4.2.1 Noise Impacts Along Proposal Length

Results from the noise calculator for road pavement construction, corridor clearing and bulk earthworks are shown in Tables 5, 6 and 7 respectively. The activities making up the latter two scenarios are detailed in the Construction Noise Calculator. Road pavement construction is a custom scenario that assumes at any given time there is a grader, vibratory roller and dump truck operating at the same time. The Sound Power Level (SWL) is the noise generated, in decibels, at the source of noise, i.e. the construction activity. The SWL for road pavement construction, corridor clearing activities and bulk earthworks is 114, 121 and 123 dB(A) respectively.

Feasible and reasonable noise mitigation measures would need to be considered for any receivers within the mitigation distance as the noise management level is exceeded. For example, the mitigation distance needed for a receiver to be below the NML in the situation where there is direct line of sight to a road pavement construction activity during standard hours is 412 metres. That is, all receivers that are at least 412 metres from work experience a noise level that is less than the NML. Receivers less than 412 metres away would experience noise impacts above the NML.

“Mitigation Measures” are additional measures that should be applied to all receivers that fall within certain set distances from the work. These measures are discussed further in Section 6 of this report.

The acronyms “HA” and “SA” stand for receivers that are ‘Highly Affected’ and ‘Sleep Affected’. These concepts are discussed in further depth in the CNVG and the NSW Department of Environment, Climate Change & Water (now the Office of Environment and Heritage) *NSW Road Noise Policy*.

To determine if a receiver falls within a set distance of the work, GIS software ArcGIS was used to chart all receivers found within the mitigation distances given in the assessment results. The extents of noise impact have been mapped and appended to this report.

Table 5 Noise Impact Levels for Road Pavement Construction Activities

Mitigation Level	Mitigation Level (dB(A))	dB(A) above RBL	Line of Sight	No Line of Sight	Mitigation Measure/s
			Mitigation Distance	Mitigation Distance	
Standard Hours					
RBL	34	0	861	554	-
NML	44	<10	412	264	-
NML+10	54	=>10, <20	196	125	LB, V
NML+20	64	=>20, <30	89	45	LB, V
NML+30	74	=>30, <40	29	21	LB, V
HA	75	41	26	18	LB, V, PC, RO
OOHW Daytime					
RBL	34	0	861	554	-
NML	39	<5	597	383	-
NML+5	44	=>5, <15	412	264	LB, R1, NR
NML+15	54	=>15, <25	196	125	V, LB, R1, NR
NML+25	64	=>25, <35	89	45	V, IB, LB, R1, NR, PC, SN
OOHW Period 1					
RBL	30	0	1147	744	-
NML	35	<5	801	515	-
NML+5	40	=>5, <15	554	355	LB, R1, NR
NML+15	50	=>15, <25	264	168	V, LB, R1, NR
NML+25	60	=>25, <35	125	71	V, IB, LB, R1, NR, PC, SN
OOHW Period 2					
RBL	30	0	1147	744	-
NML	35	<5	801	515	LB
NML+5	40	=>5, <15	554	355	V, LB, R2, NR
NML+15	50	=>15, <25	264	168	V, IB, LB, PC, SN, R2, NR
NML+25	60	=>25, <35	125	71	AA, V, IB, LB, PC, SN, R2, NR
SA	65	35	79	41	AA, V, IB, LB, PC, SN, R2, NR

Table 6 Noise Impact Levels for Corridor Clearing Activities

			Line of Sight	No Line of Sight	
Mitigation Level	Mitigation Level (dB(A))	dB(A) above RBL	Mitigation Distance	Mitigation Distance	Mitigation Measure/s
Standard Hours					
RBL	34	0	1428	937	-
NML	44	<10	700	449	-
NML+10	54	=>10, <20	332	211	LB, V
NML+20	64	=>20, <30	154	94	LB, V
NML+30	74	=>30, <40	55	24	LB, V
HA	75	41	48	24	LB, V, PC, RO
OOHW Daytime					
RBL	34	0	1428	937	-
NML	39	<5	1007	650	-
NML+5	44	=>5, <15	700	449	LB, R1, NR
NML+15	54	=>15, <25	332	211	V, LB, R1, NR
NML+25	64	=>25, <35	154	94	V, IB, LB, R1, NR, PC, SN
OOHW Period 1					
RBL	30	0	1857	1245	-
NML	35	<5	1334	872	-
NML+5	40	=>5, <15	937	604	LB, R1, NR
NML+15	50	=>15, <25	449	286	V, LB, R1, NR
NML+25	60	=>25, <35	211	132	V, IB, LB, R1, NR, PC, SN
OOHW Period 2					
RBL	30	0	1857	1245	-
NML	35	<5	1334	872	LB
NML+5	40	=>5, <15	937	604	V, LB, R2, NR
NML+15	50	=>15, <25	449	286	V, IB, LB, PC, SN, R2, NR
NML+25	60	=>25, <35	211	132	AA, V, IB, LB, PC, SN, R2, NR
SA	65	35	143	84	AA, V, IB, LB, PC, SN, R2, NR

Table 7 Noise Impact Levels for Bulk Earthwork Activities

			Line of Sight	No Line of Sight	
Mitigation Level	Mitigation Level (dB(A))	dB(A) above RBL	Mitigation Distance	Mitigation Distance	Mitigation Measure/s
Standard Hours					
RBL	34	0	1632	1007	-
NML	44	<10	811	521	-
NML+10	54	=>10, <20	386	246	LB, V
NML+20	64	=>20, <30	181	112	LB, V
NML+30	74	=>30, <40	73	30	LB, V
HA	75	41	64	26	LB, V, PC, RO
OOHW Daytime					
RBL	34	0	1632	1007	-
NML	39	<5	1161	753	-
NML+5	44	=>5, <15	811	521	LB, R1, NR
NML+15	54	=>15, <25	386	246	V, LB, R1, NR
NML+25	64	=>25, <35	181	112	V, IB, LB, R1, NR, PC, SN
OOHW Period 1					
RBL	30	0	2000	1428	-
NML	35	<5	1527	1007	-
NML+5	40	=>5, <15	1082	700	LB, R1, NR
NML+15	50	=>15, <25	521	332	V, LB, R1, NR
NML+25	60	=>25, <35	246	154	V, IB, LB, R1, NR, PC, SN
OOHW Period 2					
RBL	30	0	2000	1428	-
NML	35	<5	1527	1007	LB
NML+5	40	=>5, <15	1082	700	V, LB, R2, NR
NML+15	50	=>15, <25	521	332	V, IB, LB, PC, SN, R2, NR
NML+25	60	=>25, <35	246	154	AA, V, IB, LB, PC, SN, R2, NR
SA	65	35	167	103	AA, V, IB, LB, PC, SN, R2, NR

4.2.2 Most Affected Receivers

The receivers that would be most impacted by the work are those located closest to the road at Lake Hume Village. To help identify these receivers, Figures 4 and 5 mark all residences that, during standard construction hours and assuming a direct line of sight to work, would experience a noise disturbance equal to or greater than the NML+20, i.e. 64 dB(A). Figure 4 marks residences that fall under this category during road pavement construction, the least noisy activity; while Figure 5 marks those during bulk earthworks; the noisiest activity.



Figure 4) The most affected receivers during road pavement construction are circled in red.



Figure 5) The most affected receivers during bulk earthworks are circled in red.

4.2.3 Construction Road Traffic Noise

Noise from construction traffic on public roads is assessed under the *NSW Road Noise Policy*. When construction related traffic moves onto the public road network, or when vehicles are diverted along a temporary reroute, vehicle movements would be regarded as additional road traffic.

For Roads and Maritime projects, an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2 dB(A) due to construction traffic or a temporary reroute due to a road closure. Where increase are 2 dB(A) or less, no further assessment is required. Where noise levels increases by more than 2 dB(A) (i.e. 2.1dB(A)) further assessment is required using Roads and Maritime's *Noise Criteria Guideline*, which documents Roads and Maritime's approach to implement the *NSW Road Noise Policy*.

As the proposal would reduce traffic along a section of the Riverina Highway from one lane in both directions to one lane contraflow and reduce the speed limit from 80 to 40 km/hr, traffic noise impacts would range from a reduction in traffic noise, to having no effect on traffic noise. Extra traffic noise created by construction-related vehicles would not be enough to increase noise levels by more than 2 dB(A). Therefore consideration of additional noise mitigation measures would not be required.

5.0 Operational Noise Assessment

Unlike construction noise, operational noise considers the change in noise from road traffic once a project has been completed. For example, if another lane is added to a road, it would generally be expected that traffic numbers increase, leading to an increase in operational noise. Another example would be if a road becomes realigned so that it is now much closer to a receiver than before, therefore increasing noise experienced by that receiver.

As the proposal is considered road maintenance with only some minor alignment and no adjustments made that would increase traffic demand or flow, it can be determined that the proposal would not increase operational noise above the 2 dB(A) criteria specified in the CNVG.

6.0 Construction Vibration Guidelines

6.1 Vibration Criteria

Effects of ground vibration on buildings resulting from construction activities may be segregated into one of the following three categories:

- Human exposure – disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – vibration where the building contents may be affected.
- Effects on building structures – vibration in which the integrity of the building or structure itself may be prejudiced.

Vibration criteria relating to human comfort that are applicable to this project are taken from the DEC (2006) document *Assessing Vibration – A Technical Guideline* and include the following.

- Continuous vibration – from uninterrupted sources (see Table 8).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (see Table 9).

- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (see Table 10).

Two standards by which building damage from construction-induced vibration are commonly assessed include:

- *British Standard 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (BSI 1993)
- *German DIN 4150: Part 3 – 1999 Effects of Vibration on Structure* (DIN 1999).

The German standard provides the most stringent criteria and will be used in this CNVMP. The DIN guideline values for peak particle velocity (mm/s) measured at the foundation of the building are summarised in Table 11. The criteria are frequency dependent and specific to particular categories of structure.

Table 8 Continuous vibration acceleration criteria (m/s²) 1-80Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 9 Impulsive vibration acceleration criteria (m/s²) 1-80Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 10 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Table 11 Structural damage criteria (mm/s)

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

* For frequencies above 100Hz, at least the values specified in this column shall be applied.

6.2 Safe working distances for intensive activities

Vibration generated from construction work involving the use of rollers and/or compactors has the potential to impact on the surrounding environment and local community.

As a guide, minimum working distances for vibratory rollers at different tonnages are outlined in Table 12. The minimum working distances are quoted for both 'cosmetic damage' (refer to British Standard BS 7385-2 *Evaluation and measurement of vibration in buildings*) and human comfort

(refer to DEC's *Assessing vibration: a technical guideline*). The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by the relevant authority.

Table 12 Recommended Safe Working Distances for Vibration Intensive Plant

Plan Item	Rating/Description	Minimum Working Distance (m)	
		Cosmetic Damage (BS 7385)	Human Comfort (DEC Vibration Guideline)
Vibratory Roller	<50kN (Typically 1-2 tonnes)	5 m	15m to 20m
	<100kN (Typically 2-4 tonnes)	6 m	20 m
	<200kN (Typically 4-6 tonnes)	12 m	40 m
	<300kN (Typically 7-13 tonnes)	15 m	100 m
	>300kN (Typically 13-18 tonnes)	20 m	100 m
	>300kN (>18 tonnes)	25 m	100 m

The closest building to the work is a holiday cabin at the Lake Hume Village resort. As it is about 10 metres from the new road formation, it is recommended that the maximum tonnage of any vibratory roller used on road near Lake Hume Village be no greater than 4 tonnes. Furthermore there are three cabins that are likely to be within 20 metres of a vibratory roller, therefore exceeding the guideline for human comfort. The project manager should consider reducing the size of vibratory rollers around these properties or consider other management options, such as hiring the cabins closest to the road as accommodation for Roads and Maritime staff working on the proposal.

Additional mitigation measures regarding construction vibration impact are detailed in Section 6.3.

7.0 Mitigation Methods

There are a range of measures available to Roads and Maritime to reduce the impact of construction noise and vibration on receivers. These measures fall under two categories; feasible and reasonable mitigation measures, and additional mitigation measures. The former category of measures should be considered when planning a project, and implemented where practical and cost-effective. Additional measures are identified through a formal noise assessment and if identified should be applied.

7.1 Feasible and reasonable mitigation measures

Construction noise and vibration impacts can be reduced by simply applying a few specific measures or practices to a work. Different measures may be more effective or practical depending on the project, and it is up to the project manager to ultimately decide upon the level of measures to be applied for the work. For example, using smaller plant for a minor project is a feasible solution that would help reduce noise impacts but may not be practical on larger projects. A list of noise mitigation measures can be found in Appendix C of the Roads and Maritime CNVG.

The impact of construction noise and vibration can also be reduced through consultation with affected stakeholders. There may be the opportunity to reduce impact by scheduling work in collaboration with the community and by alerting receivers of upcoming work so that the increased noise will not come as a surprise. Strategies to consult with the community are detailed in Section 6.2 'additional mitigation measures' of this report. Furthermore, if noise and vibration impacts are identified, they should be incorporated into a broader community consultation plan. Where vibratory plant is to be used near buildings, project managers should consider conducting a pre-construction condition survey.

While ultimately it is up to the project manager to decide which noise mitigation measures should be implemented, this report attempts to make a few key recommendations:

- Construction along the last 500 metres or so of road ending at the intersection of Hume Road and Riverina Highway should only occur during standard hours, particularly for noisy activities like bulk earthworks
- Noisy construction activities should be avoided during peak holiday periods at both Lake Hume Village and Apex Park
- Roads and Maritime staff working on the proposal and requiring accommodation should consider staying in the cabins closest to the Riverina Highway. As they would be working while any noisy construction activities occur, these receivers would not be affected by the work
- Noisy construction activities should be avoided during OOHW Period 2, especially when work is located just across the lake from the town of Bellbridge
- OOHW should be avoided where possible and should not occur over a prolonged period of days.

7.2 Additional mitigation measures

This section outlines in detail the additional mitigation measures identified in Section 4 of the report. The abbreviations identified are named below in Table 13. While the noise assessment provides a recommendation for additional mitigation measures that a project manager should implement where feasible and reasonable, the level of additional mitigation ultimately put in place is considered to be at the discretion of the project manager.

Table 13 Unabbreviated additional mitigation measures

Measure	Abbreviation
Verify levels by measurement	V
Individual briefing	IB
Letter box drops	LB
Negotiated Respite	NR
Respite Offer	RO
Respite Period 1	R1
Respite Period 2	R2
Phone calls	PC
Specific notifications	SN

The additional mitigation measures identified in the noise assessment are described in detail below:

- *Verify levels by measurement* – Attended measurements are to be undertaken within a period of 14 days from the commencement of construction activities to confirm that the noise and vibration levels in the adjacent community are consistent with the predictions in the noise assessment, approval and/or licence conditions. For projects with a duration of greater than three months, the attended measurements are to be repeated on a three-monthly basis. The attended measurements must be undertaken at the potentially most exposed receivers. See Appendix F of the CNVG for further information.
- *Individual briefings* - used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially

disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.

- *Letterbox drop* – Distribute pamphlets locally several days before work is set to commence explaining the scope of the work, how many days for and the hours that work would occur, and a phone number that they can call to make complaints
- *Negotiated Respite* – Respite periods may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the number of evenings or nights worked through Negotiated Respite so that the project can be completed more quickly.

Pre-purchased movie tickets or a similar offer may also provide respite for the community while providing provision for additional out of hours works. This measure is determined on a project-by-project basis, and may not be applicable to all RMS projects.

The receivers that should be liaised with to gain community support for Negotiated Respite include those where out of hours works exceed the NML.

Where there are few receivers above the NML each of these receivers should be visited to discuss the project to gain support for Negotiated Respite.

In instances where there are many receivers above the NML it may not be practical discuss the project with every receiver. Instead the community should be proactively engaged so they have an incentive to participate in discussion supporting Negotiated Respite. Support may be demonstrated from surveys, online feedback, contact phone numbers and community events

- *Respite Offer* - Should be made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers
- *Respite Period 1* - Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Negotiated Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month
- *Respite Period 2* - Night time construction noise in out of hours period 2 shall be limited to two consecutive nights except for where there is a Negotiated Respite. For night work these periods of work should be separated by not less than one week and 6 nights per month.
- *Phone calls* - Phone calls detailing relevant information would be made to identified/affected stakeholders within seven days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc
- *Specific Notifications* – A form of letterbox drop aimed at providing receiver-specific information. Applies to receivers expected to experience greater noise impacts

7.3 Additional mitigation measures for construction vibration

Table 12 of this report, Recommended Safe Working Distances for Vibration Intensive Plant, determines the maximum tonnage that a vibratory roller can be when within set distances from a structure. The closest structure to the work, a holiday cabin at Lake Hume Village, is about ten metres from where the vibratory roller would operate. Therefore the maximum tonnage a vibratory roller could safely be is about 4 tonnes, putting the extent of cosmetic damage at less than 6 metres from the works and human comfort at less than 20 metres from the work.

The additional mitigation measures for vibratory impacts set out in Table 14 should be considered when a vibratory roller chosen exceeds human comfort levels as identified in Table 12.

Table 12 Additional Mitigation Measures: Vibration

Additional mitigation measures	
Type	Apply to:
Standard Hours	
V, LB, RP	Locations within minimum working distance
OOHW Period 1	
V, IB, LB, RO, PC, R1, SN	Locations within minimum working distance
OOHW Period 2	
AA, V, IB, LB, PC, RP, SN	Locations within minimum working distance

7.4 Applying additional mitigation measures

Additional mitigation measures are about consulting with affected receivers. While the maps in Appendix B mark the noise envelope at different mitigation levels, they do not completely identify which receivers fall under each noise category. There are a few rules to follow when identifying which receivers fall under each noise envelope:

- Distance between a noise-generating source and a receiver should be measured directly from the source to the curtilage (property boundary) of the receiver, unless the building/s are greater than 30 metres from the curtilage, in which case the distance is measured to within 30 metres of the building/s
- Solid objects provide a barrier between a source of noise and a receiver. This reduces the effective distance of the noise. If line of sight between a noise source and a receiver is effectively blocked by a dense object such as a row of houses or a hill, the “no line of sight” category should be applied
- The calculations made in this report generally suggest a more conservative noise impact than the actual noise impact.

While the noise assessment provides a recommendation for additional mitigation measures that a project manager should implement, the level of additional mitigation ultimately put in place is considered to be at the discretion of the project manager.

8 Conclusion

This report details the findings and conclusions of a construction noise and vibration assessment for the proposal to make safety improvements on the Riverina Highway between Lake Hume Village and Bethanga Bridge. The project is introduced and outlined in Sections 1 and 2. Section 3 sets out the construction noise management levels and assumptions made in the assessment. Results of the noise assessment are given in Section 4 and the operational noise assessment in Section 5. Section 6 details guidelines and allowances for construction vibration. Noise and vibration mitigation measures are explained in Section 7.

Recommendation

The report recommends that standard and additional mitigation measures as outlined in Section 6 be implemented where reasonable and feasible to reduce the impact of construction noise and vibration, and that these mitigation measures reduce noise and vibration impacts to an acceptable level for affected receivers.

Declaration

The above report provides an appropriate assessment of potential noise impacts of the proposed work.

Prepared by:

Roads and Maritime Services Cadet Environment Officer: Alexander Warren

Signature:

Date:

Recommended by:

Roads and Maritime Services Environment Officer: Robert Norton

Signature:

Date:

Endorsed by:

Roads and Maritime Services Environment Manager: Daniel Francis

Signature:

Date:

Appendix:

Appendix A - Glossary of Acoustic Terms

Airborne noise management levels (NML)	To be measured and assessed at the residential property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the residential property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30m of the residence.
dB	This is the abbreviation used for decibel which is the measure of sound pressure level.
dBA	The “A” denotes that the sound pressure level has been A weighted so that the scale approximates the response of the human ear. The ear is less sensitive to high and low frequency sounds than it is to sounds in the mid-range. Most community noise is measured in “A” weighted decibels.
$L_{Aeq,(15\text{minute})}$	the A-weighted equivalent continuous (energy average) sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community. Other descriptors may be used providing they can be justified as representing the characteristics of the construction noise
PPV	This is the abbreviation used for peak particle velocity, which is the maximum instantaneous velocity without any averaging.
Rating background level (RBL)	The overall single-figure background noise level for each assessment period. Determination of the rating background level is by the method described in the NSW <i>Industrial Noise Policy</i> (EPA 2000). This approach aims to result in the noise management level being met for at least 90% of the time periods (15 minutes each) over which reactions of annoyance can occur.
rms	This is the abbreviation used for root mean square, also known as the quadratic mean in statistics.
Vibration	Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of ‘peak’ velocity or ‘rms’ velocity.
VDV	When assessing intermittent vibration for human comfort it is necessary to use the vibration dose value (VDV), which is a cumulative measurement of the vibration level received over a 15-hour or 9-hour period.

Appendix B – Receiver Noise Level Mapping

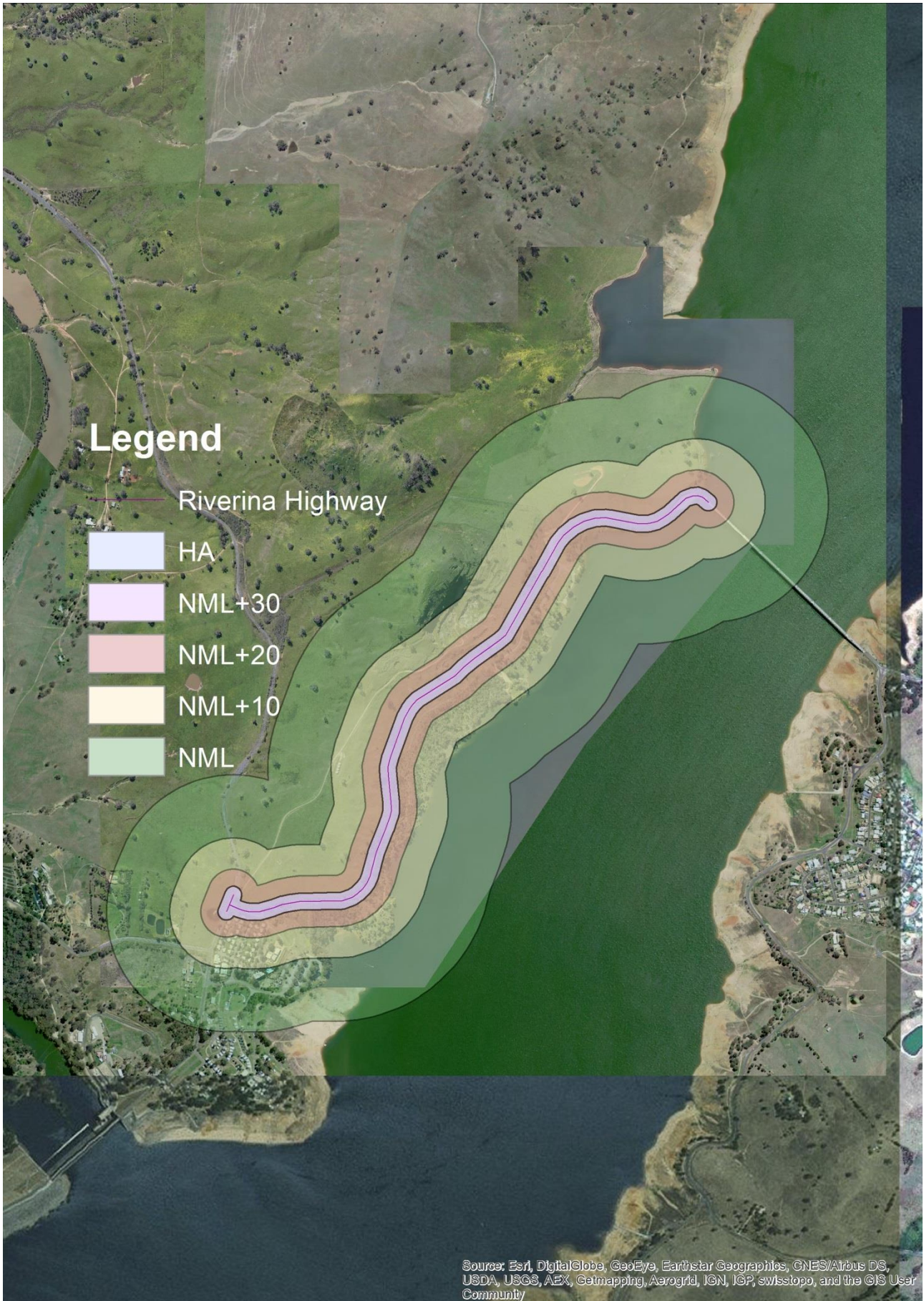
The following section maps the mitigation distances of each major construction activity, i.e. road pavement construction, corridor clearing activities and bulk earthworks. Mitigation distances are given for each relevant noise band, e.g. NML, NML+10 etc.; during each period of work, i.e. standard hours and OOHW Periods 1 and 2; and for receivers with and without direct line of sight to the work.

Each map containing the entire project length is followed by a close-up map of Lake Hume Village overlaid with the mitigation distances of higher noise bands. The purpose of this is to show which receivers are most affected by the work so that they can then be targeted by additional mitigation measures.

Pages 24 – 35 detail mitigation distances for road pavement construction

Pages 36 – 47 detail mitigation distances for corridor clearing activities

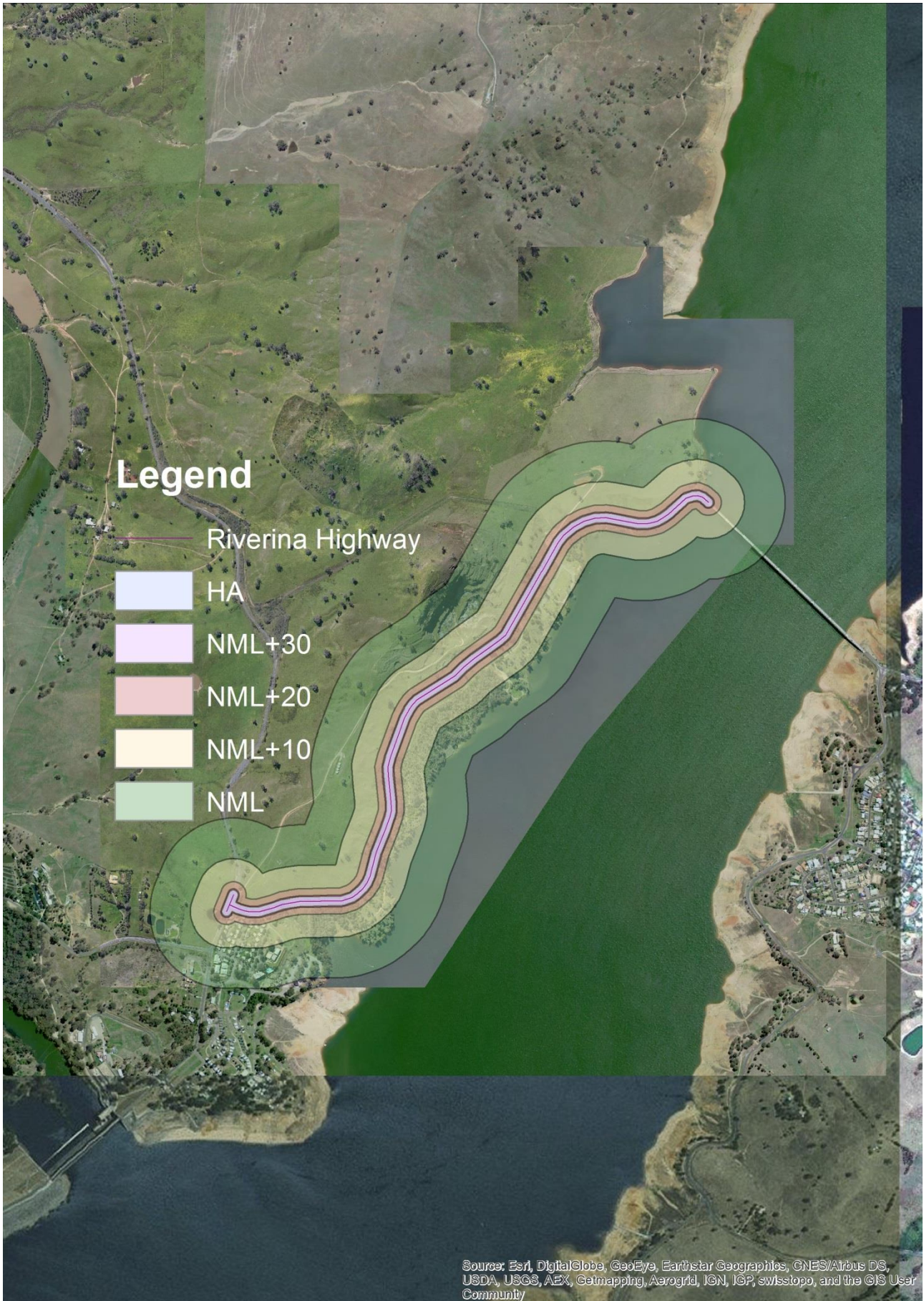
Pages 48 – 59 detail mitigation distances for bulk earthworks



Noise receiver levels for road pavement construction during standard hours with a line of sight to the work. Source: Esri ArcGIS



Sensitive receiver noise levels for road pavement construction during standard hours with a line of sight to the work. Source: Esri ArcGIS



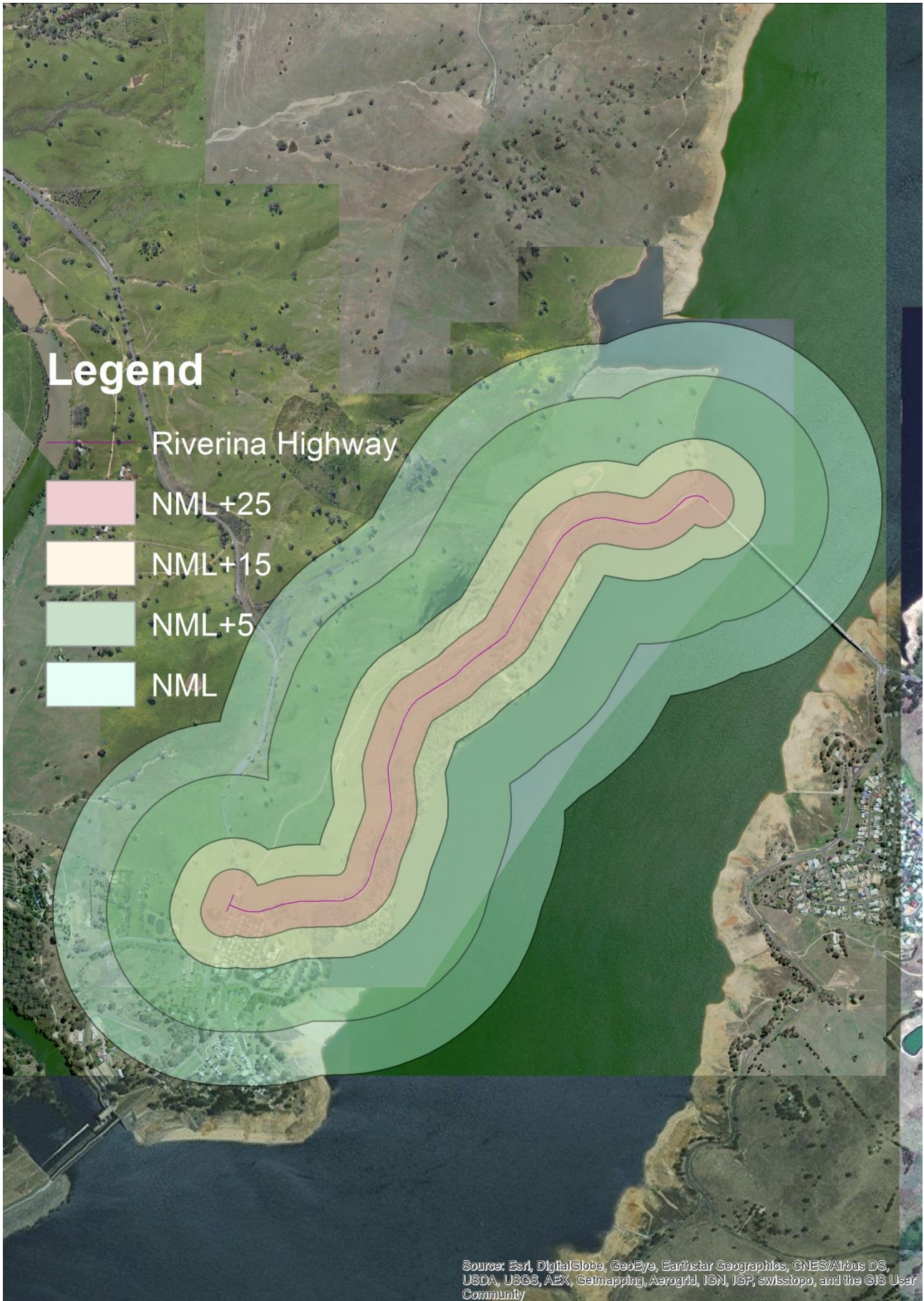
Receiver noise levels for road pavement construction during standard hours with no line of sight to the work. Source: Esri ArcGIS



Legend

- Riverina Highway
- HA
- NML+30
- NML+20

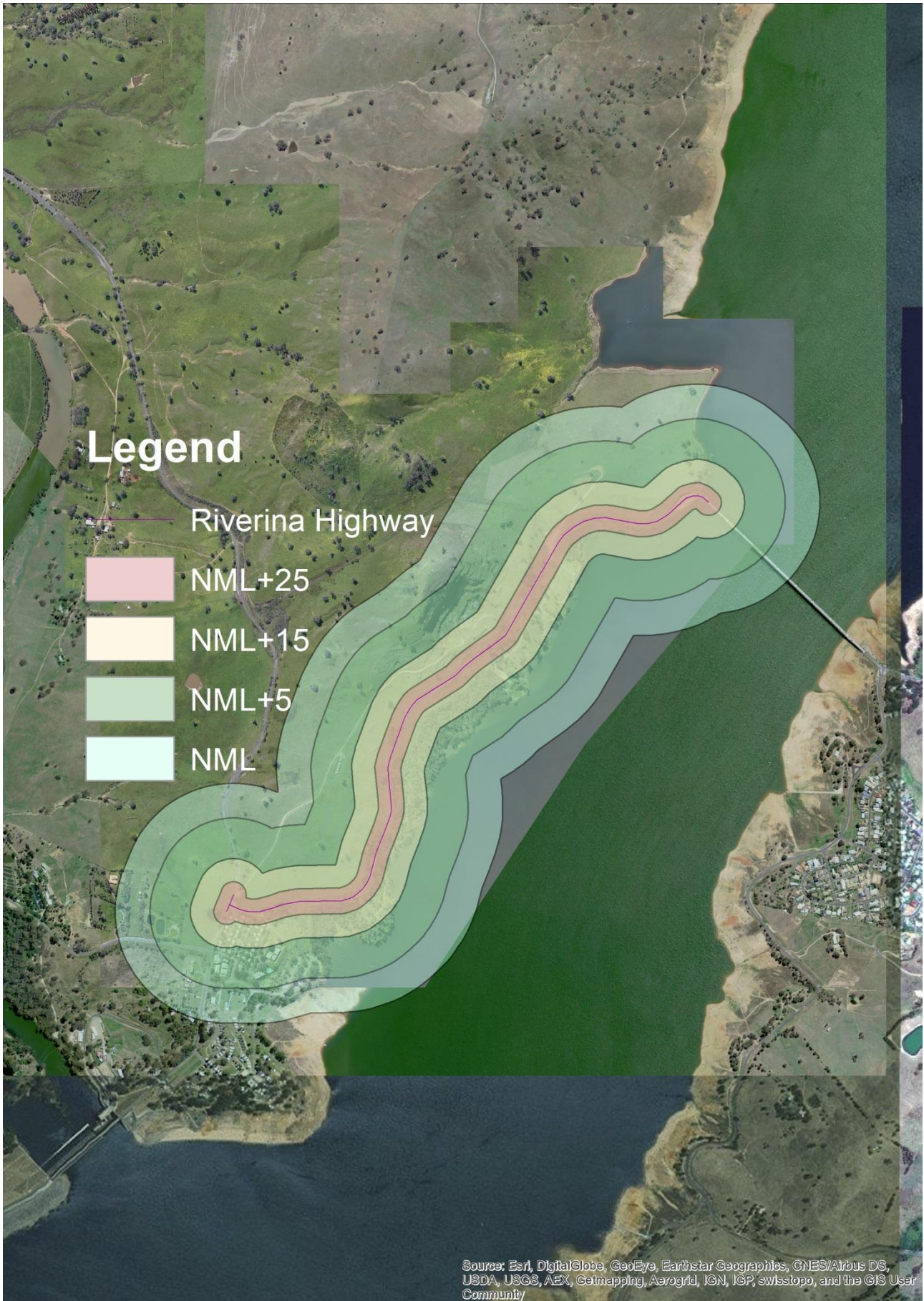
Sensitive receiver noise levels for road pavement construction during standard hours with no line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for road pavement construction during daytime OOHV with a line of sight to the work. Source: Esri ArcGIS



Sensitive receiver noise levels for road pavement construction during daytime OOHW with a line of sight to the work. Source: Esri ArcGIS



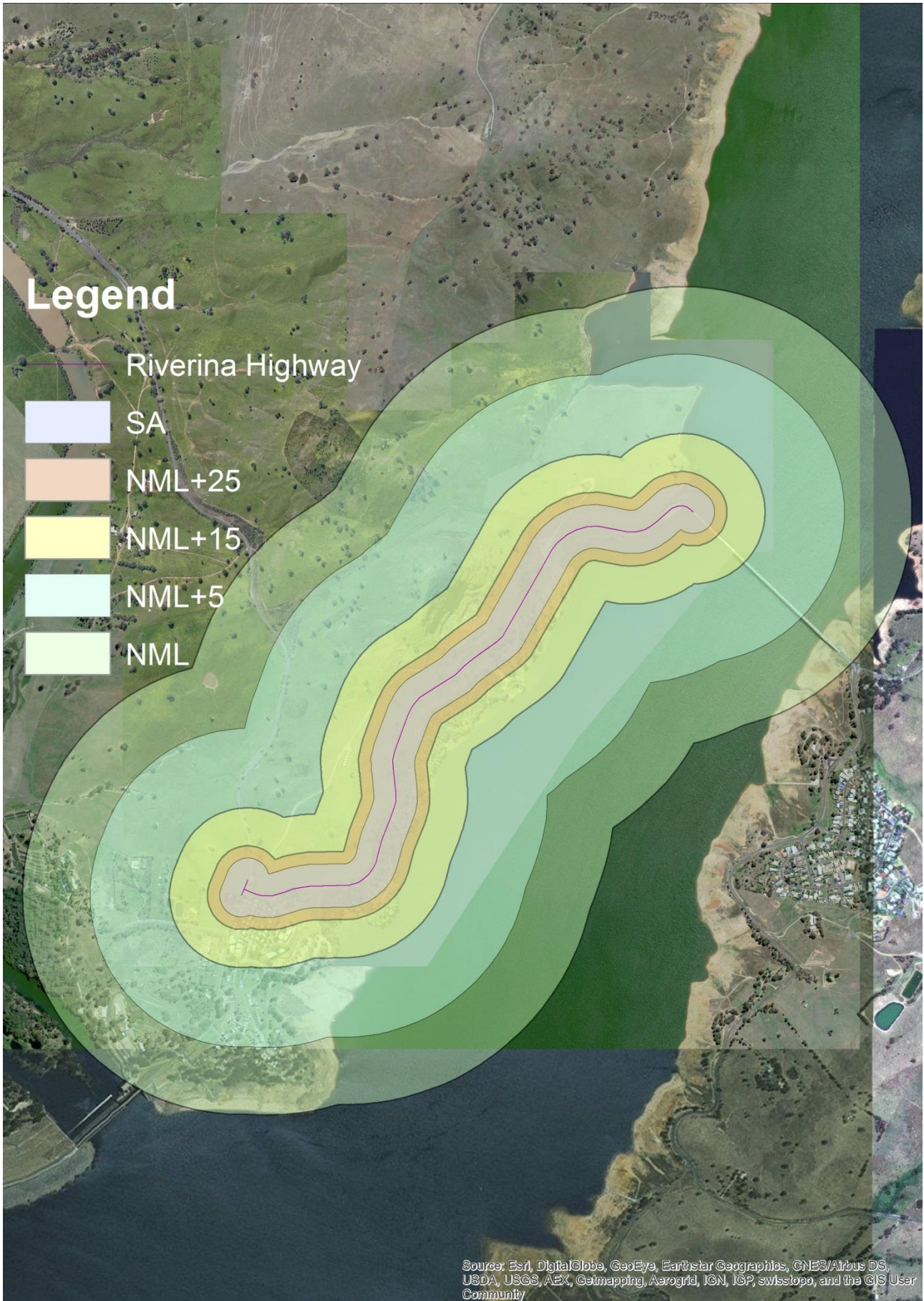
Receiver noise levels for road pavement construction during daytime OOHW with no line of sight to the work. Source: Esri ArcGIS



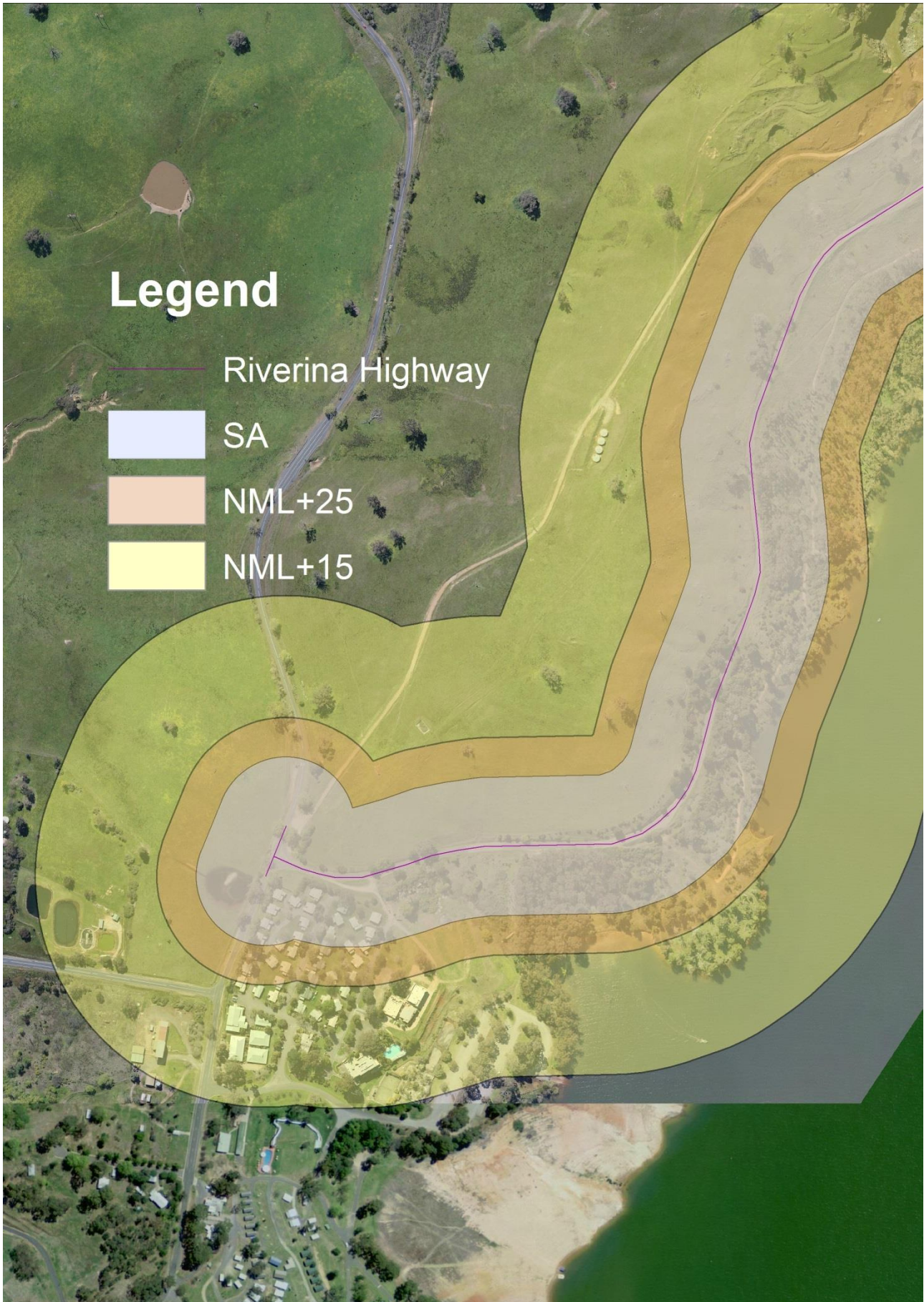
Legend

- Riverina Highway
- NML+25
- NML+15

Sensitive receiver noise levels for road pavement construction during daytime OOHW with no line of sight to the work. Source: Esri ArcGIS



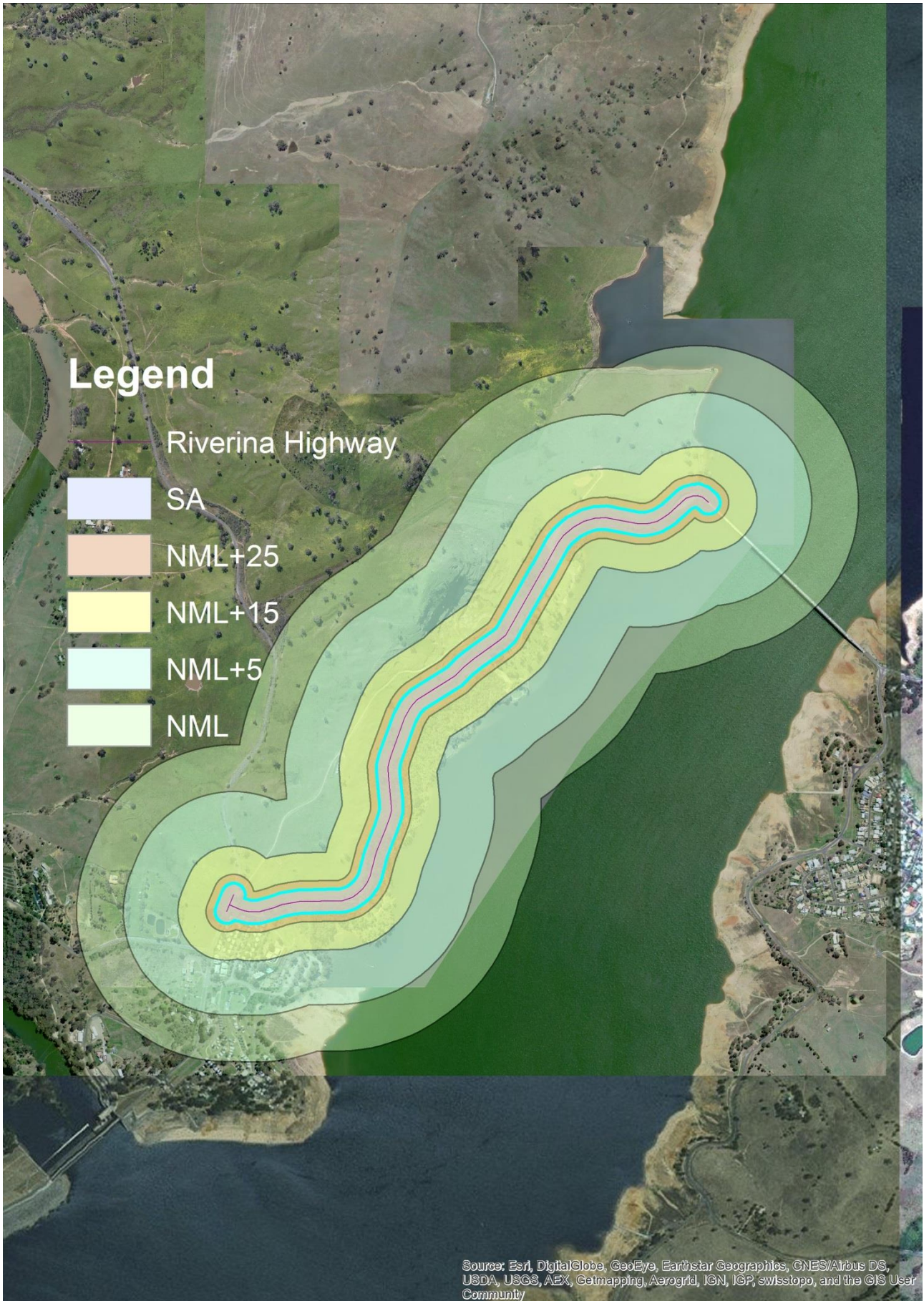
Receiver noise levels for road pavement construction during OOHV with a line of sight to the work. Source: Esri ArcGIS



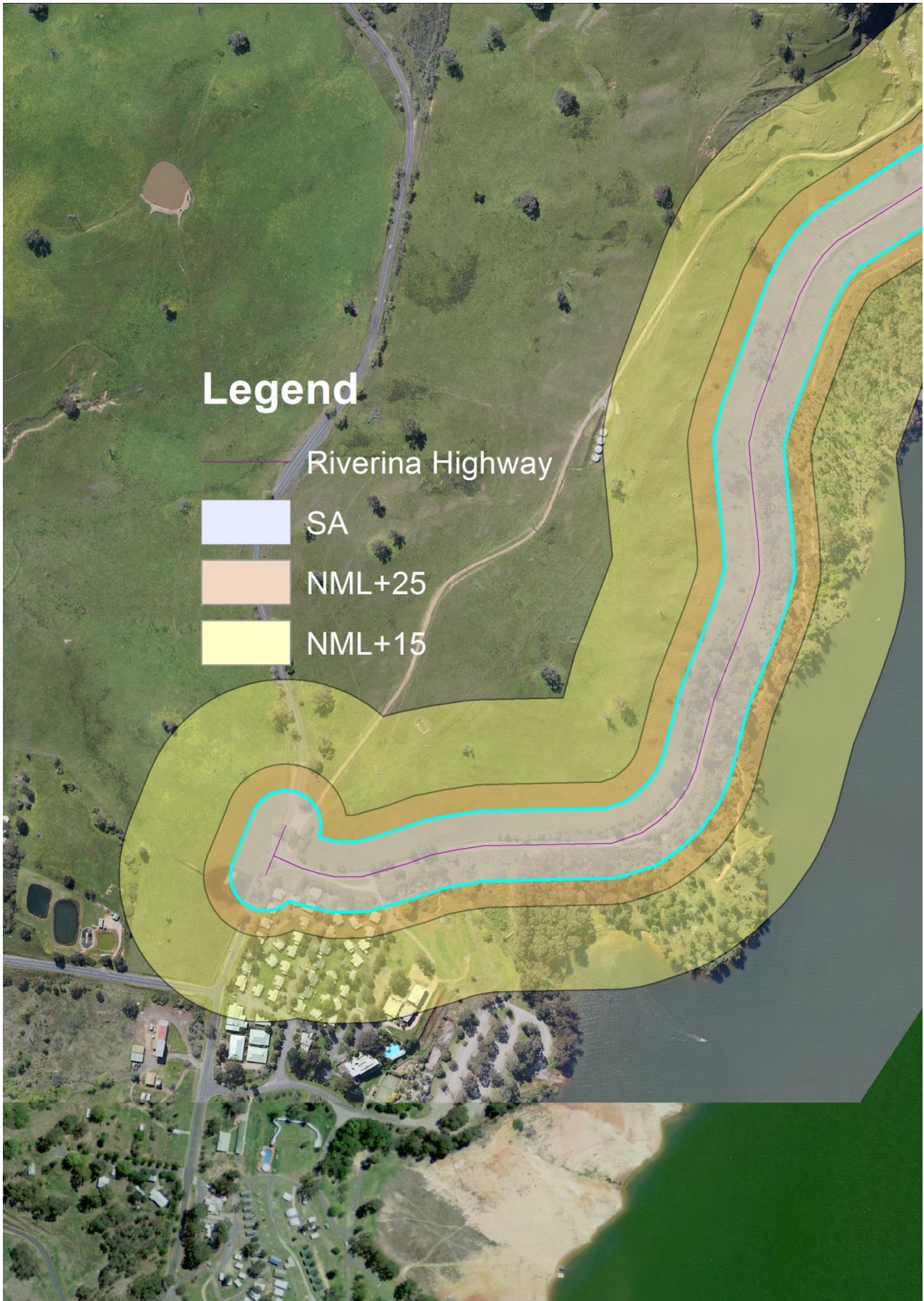
Legend

- Riverina Highway
- SA
- NML+25
- NML+15

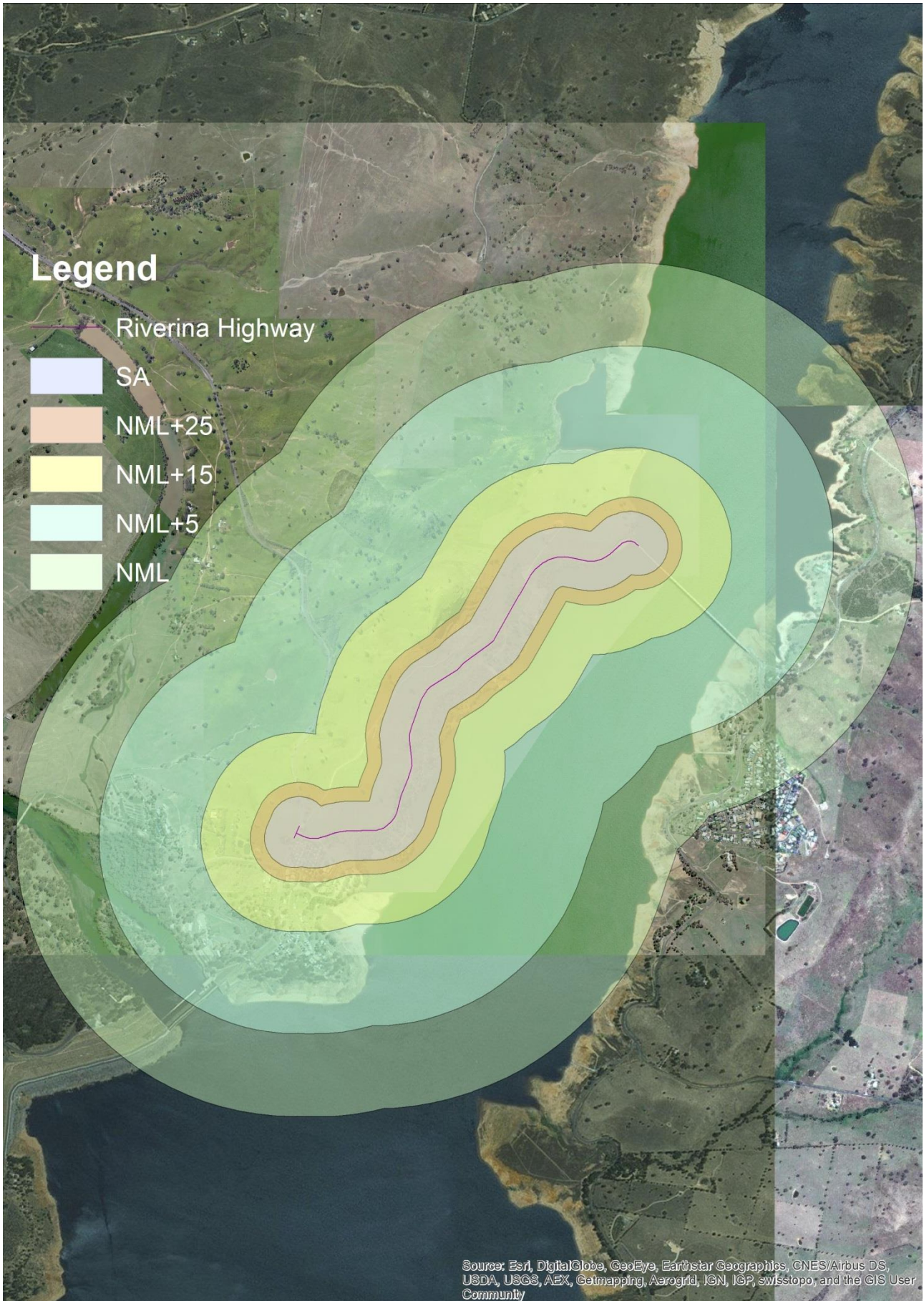
Receiver noise levels for road pavement construction during OOHV with a line of sight to the work. Source: Esri ArcGIS



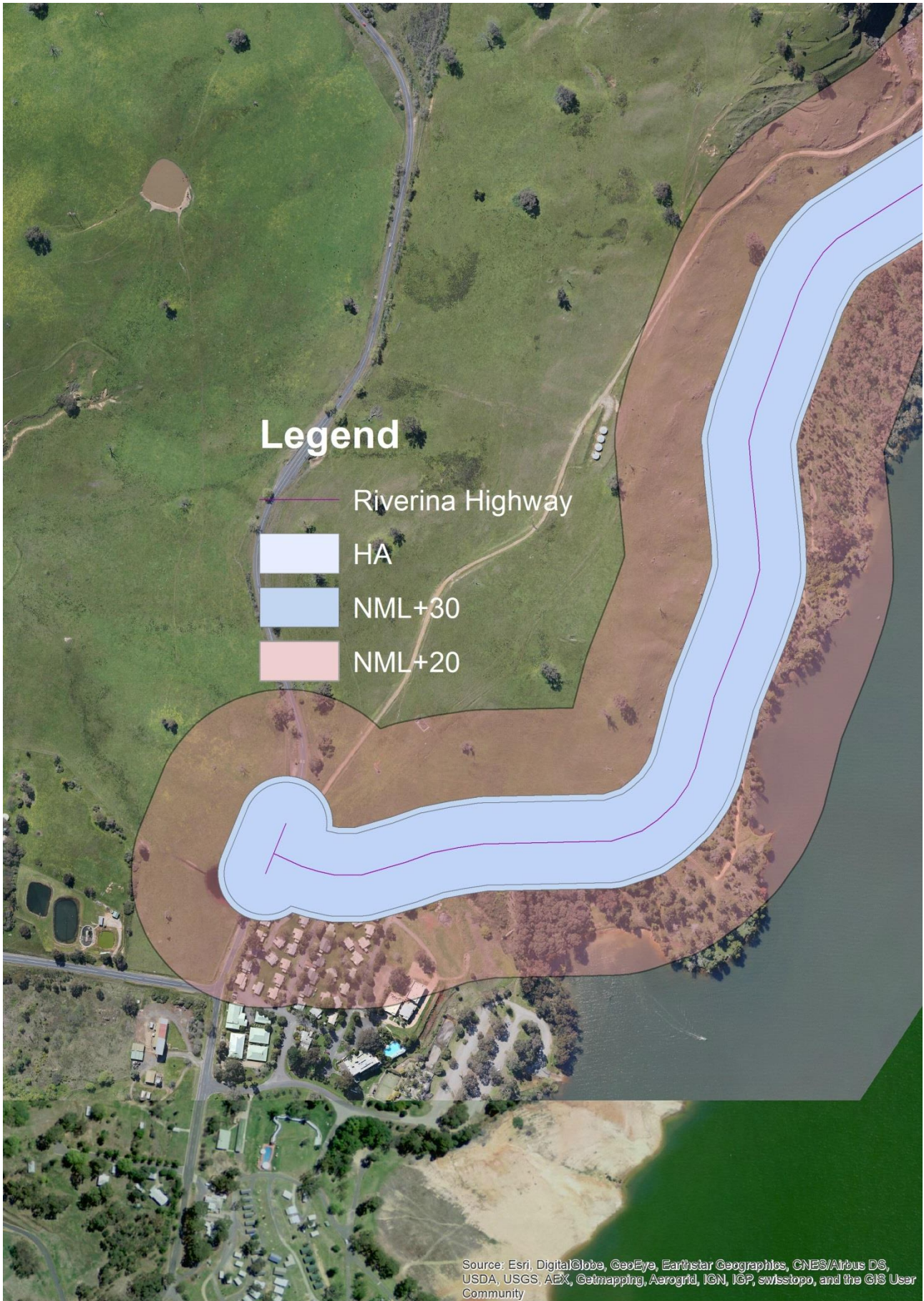
Receiver noise levels for road pavement construction during OOHV with no line of sight to the work. Source: Esri ArcGIS



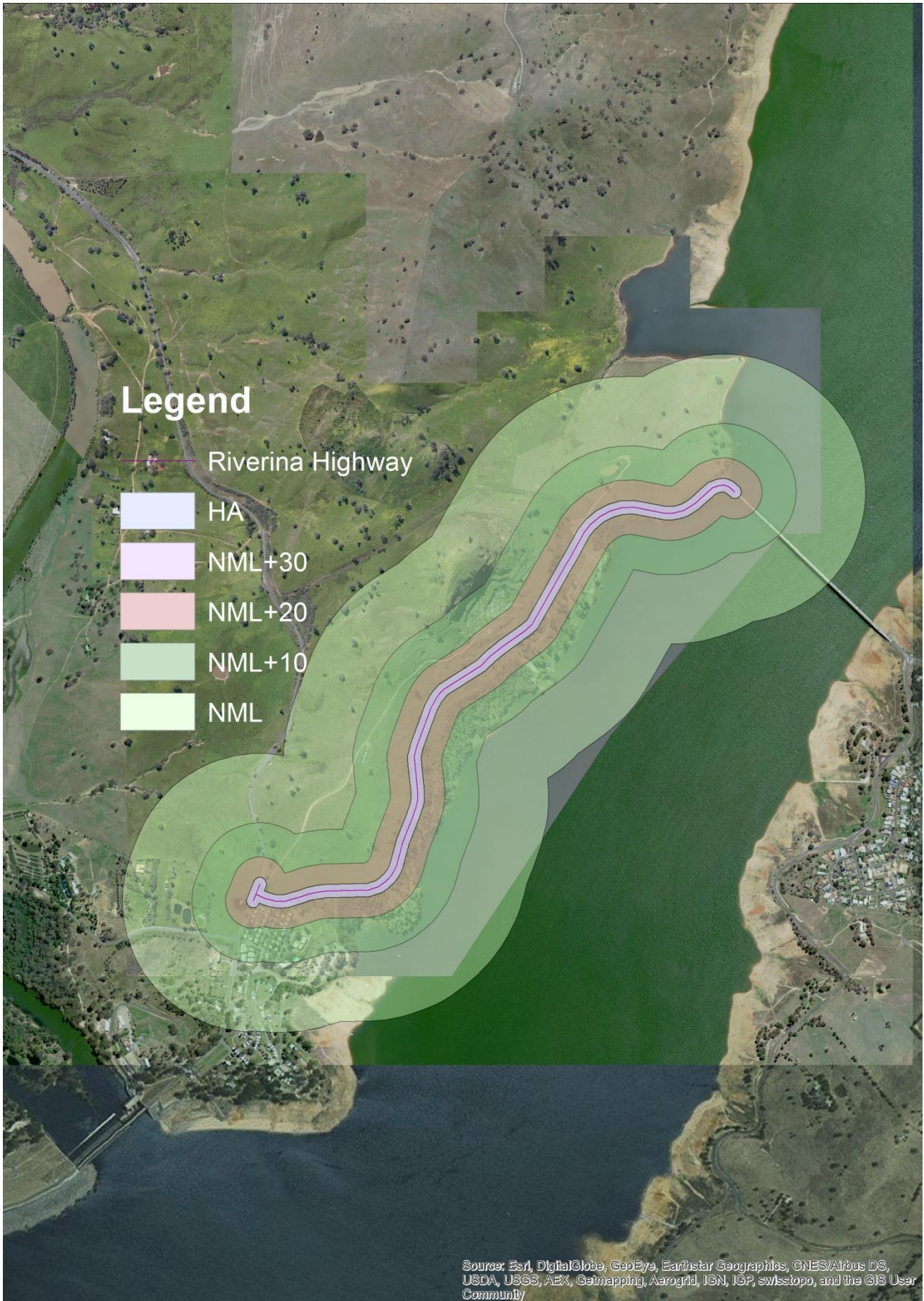
Receiver noise levels for road pavement construction during OOHW with no line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for corridor clearing activities during standard hours with a line of sight to the work. Source: Esri ArcGIS



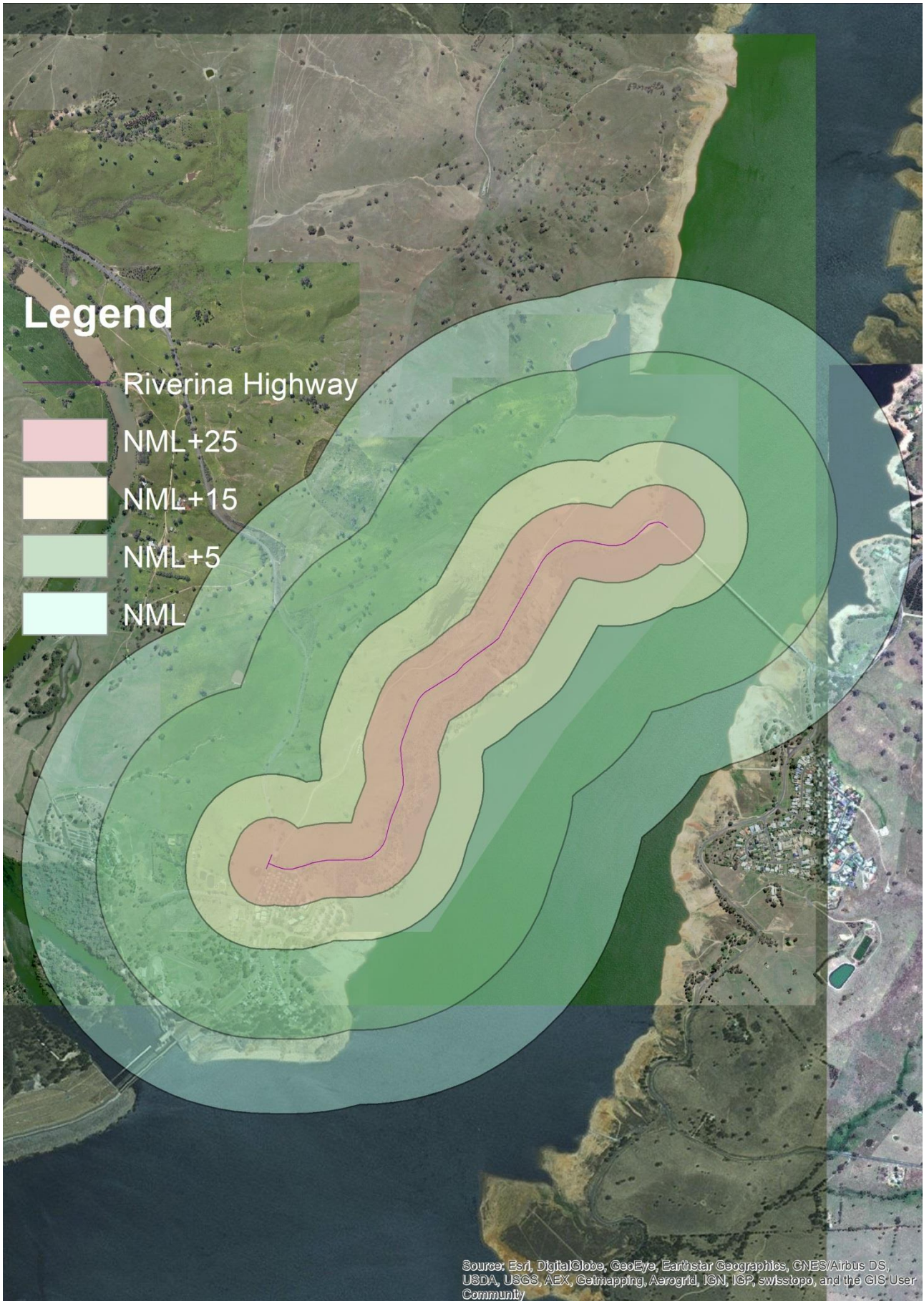
Sensitive receiver noise levels for corridor clearing activities during standard hours with a line of sight to the work. Source: Esri ArcGIS



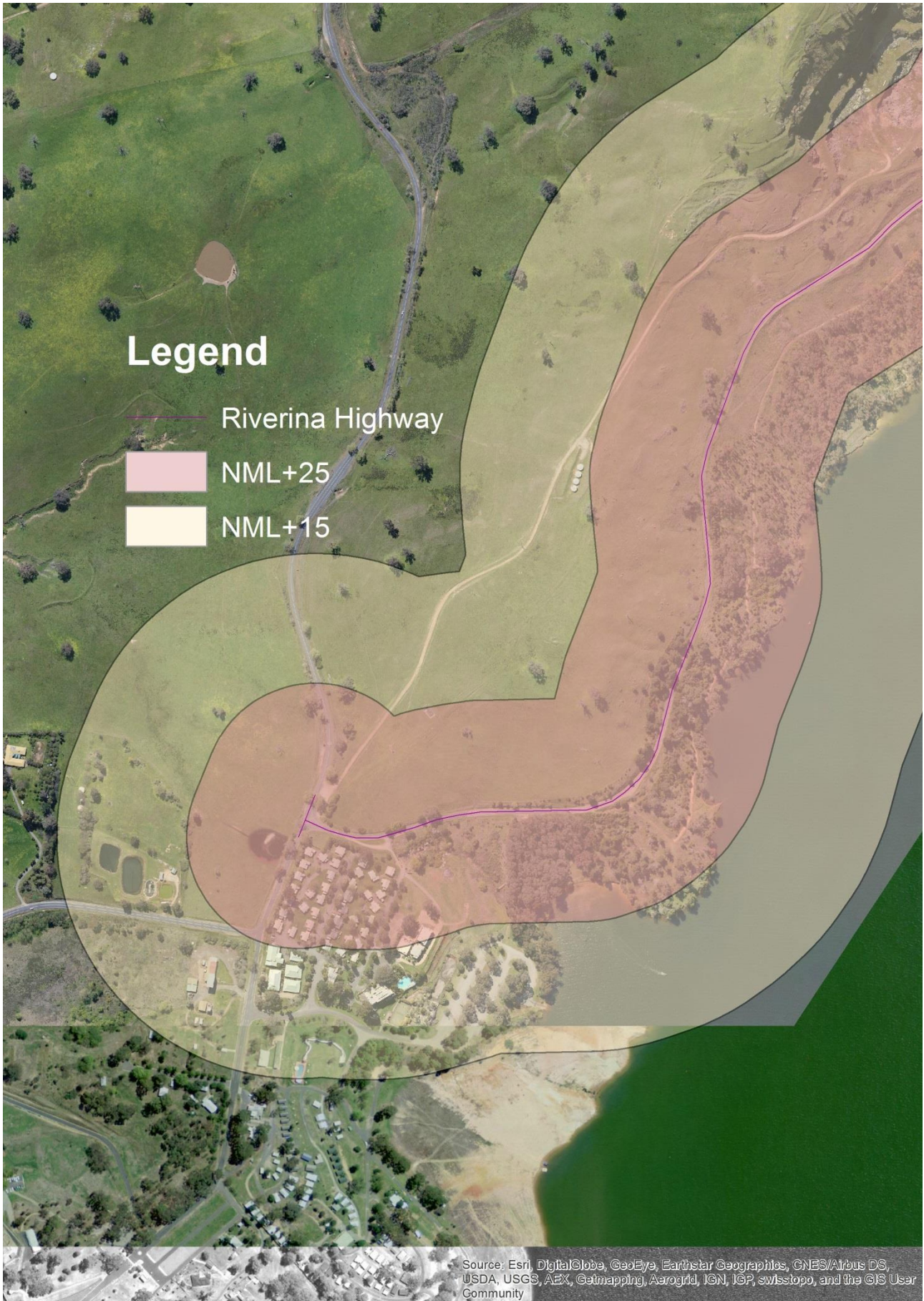
Receiver noise levels for corridor clearing activities during standard hours with no line of sight to the work. Source: Esri ArcGIS



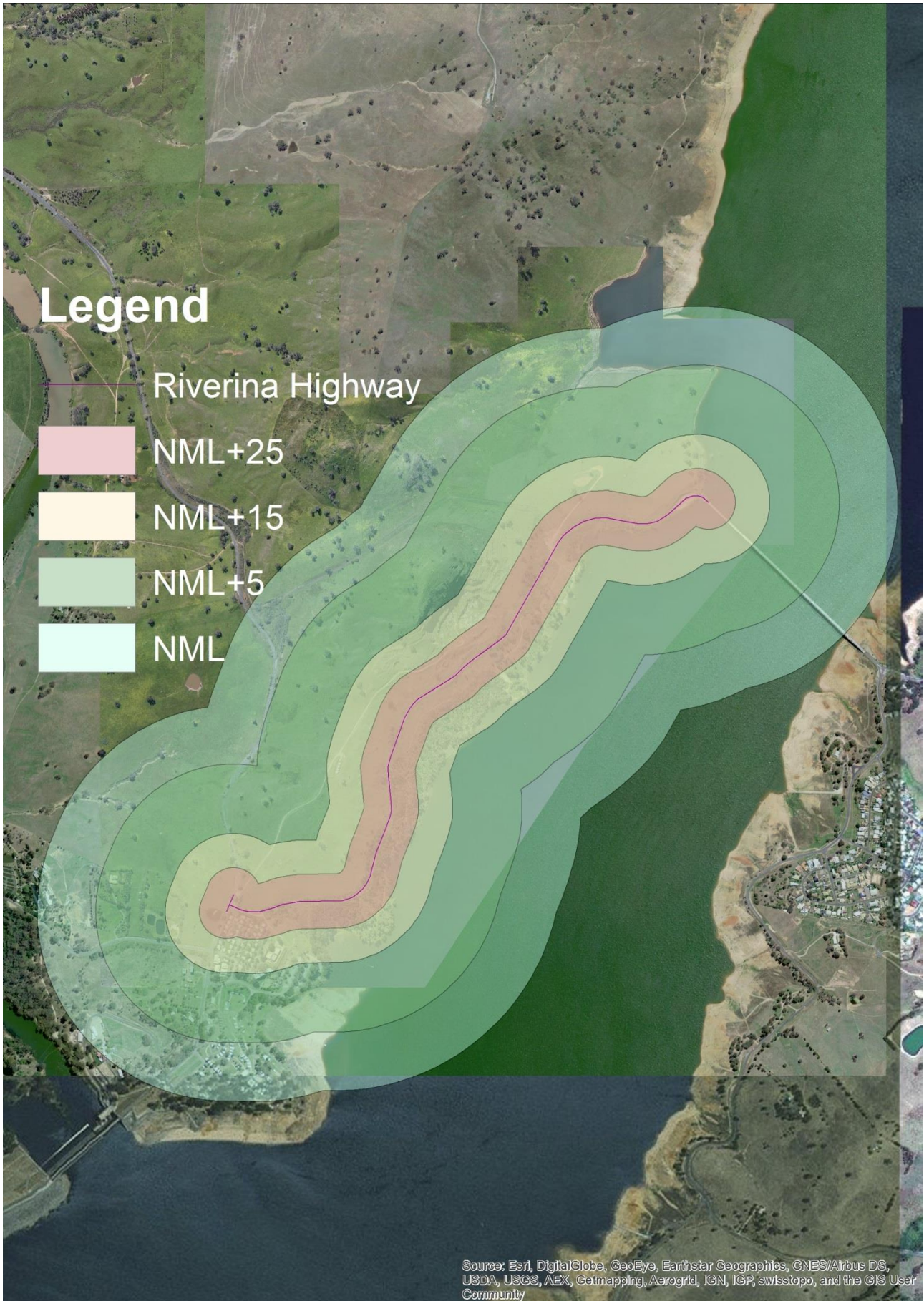
Sensitive receiver noise levels for corridor clearing activities during standard hours with no line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for corridor clearing activities during daytime OOHW with a line of sight to the work. Source: Esri ArcGIS



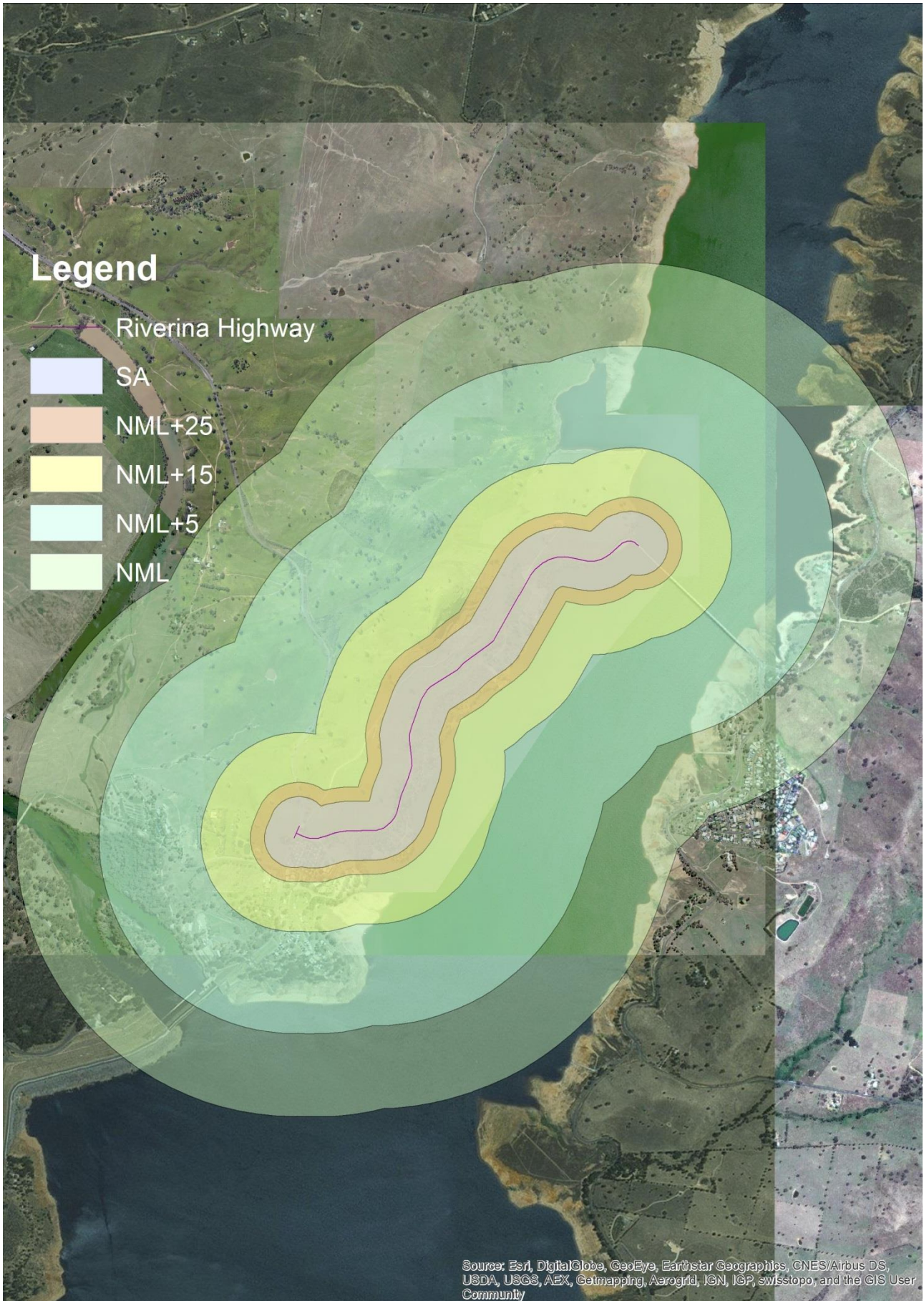
Sensitive receiver noise levels for corridor clearing activities during daytime OOHW with a line of sight to the work. Source: Esri ArcGIS



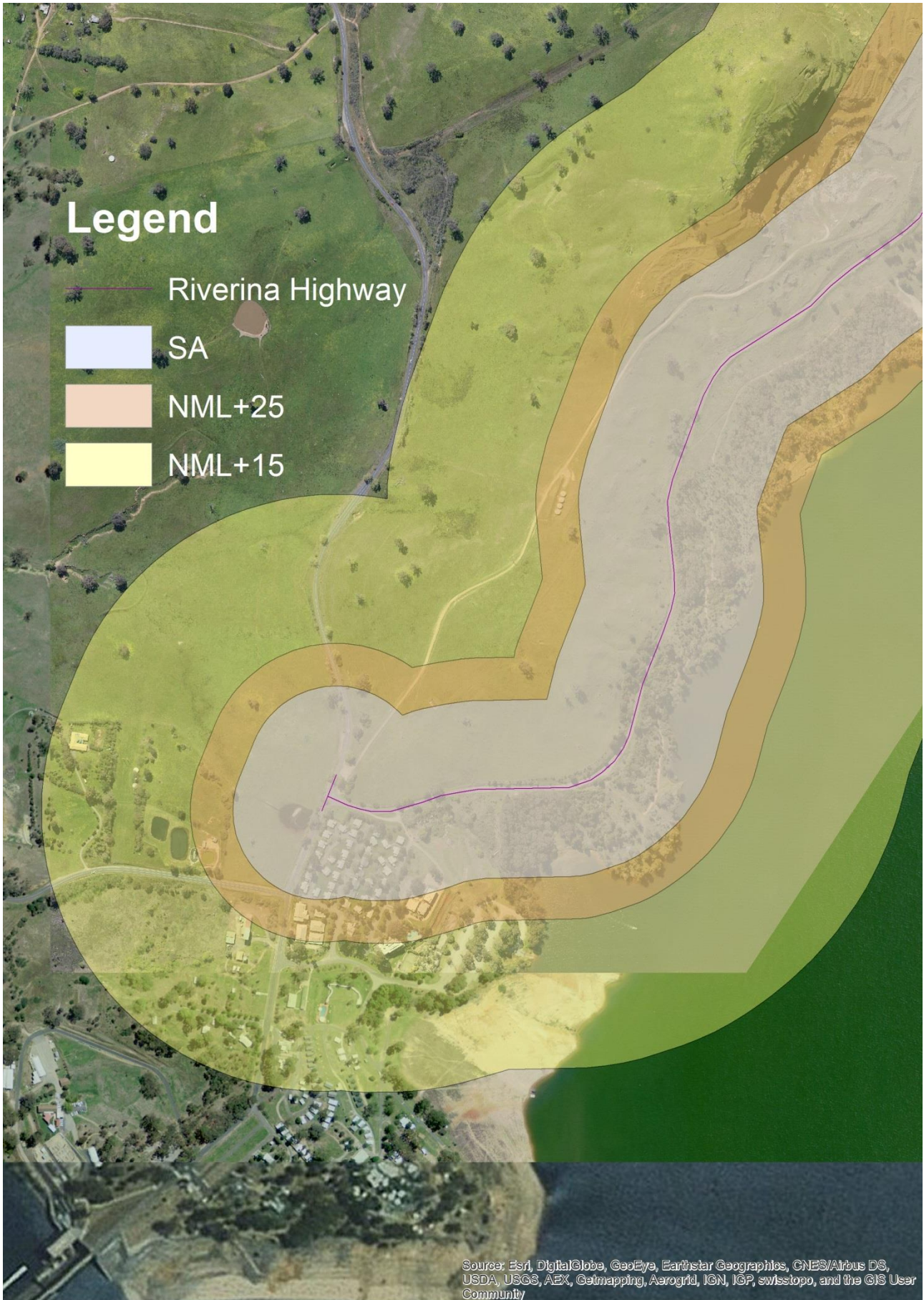
Receiver noise levels for corridor clearing activities during daytime OOHW with no line of sight to the work. Source: Esri ArcGIS



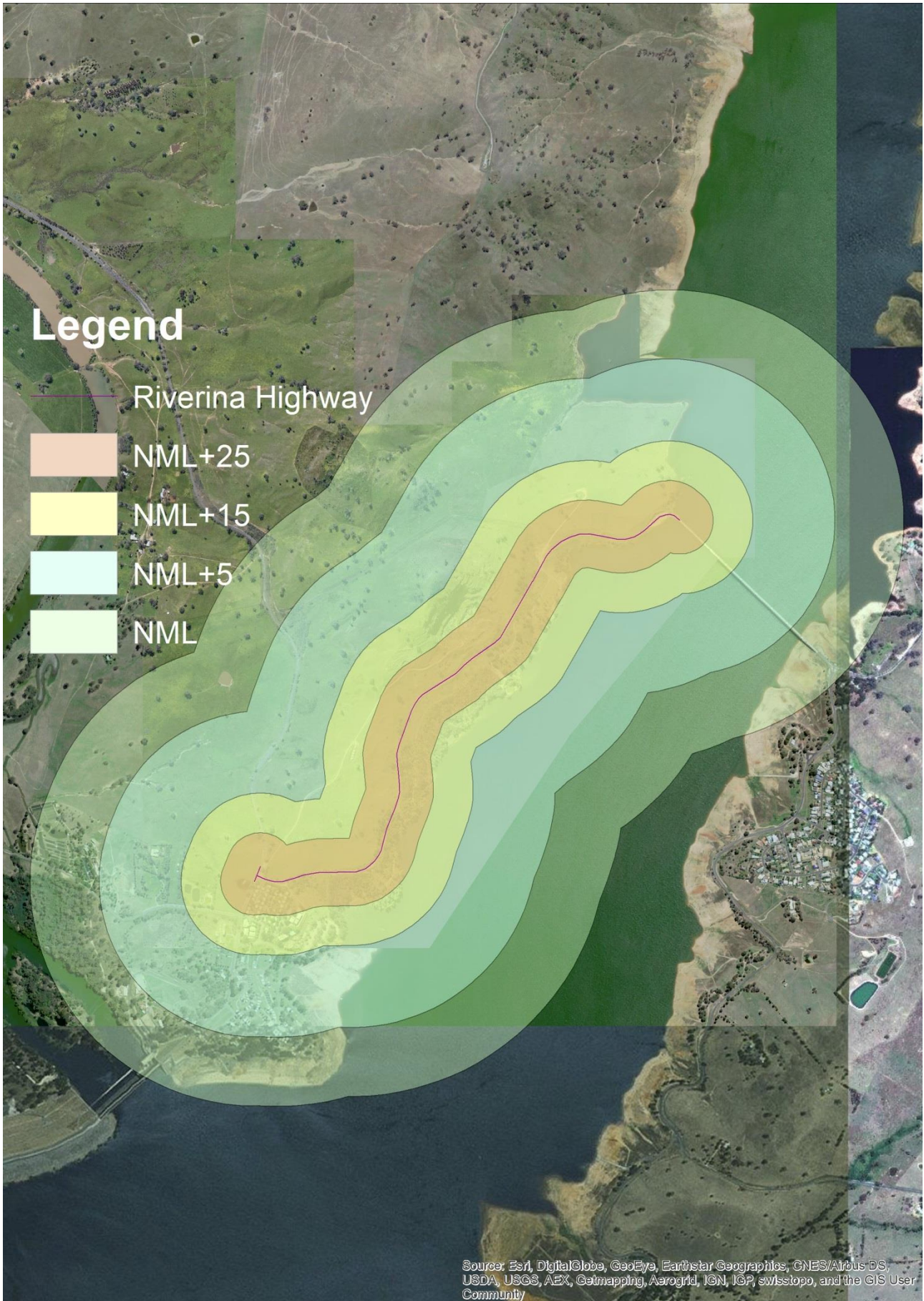
Sensitive receiver noise levels for corridor clearing activities during daytime OOHW with no line of sight to the work. Source: Esri ArcGIS



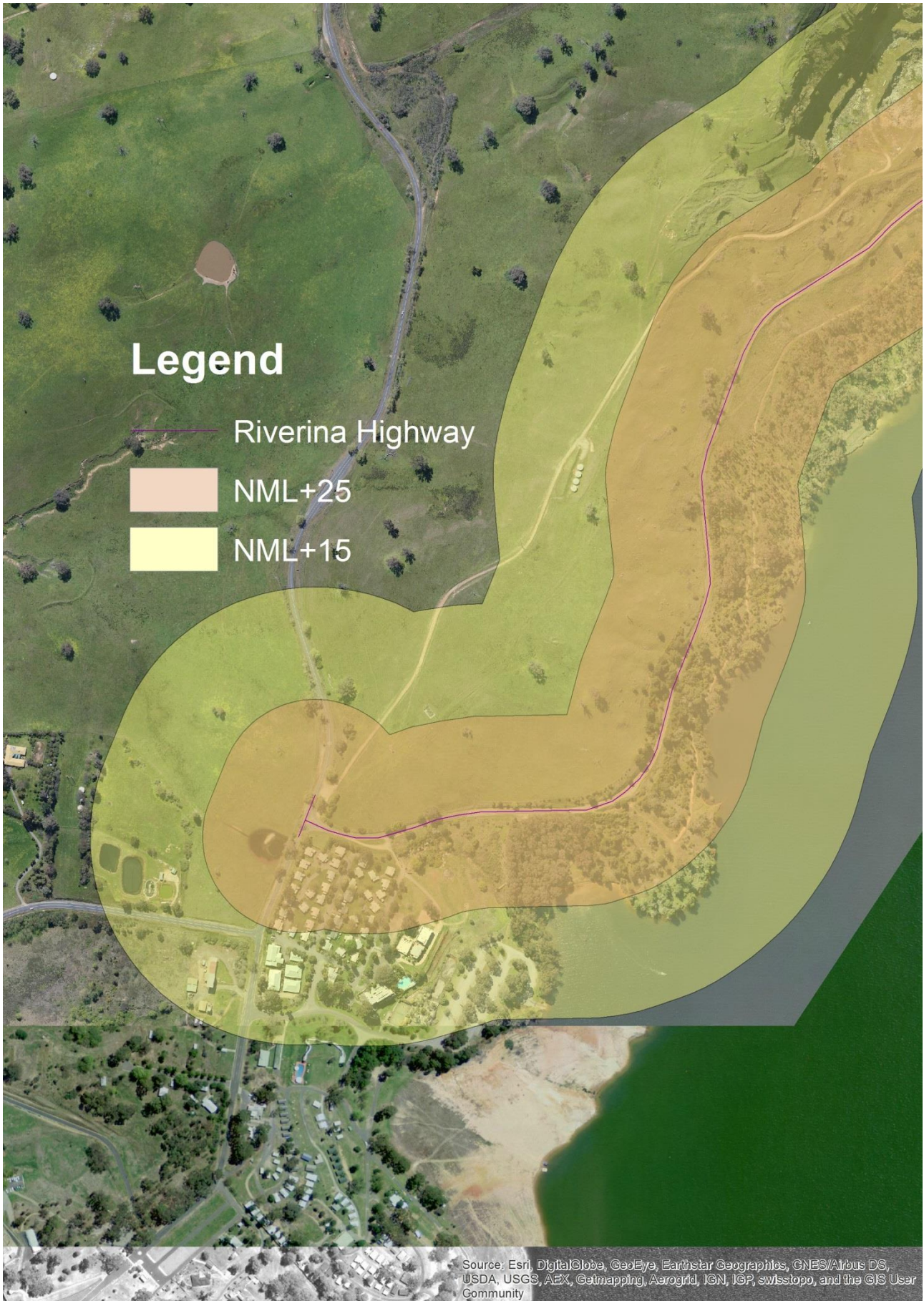
Receiver noise levels for corridor clearing activities during OOHV with a line of sight to the work. Source: Esri ArcGIS



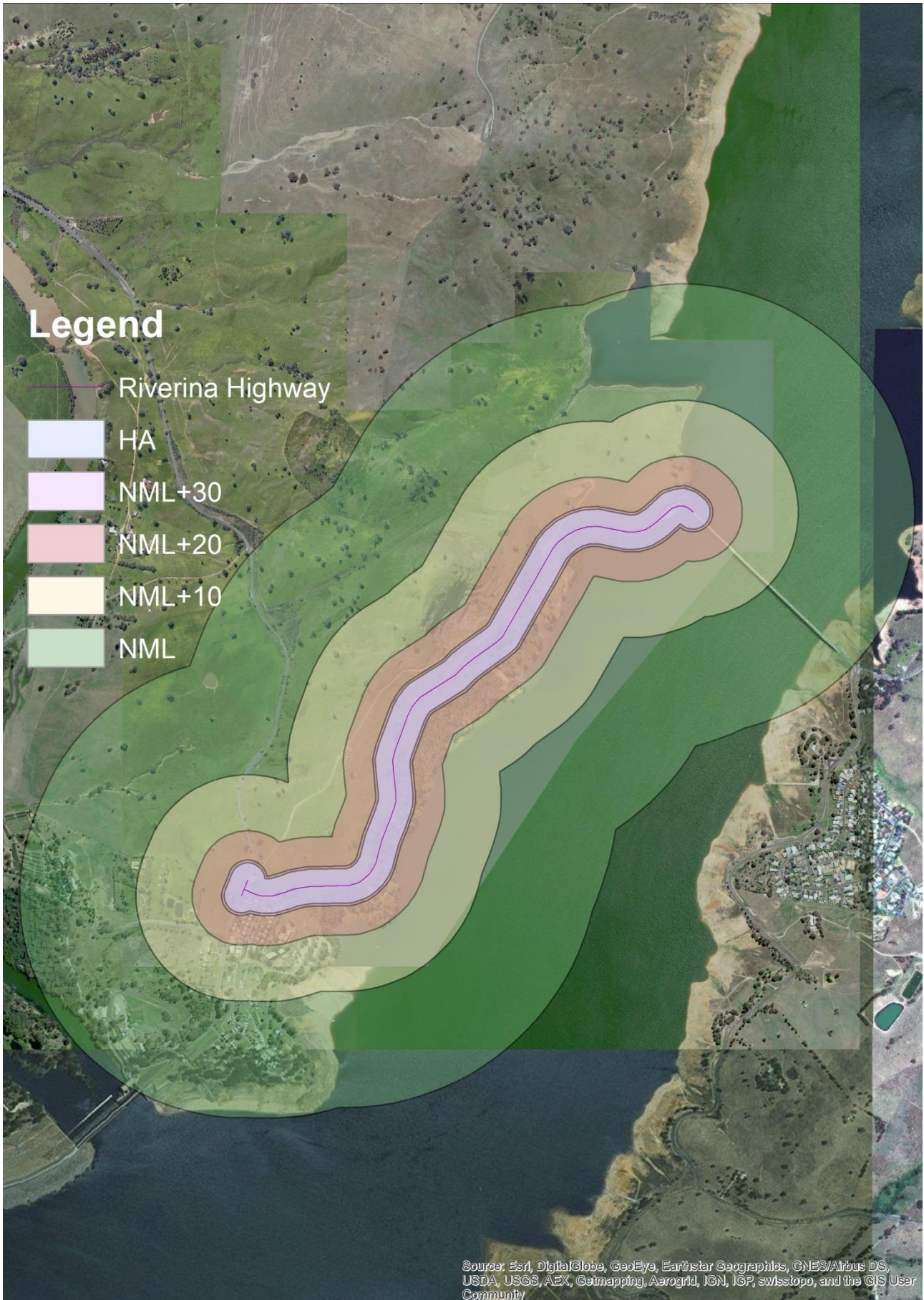
Sensitive receiver noise levels for corridor clearing activities during OOHW with a line of sight to the work. Source: Esri ArcGIS



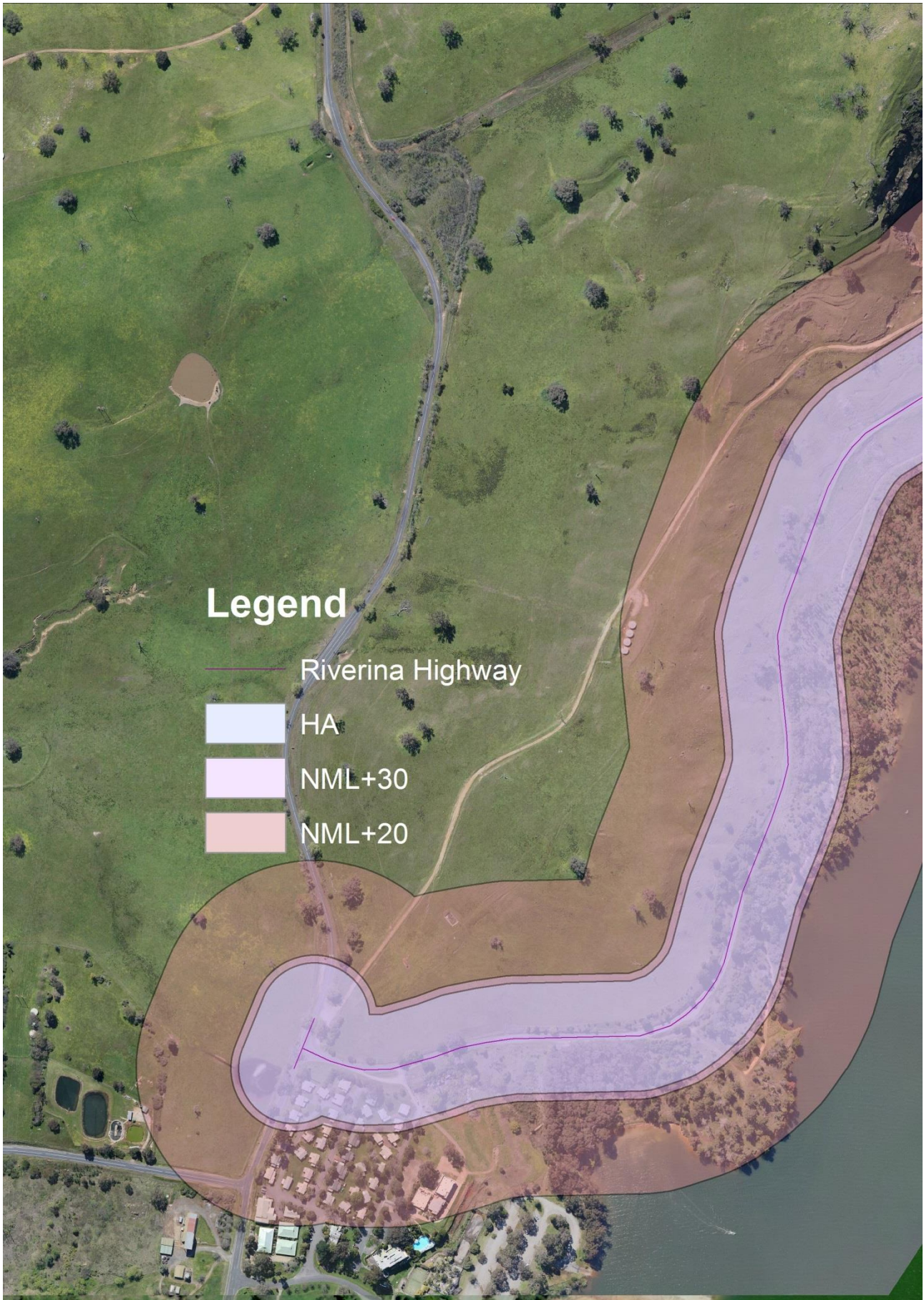
Receiver noise levels for corridor clearing activities during OOHV with no line of sight to the work. Source: Esri ArcGIS



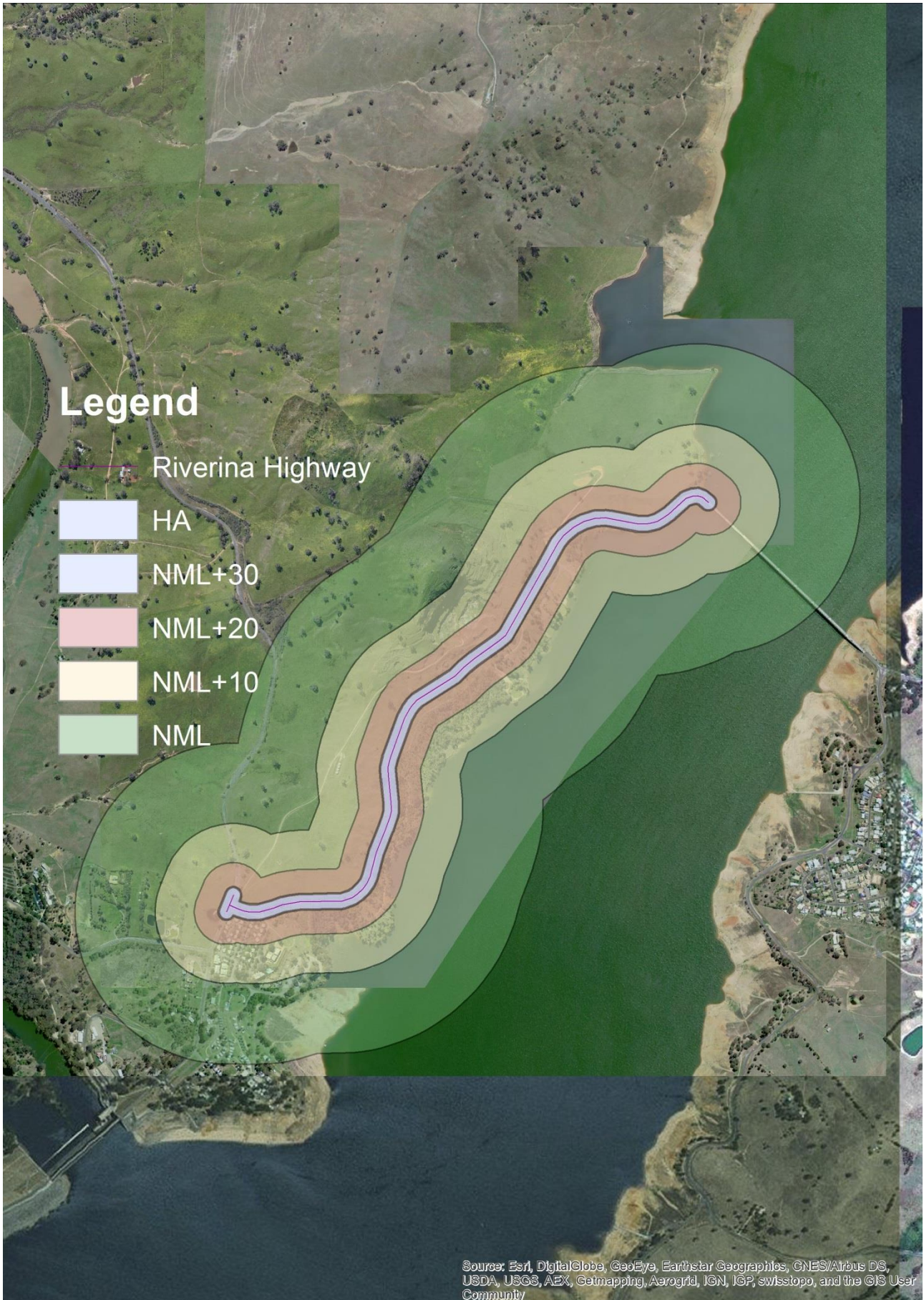
Sensitive receiver noise levels for corridor clearing activities during OOHW with no line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for bulk earthworks during standard hours with a line of sight to the work. Source: Esri ArcGIS



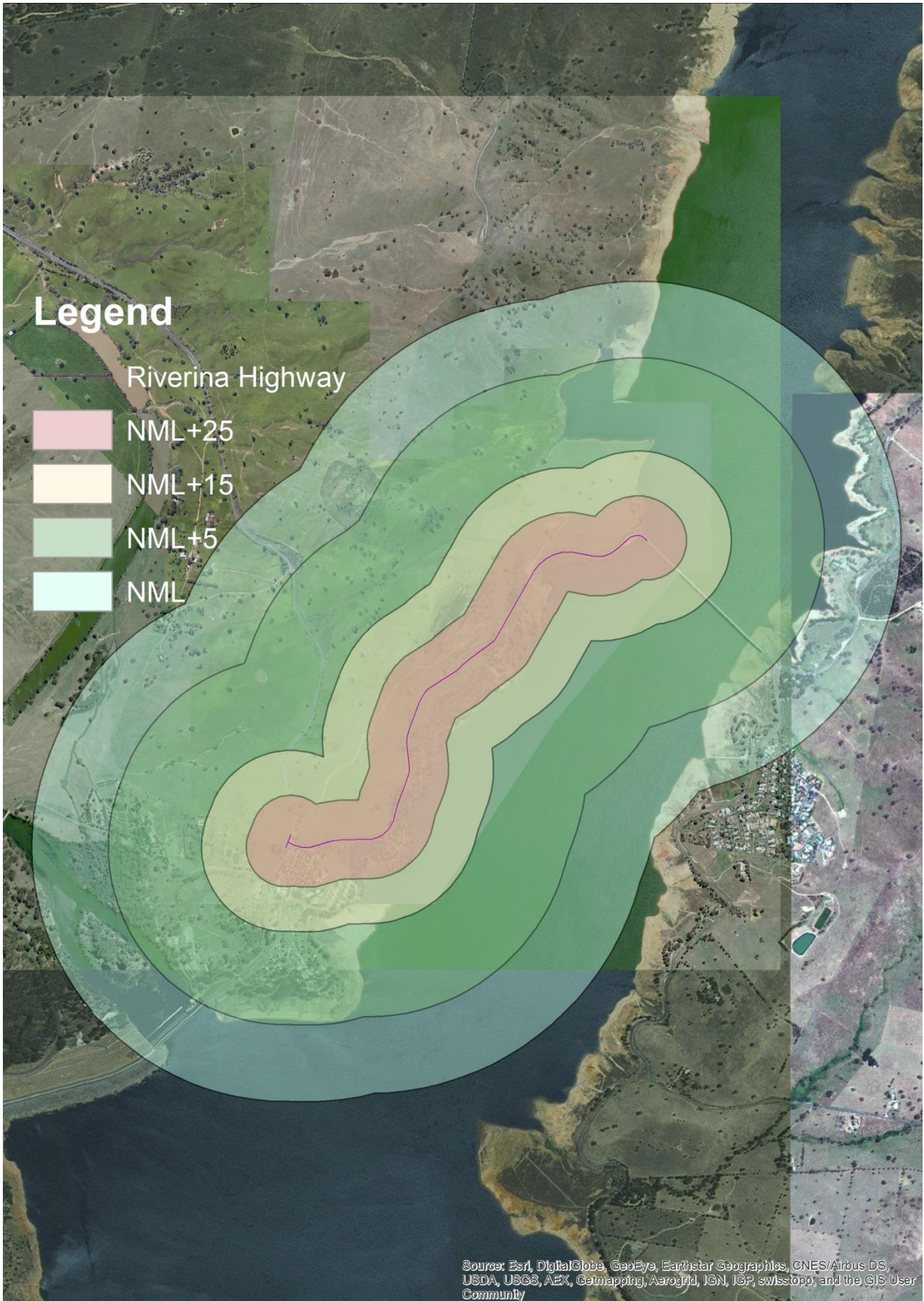
Sensitive receiver noise levels for bulk earthworks during standard hours with a line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for bulk earthworks during standard hours with no line of sight to the work. Source: Esri ArcGIS



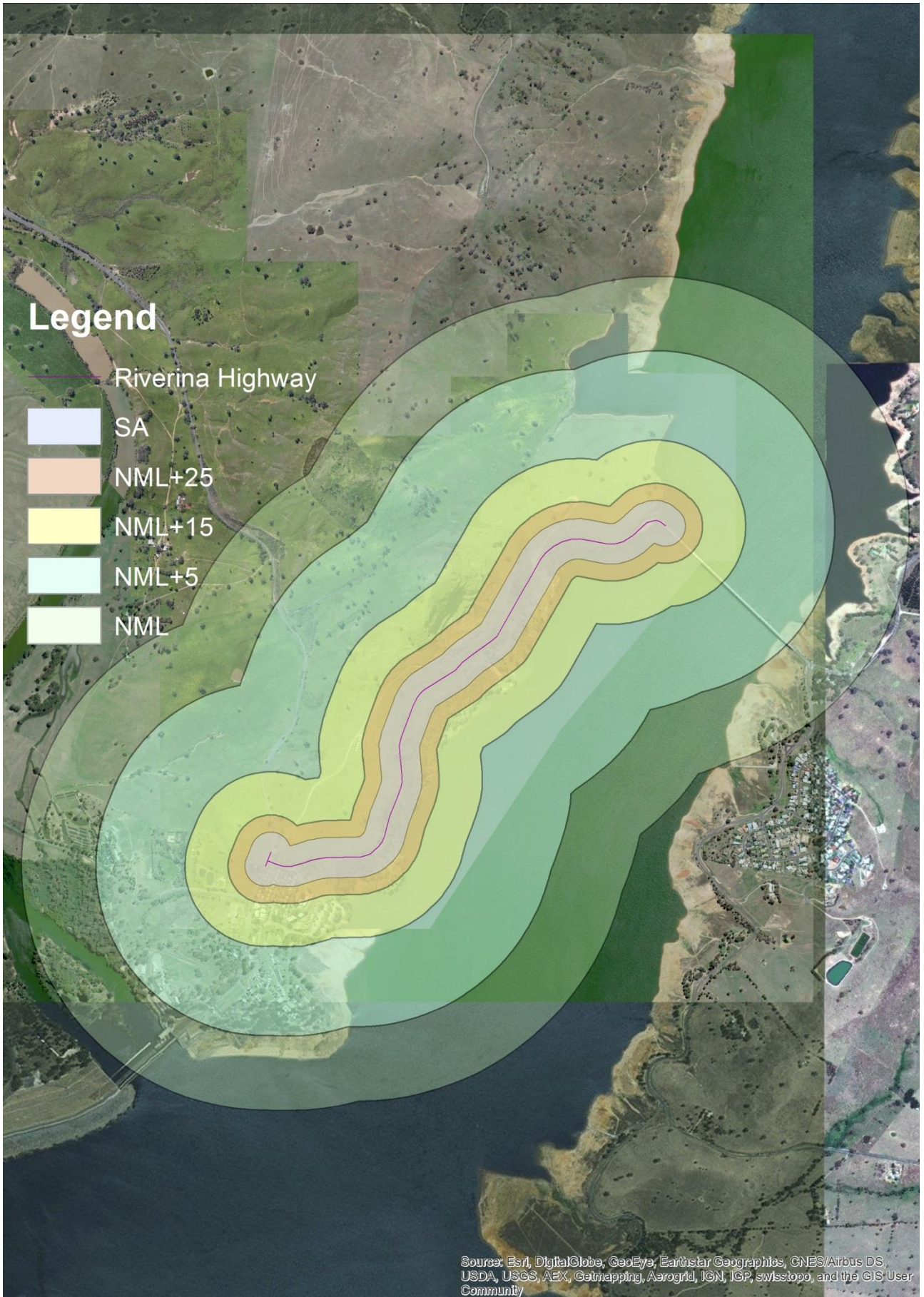
Sensitive receiver noise levels for bulk earthworks during standard hours with no line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for bulk earthworks during daytime OOHV with a line of sight to the work. Source: Esri ArcGIS



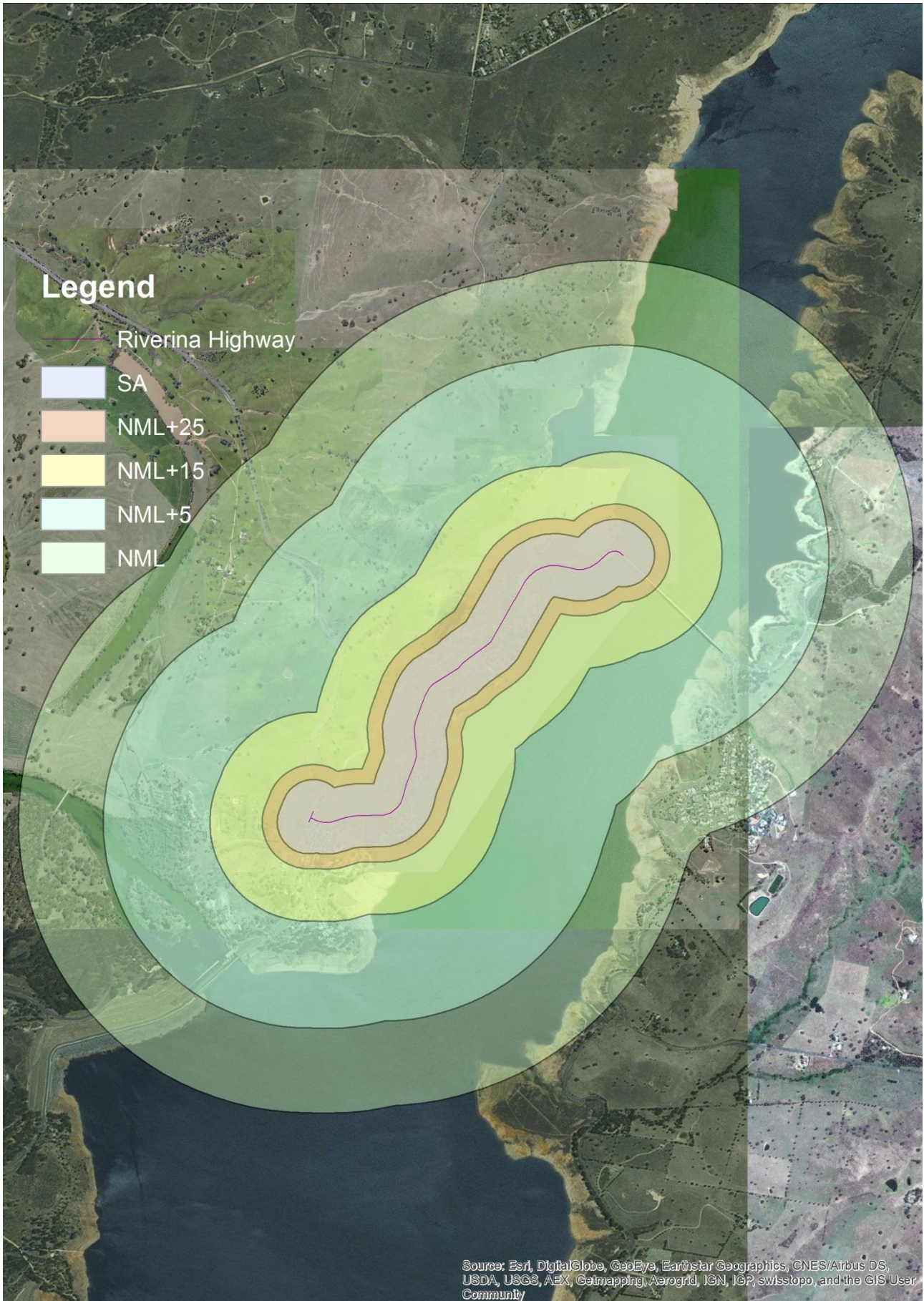
Sensitive receiver noise levels for bulk earthworks during daytime OOHW with a line of sight to the work. Source: Esri ArcGIS



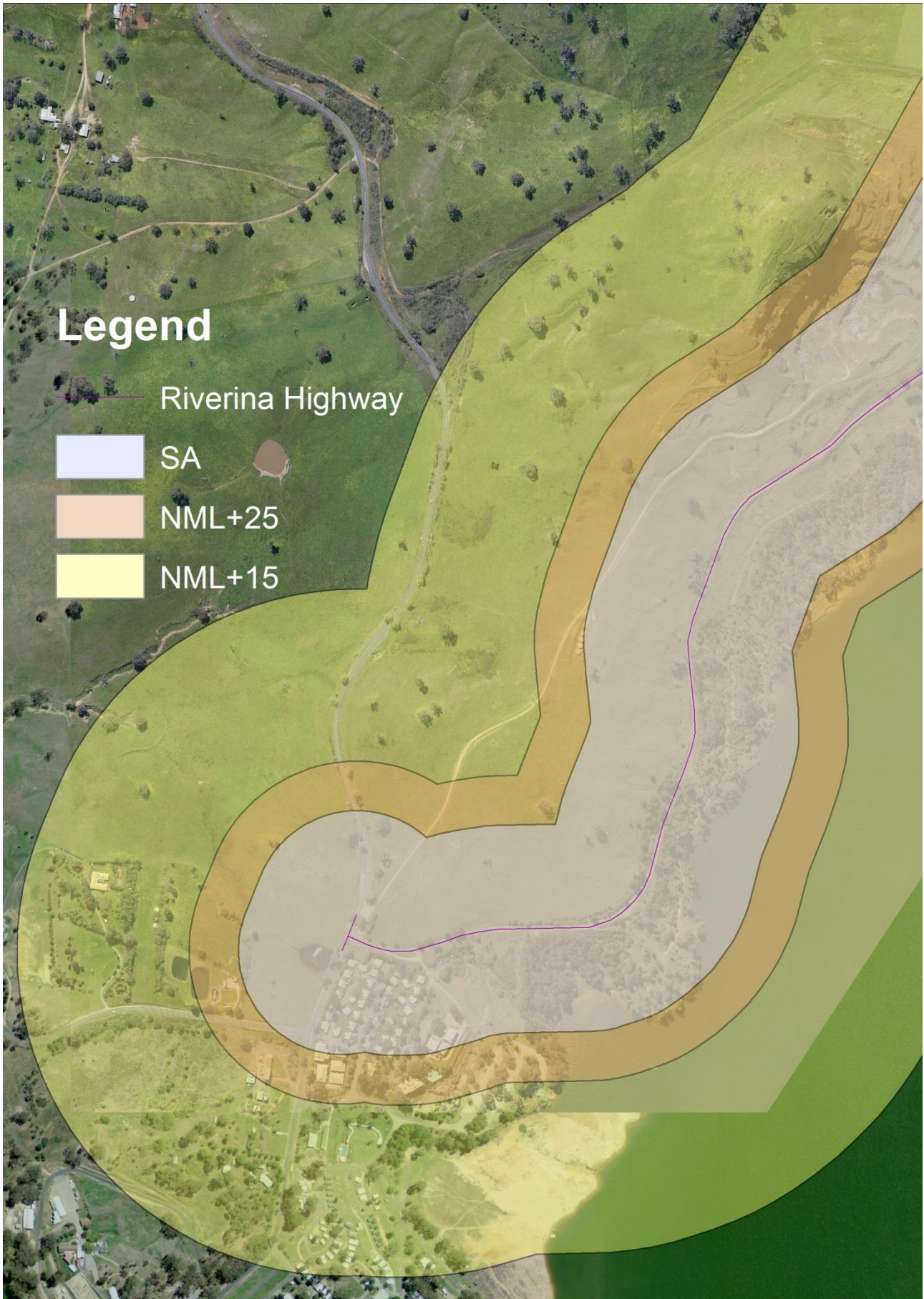
Receiver noise levels for bulk earthworks during daytime OOHV with no line of sight to the work. Source: Esri ArcGIS



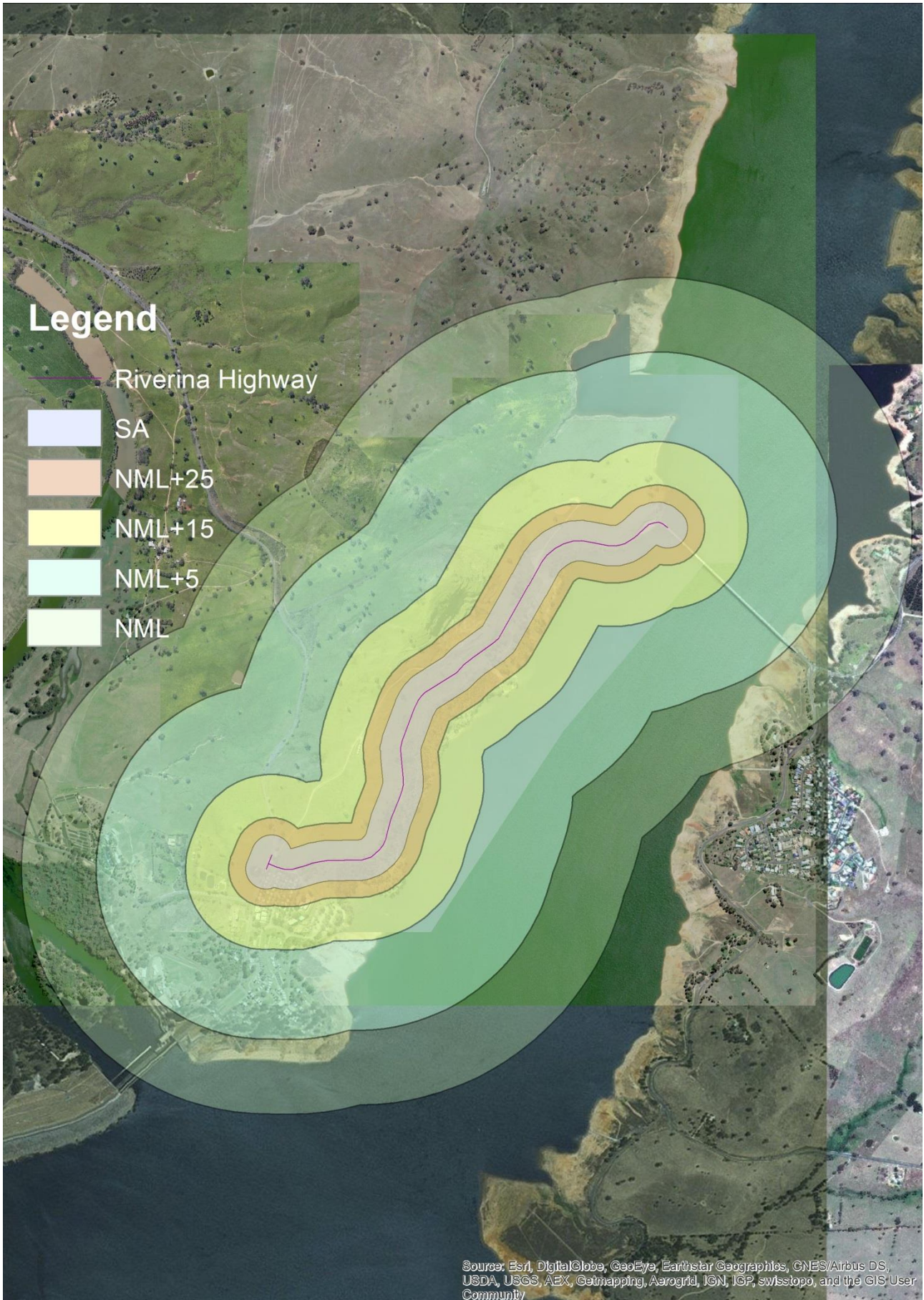
Sensitive receiver noise levels for bulk earthworks during daytime OOHW with no line of sight to the work. Source: Esri ArcGIS



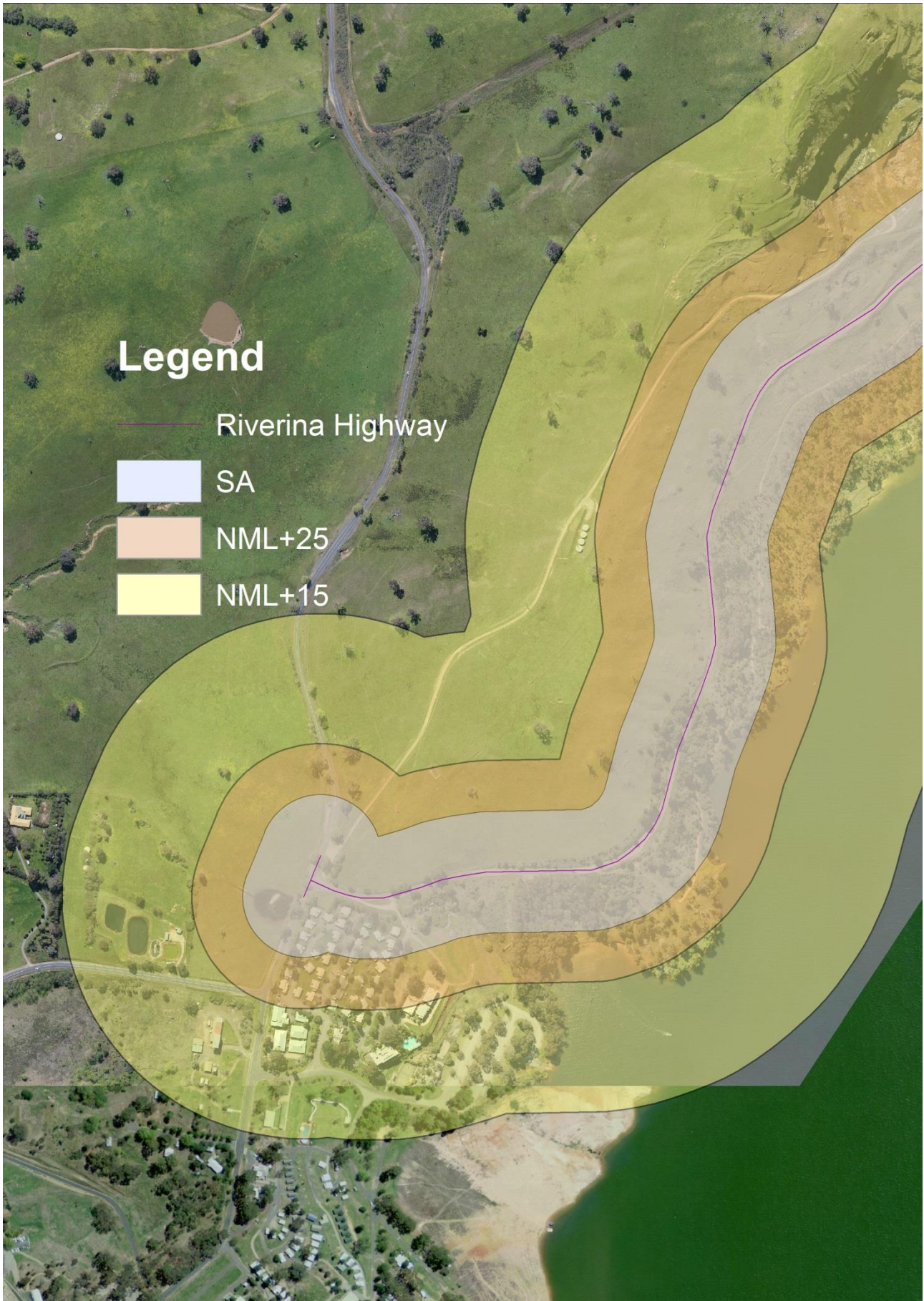
Receiver noise levels for bulk earthworks during OOHW with a line of sight to the work. Source: Esri ArcGIS



Sensitive receiver noise levels for bulk earthworks during OOHV with a line of sight to the work. Source: Esri ArcGIS



Receiver noise levels for bulk earthworks during OOHW with no line of sight to the work. Source: Esri ArcGIS



Sensitive receiver noise levels for bulk earthworks during OOHW with no line of sight to the work. Source: Esri ArcGIS

Attachments

Attachment 1 – Appendices B and C of the Roads and Maritime *Construction Noise and Vibration Guideline*.

Appendix B – Standard mitigation measures

The actions set out in the tables below must be implemented on all construction projects

Action required	Applies to	Details
Management measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation measures (refer to Appendix C for further details of each measure).	Long term projects (greater than 6 weeks) Airborne noise. Ground-borne noise & vibration.	periodic notification (monthly letterbox drop or equivalent) detailing proposed dates, alternative dates for wet weather and hourly activity plan for night works. website Project Infoline Construction Response Line email distribution list Community Based Forums (if required by approval conditions).
	Short term projects (6 weeks or less) including scheduled maintenance Airborne noise. Ground-borne noise & vibration	Notification within 4 weeks prior to works detailing proposed dates, alternative dates for wet weather and hourly activity plan for night works. website Project Infoline Construction Response Line email distribution list Community Based Forums (if required by approval conditions).

Action required	Applies to	Details
Site inductions	Airborne noise. Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: all project specific and relevant standard noise and vibration mitigation measures relevant licence and approval conditions permissible hours of work any limitations on high noise generating activities location of nearest sensitive receivers construction employee parking areas designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	Where specified under Appendix C a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction Environmental Management Plans	Airborne noise. Ground-borne noise & vibration.	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Source controls		

Action required	Applies to	Details
Construction hours and scheduling.	Airborne noise. Ground-borne noise & vibration.	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period.	Ground-borne noise & vibration. Airborne noise.	<p>As a guide high noise and vibration generating activities near receivers should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block . The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers.</p> <p>Unless negotiated with the community with consultation documented and approved by RMS project manager or permitted under the license there should be no more</p> <ul style="list-style-type: none"> • 2 consecutive evenings or nights per week; and • 3 evenings or nights per week; and • 6 evenings or nights per month. <p>For night work these periods of work should be separated by not less than one week.</p>
Equipment selection.	Airborne noise. Ground-borne noise & vibration	<p>Use quieter and less vibration emitting construction methods where feasible and reasonable.</p> <p>For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits.</p> <p>Ensure plant including the silencer is well maintained.</p>
Plant noise levels.	Airborne-noise.	<p>The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H.</p> <p>Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Appendix H.</p>

Action required	Applies to	Details
Rental plant and equipment.	Airborne-noise.	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2.
Use and siting of plant.	Airborne-noise.	<p>The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.</p> <p>Plant used intermittently to be throttled down or shut down.</p> <p>Noise-emitting plant to be directed away from sensitive receivers.</p> <p>Only have necessary equipment on site.</p>
Plan worksites and activities to minimise noise and vibration.	Airborne noise. Ground-borne vibration.	<p>Locate compounds away from sensitive receivers and discourage access from local roads.</p> <p>Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.</p> <p>Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible.</p> <p>Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm.</p> <p>Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.</p> <p>If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.</p>
Reduced equipment power	Airborne noise. Ground-borne vibration.	Use only the necessary size and power.

Action required	Applies to	Details
Non-tonal and ambient sensitive reversing alarms	Airborne noise.	<p>Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.</p> <p>Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.</p>
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise.	<p>Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</p> <p>Select site access points and roads as far as possible away from sensitive receivers.</p> <p>Dedicated loading/unloading areas to be shielded if close to sensitive receivers.</p> <p>Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.</p> <p>Avoid or minimise these out of hours movements where possible.</p>
Blasting regime	Airborne noise. Ground-borne vibration.	<p>The noise and vibration impacts of blasting operations can be minimised by:</p> <p>Choosing the appropriate blast charge configurations</p> <p>Ensuring appropriate blast-hole preparation</p> <p>Optimising blast design, location, orientation and spacing</p> <p>Selecting appropriate blast times, and</p> <p>Utilising knowledge of prevailing meteorological conditions.</p> <p>AS 2187.2 Explosives-Storage, transport and use, Part 2: Use of Explosives provides more detailed advice on ground vibration and airblast overpressure impact minimisation options.</p>

Action required	Applies to	Details
Engine compression brakes	Construction vehicles	<p>Limit the use of engine compression brakes at night and in residential areas.</p> <p>Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commissions 'In-service test procedure' and standard.</p>
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise.	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.
Receptor controls		
Structural surveys and vibration monitoring	Ground-borne vibration.	<p>Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted.</p> <p>At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.</p>
See Appendix C for additional measures	Airborne noise. Ground-borne vibration.	In some instances additional mitigation measures may be required.

Appendix C – Additional mitigation measures

After feasible and reasonable standard noise mitigation measures (Appendix B) have been applied noise levels may still exceed noise management levels. Where exceedances remain implement the following approaches in tables C.1 to C.3 based on calculated noise, Mitigation Level or vibration level.

During long term works or at fixed sites the additional mitigation measures below may become less effective. In these situations at-receiver noise mitigation may be considered where feasible and reasonable at source noise mitigation and management measures have been exhausted. At receiver mitigation may include temporary window and door screens, temporary localised shielding or permanent forms of mitigation.

C.1 Airborne noise

For calculated noise levels the tables show additional measures to be implemented for each receiver depending on how far above the background noise level or NML the impact is.

For Mitigation Distance based assessments the distances where additional mitigation measures should be implemented are identified by cross referencing the Mitigation Levels in Table C1 with the plant and Mitigation Levels in Table D2 and D3.

As an example using distance based methods consider a NML of 45dBA in OOHW Period 1 in Table C1 below. Letter box drops should be completed at Mitigation Levels greater than 50dBA (NML+5dBA). From Table D2 this corresponds to receivers at distances equal to or less than 360m for a concrete saw.

Table C.1: Triggers for Additional Mitigation Measures - Airborne Noise

Predicted airborne L _{Aeq(15min)} noise level at receiver perception	noise level at receiver		Additional mitigation measures	
	dB(A) above RBL	dB(A) above NML	type ¹ :	Mitigation Levels ² :
All hours				
75dBA or greater			LB, V, PC, RO	HA
Standard Hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)				
Noticeable	5 to 10	0	-	NML
Clearly Audible	10 to 20	< 10	-	NML
Moderately intrusive	20 to 30	10 to 20	LB, V	NML+10
Highly intrusive	> 30	> 20	LB, V	NML+20
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)				
Noticeable	5 to 10	< 5	-	NML
Clearly Audible	10 to 20	5 to 15	LB, R1, NR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, LB, R1, NR	NML+15
Highly intrusive	> 30	> 25	V, IB, LB, R1, NR, PC, SN	NML+25
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)				
Noticeable	5 to 10	< 5	LB	NML
Clearly Audible	10 to 20	5 to 15	V, LB, R2, NR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, IB, LB, PC, SN, R2, NR	NML+15
Highly intrusive	> 30	> 25	AA, V, IB, LB, PC, SN, R2, NR	NML+25

Notes:

- | | |
|---|--|
| <p>1 AA = Alternative accommodation
 V = Validation of predicted noise levels (not required for projects less than 3 weeks)
 IB = Individual briefings (not required for projects less than 3 weeks)
 LB = Letter box drops
 R2 = Respite Period 2
 NR = Negotiated Respite</p> | <p>R1 = Respite Period 1
 PC = Phone calls
 SN = Specific notifications
 Perception = relates to level above RBL</p> |
| <p>2 NML = Noise Management Level (see Appendix D)</p> | <p>HA = Highly Affected (> 75 dB(A) - applies to residences only)</p> |

C.2 Ground-borne noise

Table C.2: Triggers for Additional Mitigation Measures - Ground-borne Noise

Predicted ground-borne $L_{Aeq(15min)}$ noise level at receiver perception	dB(A) above GB NML	Additional mitigation measures type ¹ :	apply to ² :
Standard Hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
N/A	Vibration only applicable during standard hours		
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Clearly Audible	< 10	LB	All
Moderately intrusive	10 to 20	V, LB, R1, NR SN	All
Highly intrusive	> 20	V, IB, LB, PC, SN, R1, NR	All
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Clearly Audible	< 10	V, LB, SN	All
Moderately intrusive	10 to 20	AA, V, IB, LB, PC, RP, SN, R2, NR	All
Highly intrusive	> 20	AA, V, IB, LB, PC, RP, SN, R2, NR	All

Notes:

- | | | |
|---|--|-----------------------------|
| 1 | AA = Alternative accommodation | R1 = Respite Period 1 |
| | V = Validation of predicted noise levels | PC = Phone calls |
| | IB = Individual briefings | SN = Specific notifications |
| | LB = Letter box drops | |
| | R2 = Respite Period 2 | |
| | NR = Negotiated Respite | |
| 2 | All affected receivers | |

C.3 Vibration

Table C.3: Triggers for Additional Mitigation Measures – Vibration

Predicted ground-borne $L_{Aeq(15min)}$ noise level at receiver perception	dB(A) above GB NML	Additional mitigation measures type ¹ :	apply to ² :
Standard Hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Predicted Vibration Exceeds Maximum Levels		V, LB, RP	All
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Predicted Vibration Exceeds Maximum Levels		V, IB, LB, RO, PC, RP, SN	All
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Predicted Vibration Exceeds Maximum Levels		AA, V, IB, LB, PC, RP, SN	All

Notes:

- | | | |
|---|--|-------------------------------------|
| 1 | AA = Alternative accommodation | RO = Project specific respite offer |
| | V = Validation of predicted noise levels | PC = Phone calls |
| | IB = Individual briefings | SN = Specific notifications |
| | LB = Letter box drops | |
| 2 | All affected receivers | |

C.4 Construction related traffic noise

Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:

- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Feasible and reasonable considerations should also include:

- time of day of the noise increase and exceedence of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Appendix 5

PACHCI Stage 1 Aboriginal Assessment and Clearance
Letter

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(http://www.nsw.gov.au/gazette\)](http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Roads and Maritime Services - Wagga Wagga

Date: 29 January 2016

1 Simmons St

Wagga Wagga New South Wales 2650

Attention: Andrew Whitton

Email: andrew.whitton@rms.nsw.gov.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -36.1001, 147.0372 - Lat, Long To : -36.0876, 147.0554 with a Buffer of 200 meters, conducted by Andrew Whitton on 29 January 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *



18 April 2016

Parthi Parthiban
Project/Contract Manager
Roads & Maritime Services
1 Simmons Street
Wagga Wagga NSW 2650
Parthi,

Preliminary assessment results for Riverina Hwy (HW20)- Stage 2 Safety Improvement Works Bethanga Bridge to Lake Hume Village (0.7 – 3.3km) based on Stage 1 of the Procedure for Aboriginal cultural heritage consultation and investigation (the procedure).

The project, as described in the Project REF brief, was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate any Aboriginal objects or places in the study area.
- The study area does contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services' procedure. However, the project area has been previously disturbed during road construction and maintenance activities
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff Dan Francis (Ext 71634) to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' *Unexpected Archaeological Finds Procedure*.

For further assistance with this matter please do not hesitate to contact me.

Yours sincerely,

Andrew Whitton
Aboriginal Cultural Heritage Advisor – South West

Appendix 6

Statement of Heritage Impact & Non-Aboriginal Heritage
Database Search

Technical College 502 Dean St	Albury, NSW, Australia	National Estate (Non-statutory archive) (Registered) Register of the National Estate (Non-statutory archive)
Town Hall Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Turks Head Museum Wodonga Pl	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Report Produced: Fri Apr 22 10:57:41 2016

		(Non-statutory archive)
Hall Next to the Town Hall Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Headmasters Cottage 653 Kiewa St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Hume Dam and Pondage	Hume Weir, VIC, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Lawn Cemetery Union Rd	Albury, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Murray River Rail Bridge	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Murray Valley Flood Plain (part) Riverina Hwy	Howlong, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Public School, 1892 Building 465 David St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
S M Abikhair Haberdashery Store 558-560 Olive St	Albury, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Sodens Hotel Australia 459 Wilson St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Station Masters Residence Young St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
T and G Building 555 Dean St	Albury, NSW, Australia	(Registered) Register of the

Search Results

25 results found.

ANZ Bank (former) 500 Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Albury Courthouse 564 Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Albury Post Office 570 Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Albury Post Office 570 Dean St	Albury, NSW, Australia	(Listed place) Commonwealth Heritage List
Albury Public School (1861) 468 Olive St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Albury Railway Station Railway Pl	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Albury Railway Station and Yard Hume Hwy	Albury, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
Bellevue 592 Kiewa St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Bungambrawatha Creek Road Bridge Smollett St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
CML Building 499 Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Civic Precinct Dean St	Albury, NSW, Australia	(Registered) Register of the National Estate

			City	
<u>Terrace Houses</u>	662- 670 David Street	Albury	Albury City	LGOV
<u>Terrace Houses</u>	480 - 484 Macauley Street	Albury	Albury City	LGOV
<u>Terrace Houses</u>	561 - 565 Wyse Street	Albury	Albury City	LGOV
<u>Terrace Houses</u>	454 - 456 Swift Street	Albury	Albury City	LGOV
<u>Terrace Houses</u>	466 - 470 Swift Street	Albury	Albury City	LGOV
<u>The Carriageway</u>	506 - 508 Smollett Street	Albury	Albury City	LGOV
<u>The Model Store</u>	582 David Street	Albury	Albury City	LGOV
<u>Thiel's Building</u>	442- 444 Dean Street	Albury	Albury City	LGOV
<u>Transhipment Shed</u>	Young Street	Albury	Albury City	LGOV
<u>Trees</u>	Carrington Street	Albury	Albury City	LGOV
<u>Trees</u>	Paine Place	Albury	Albury City	LGOV
<u>Trees</u>	682 Kiewa Street	Albury	Albury City	LGOV
<u>Turks Head Museum</u>	Wodonga Place	Albury	Albury City	LGOV
<u>University Buildings</u>	616 - 630 Olive Street	Albury	Albury City	LGOV
<u>Warehouse Facades</u>	590-600 Nurigong Street	South Albury	Albury City	LGOV
<u>Water Pumping Station and Electricity Generating House, Former</u>	Boundary Road	Albury	Albury City	LGOV
<u>Westpac Bank</u>	615 Dean Street	Albury	Albury City	LGOV
<u>Wine Vats</u>	69 Maryville Way	Thurgoona	Albury City	LGOV

There was a total of 324 records matching your search criteria.

Key:

LGA = Local Government Area

GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

<u>Shops</u>	464 - 480 Dean Street	Albury	Albury City	LGOV
<u>Shops</u>	537- 551 Dean Street	Albury	Albury City	LGOV
<u>Shops</u>	633 - 635 Jones Street	Albury	Albury City	LGOV
<u>Shops 'Abikhairs'</u>	558 - 560 Olive Street	Albury	Albury City	LGOV
<u>Signal Box and Footbridge</u>	Young Street	Albury	Albury City	LGOV
<u>Smollet Street Bridge Over Bungambrawatha Creek</u>	Riverina Highway	Albury	Albury City	SGOV
<u>Smollett Street Bridge</u>	Smollett Street	Albury	Albury City	LGOV
<u>Soden's Hotel Accommodation</u>	459 Wilson Street	Albury	Albury City	LGOV
<u>South Albury Conservation Area</u>	Charles Street	South Albury	Albury City	LGOV
<u>South Albury Hall</u>	467 Ebden Street	South Albury	Albury City	LGOV
<u>St David's Church</u>	595 Olive Street	Albury	Albury City	LGOV
<u>St David's Church Hall</u>	591 Olive Street	Albury	Albury City	LGOV
<u>St David's Conservation Area</u>	David Street	Albury	Albury City	LGOV
<u>St David's Manse</u>	589 Olive Street	Albury	Albury City	LGOV
<u>St John's Anglican Church</u>	Old Sydney Road	Thurgoona	Albury City	LGOV
<u>St Mary's Catholic Church</u>	28 Carsten Street	Lavington	Albury City	LGOV
<u>St Matthews Church</u>	514 Kiewa Street	Albury	Albury City	LGOV
<u>St Matthew's Rectory</u>	518 Kiewa Street	Albury	Albury City	LGOV
<u>St Patrick's Conservation Area</u>	Olive Street	Albury	Albury City	LGOV
<u>St Patrick's Presbytery</u>	515 Smollett Street	Albury	Albury City	LGOV
<u>St Patrick's Primary School</u>	Smollett Street	Albury	Albury City	LGOV
<u>St. Patrick's Church</u>	515 Smollett Street	Albury	Albury City	LGOV
<u>Station Master's Residence</u>	Young Street	Albury	Albury City	LGOV
<u>Survey Tree - Mr7, Albury</u>	Riverina Highway	5 Km From Albury	Albury City	SGOV
<u>Swift Street Conservation Area</u>	Swift Street	Albury	Albury City	LGOV
<u>T & G Building</u>	555 Dean Street	Albury	Albury City	LGOV
<u>Temple Court</u>	617 Dean Street	Albury	Albury	LGOV

<u>Railway Bridge</u>	Murray River	South Albury	Albury City	LGOV
<u>Railway Conservation Area</u>	Young Street	Albury	Albury City	LGOV
<u>Railway Gatehouse</u>	Dallinger Road	Lavington	Albury City	LGOV
<u>Railway Turntable</u>	Young Street	Albury	Albury City	LGOV
<u>Railway Worker's Hut</u>	508 Young Street	Albury	Albury City	LGOV
<u>Regional Arts Centre</u>	546 Dean Street	Albury	Albury City	LGOV
<u>Reids Butcher Shop and House</u>	462 Guinea Street	Albury	Albury City	LGOV
<u>Remnant Box Gum Woodland</u>	393 Wood Street	Albury	Albury City	LGOV
<u>Rifle Range</u>	Poole Street	Albury	Albury City	LGOV
<u>Riverina House</u>	545 Old Sydney Road	Table Top	Albury City	LGOV
<u>Roman Catholic Hall</u>	521 Smollett Street	Albury	Albury City	LGOV
<u>Ryans Creek Weir</u>	Murray River	Albury	Albury City	SGOV
<u>School of Environmental and Information Sciences, Charles Sturt University</u>	Elizabeth Mitchell Drive	Thurgoona	Albury City	LGOV
<u>Shop</u>	459 Townsend Street	Albury	Albury City	LGOV
<u>Shop</u>	426 Wilson Street	Albury	Albury City	LGOV
<u>Shop</u>	552 Thurgoona Street	Albury	Albury City	LGOV
<u>Shop</u>	453- 459 Dean Street	Albury	Albury City	LGOV
<u>Shop</u>	452 Dean Street	Albury	Albury City	LGOV
<u>Shop</u>	583 Dean Street	Albury	Albury City	LGOV
<u>Shop and House</u>	638 Kiewa Street	Albury	Albury City	LGOV
<u>Shop and Two Dwellings</u>	436 - 440 Wilson Street	Albury	Albury City	LGOV
<u>Shop 'Florence Chemist'</u>	461- 463 Dean Street	Albury	Albury City	LGOV
<u>Shop 'Maples Building'</u>	639 Dean Street	Albury	Albury City	LGOV
<u>Shop 'Mates Arcade'</u>	569 Dean Street	Albury	Albury City	LGOV
<u>Shops</u>	608 - 614 and 642 Dean Street	Albury	Albury City	LGOV
<u>Shops</u>	483 - 485 Dean Street	Albury	Albury City	LGOV

		Albury	City	
<u>Maryvale</u>	Table Top Road	Table Top	Albury City	LGOV
<u>Memorial Bowl</u>	Monument Hill	Albury	Albury City	LGOV
<u>Methodist Church</u>	551 Olive Street	Albury	Albury City	LGOV
<u>Methodist Church Hall</u>	559 Olive Street	Albury	Albury City	LGOV
<u>Monastery</u>	481 Smollett Street	Albury	Albury City	LGOV
<u>Monument</u>	Monument Hill	Albury	Albury City	LGOV
<u>Monument Hills Parkland Conservation Area</u>	Dean Street	Albury	Albury City	LGOV
<u>Mount Street Conservation Area</u>	Mount Street	Albury	Albury City	LGOV
<u>Mudges Canal</u>	Hovell Street (Townsend - Kiewa)	South Albury	Albury City	LGOV
<u>Murray Valley Vineyards</u>	Dallinger Road	Lavington	Albury City	LGOV
<u>Music Conservatorium (Albury Technical College)</u>	502 Dean Street	Albury	Albury City	LGOV
<u>National Australia Bank</u>	573 Dean Street	Albury	Albury City	LGOV
<u>National Australia Bank</u>	606 Dean Street	Albury	Albury City	LGOV
<u>National Environment Centre</u>	97 Ettamogah Road	Thurgoona	Albury City	LGOV
<u>Neighbourhood Store, Former</u>	600 Wyse Street	Albury	Albury City	LGOV
<u>New Albury Hotel Accommodation</u>	491 Kiewa Street	Albury	Albury City	LGOV
<u>Old Meramie Hotel</u>	595 Kiewa Street	Albury	Albury City	LGOV
<u>Paddlesteamer Cumberoona</u>	Noreuil Park, Wodonga Place	Albury	Albury City	LGOV
<u>Padman Park</u>	Padman Drive	West Albury	Albury City	LGOV
<u>Palm Tree</u>	Banff Avenue	Albury	Albury City	LGOV
<u>Palm Trees</u>	530 Creek Street	Albury	Albury City	LGOV
<u>Parkland</u>	Dean Street (West)	Albury	Albury City	LGOV
<u>Post Office</u>	570 Dean Street	Albury	Albury City	LGOV
<u>Pump Station</u>	440 Wodonga Place	Albury	Albury City	LGOV
<u>Quilters Cottage</u>	Spencer Street	Albury	Albury City	LGOV
<u>Racecourse - Public Entrance Gates and Office</u>	16 Dallinger Road	Lavington	Albury City	LGOV

<u>Houses</u>	355 - 369 Charles Street	South Albury	Albury City	LGOV
<u>Houses</u>	328 and 330 David Street	South Albury	Albury City	LGOV
<u>Houses</u>	408 - 412 David Street	South Albury	Albury City	LGOV
<u>Houses</u>	648 and 652 David Street	Albury	Albury City	LGOV
<u>Houses</u>	582 - 606 Englehardt Street	Albury	Albury City	LGOV
<u>Houses</u>	446 and 448 Macauley Street	Albury	Albury City	LGOV
<u>Houses</u>	371- 379 Rau Street	East Albury	Albury City	LGOV
<u>Houses</u>	595 - 623 Griffith Street	Albury	Albury City	LGOV
<u>Houses & Corner Store</u>	347- 381 Kenilworth Street	East Albury	Albury City	LGOV
<u>Hovell Tree</u>	Wodonga Place - Hovell Tree Reserve	Albury	Albury City	LGOV
<u>Hume Dam</u>	Accessed off Murray Street, Lake Hume Village. Murray Valley, on the Murray River	Albury	Albury City	SGOV
<u>Hume Dam Cottage 1</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam Cottage 4</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam Interpretive display including Crompton electric motor, Steam engine/generator set and air compressor</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam moveable heritage items</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam Nissan Huts (2)</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam storage, dam wall crest including structure, plaques, original winch machinery and wall embellishments</u>	Murray River	Albury	Albury City	SGOV
<u>Hume Dam Town Plan including streets, curbing, fences and street trees</u>	Murray River	Albury	Albury City	SGOV
<u>Immaculate Heart of Mary Parish Church</u>	20 Hartigan Street	Thurgoona	Albury City	LGOV
<u>Jelbart Park</u>	Moore Street	Lavington	Albury City	LGOV
<u>Kenilworth Street Conservation Area</u>	Kenilworth Street	East Albury	Albury City	LGOV
<u>Kia Ora</u>	473 Townsend Street	Albury	Albury City	LGOV
<u>Kia Ora</u>	Townsend Street	Albury	Albury City	SGOV
<u>Krautz Date Palms</u>	607 Krautz Street	Lavington	Albury City	LGOV
<u>Laotian Buddhist Temple</u>	605 Abercorn Street	South Albury	Albury City	LGOV
<u>Lavington Historic Precinct</u>	464, 450, 468, 486 and 494 Urana Road	Lavington	Albury City	LGOV
<u>Macquarie Worsteds</u>	Schubach Street	East	Albury	LGOV

			City	
<u>House 'The Castle'</u>	549 Lyne Street	Lavington	Albury City	LGOV
<u>House 'The Cedar'</u>	610 Olive Street	Albury	Albury City	LGOV
<u>House 'The Glasshouse'</u>	638 Old Sydney Road	Table Top	Albury City	LGOV
<u>House 'The Ivy'</u>	610 Old Sydney Road	Table Top	Albury City	LGOV
<u>House 'Torlochan'</u>	482 Swift Street	Albury	Albury City	LGOV
<u>House 'Tremonti'</u>	285 Union Road	Lavington	Albury City	LGOV
<u>House 'Tumarazani'</u>	595 Heathwood Avenue	Lavington	Albury City	LGOV
<u>House 'Uralba'</u>	443 Wilson Street	Albury	Albury City	LGOV
<u>Houses</u>	368 - 376 Wilson Street	East Albury	Albury City	LGOV
<u>Houses</u>	420 - 424 Wilson Street	Albury	Albury City	LGOV
<u>Houses</u>	316 - 318 Townsend Street	South Albury	Albury City	LGOV
<u>Houses</u>	350 - 362 Wilson Street	East Albury	Albury City	LGOV
<u>Houses</u>	532 - 536 Young Street	Albury	Albury City	LGOV
<u>Houses</u>	442 - 450 Swift Street	Albury	Albury City	LGOV
<u>Houses</u>	522 - 534 Thurgoona Street	Albury	Albury City	LGOV
<u>Houses</u>	432 and 436 Swift Street	Albury	Albury City	LGOV
<u>Houses</u>	470 - 490 Wilson Street	Albury	Albury City	LGOV
<u>Houses</u>	627- 645 Olive Street	Albury	Albury City	LGOV
<u>Houses</u>	427 and 429 Macauley Street	Albury	Albury City	LGOV
<u>Houses</u>	438 and 440 Macauley Street	Albury	Albury City	LGOV
<u>Houses</u>	638 - 642 Macauley Street	Albury	Albury City	LGOV
<u>Houses</u>	595 - 624 Jones Street	Albury	Albury City	LGOV
<u>Houses</u>	513 - 529 Guinea Street	Albury	Albury City	LGOV
<u>Houses</u>	Hanel Street	East Albury	Albury City	LGOV
<u>Houses</u>	405 - 415 David Street	South Albury	Albury City	LGOV
<u>Houses</u>	607- 638 Carrington Street	Albury	Albury City	LGOV

<u>House</u>	448 David Street	Albury	Albury City	LGOV
<u>House</u>	356 David Street	South Albury	Albury City	LGOV
<u>House 'Adams'</u>	646 Olive Street	Albury	Albury City	LGOV
<u>House 'Avonlea'</u>	511 Crisp Street	Albury	Albury City	LGOV
<u>House 'Beaumont'</u>	600 Beaumont Crescent	East Albury	Albury City	LGOV
<u>House 'Bellevue'</u>	592 Kiewa Street	Albury	Albury City	LGOV
<u>House 'Ben Werrin'</u>	599 Paine Street	Albury	Albury City	LGOV
<u>House 'Boldrewood'</u>	640 Olive Street	Albury	Albury City	LGOV
<u>House 'Bonequilla'</u>	587 Kiewa Street	Albury	Albury City	LGOV
<u>House 'Cumnock'</u>	418 Wilson Street	Albury	Albury City	LGOV
<u>House 'Davern Residence'</u>	485 Kotthoff Street	Lavington	Albury City	LGOV
<u>House 'Fernhurst'</u>	591 David Street	Albury	Albury City	LGOV
<u>House 'Grandview'</u>	19 Goldworthy Street	Lavington	Albury City	LGOV
<u>House 'Green Court'</u>	589 Smollett Street	Albury	Albury City	LGOV
<u>House 'Grestford'</u>	364 Rau Street	East Albury	Albury City	LGOV
<u>House 'Haberfields'</u>	419 David Street	South Albury	Albury City	LGOV
<u>House 'Hawthorn'</u>	585 Kiewa Street	Albury	Albury City	LGOV
<u>House 'Koch Residence'</u>	511 Prune Street	Lavington	Albury City	LGOV
<u>House 'McGrath Residence'</u>	553 Roach Street	Lavington	Albury City	LGOV
<u>House 'Muniong'</u>	Hume Highway	Springdale Heights	Albury City	LGOV
<u>House 'Noorla'</u>	St Johns Road	Thurgoona	Albury City	LGOV
<u>House 'Nyang'</u>	590 Kiewa Street	Albury	Albury City	LGOV
<u>House 'Polkinghorne Residence'</u>	560 Lyne Street	Lavington	Albury City	LGOV
<u>House 'Quamby'</u>	641 Macauley Street	Albury	Albury City	LGOV
<u>House 'Spanish Mission Residence'</u>	577 Heathwood Avenue	Lavington	Albury City	LGOV
<u>House 'Springfield'</u>	431 Crisp Street	Albury	Albury City	LGOV
<u>House 'St Hillaire'</u>	St Johns Road	Thurgoona	Albury	LGOV

			City	
<u>House</u>	462 Swift Street	Albury	Albury City	LGOV
<u>House</u>	474 Schubach Street	East Albury	Albury City	LGOV
<u>House</u>	382 Olive Street	South Albury	Albury City	LGOV
<u>House</u>	341 Macauley Street	South Albury	Albury City	LGOV
<u>House</u>	644 Kiewa Street	Albury	Albury City	LGOV
<u>House</u>	607 Kiewa Street	Albury	Albury City	LGOV
<u>House</u>	612 Kiewa Street	Albury	Albury City	LGOV
<u>House</u>	378 Rau Street	East Albury	Albury City	LGOV
<u>House</u>	624 Sackville Street	Albury	Albury City	LGOV
<u>House</u>	365 Macauley Street	South Albury	Albury City	LGOV
<u>House</u>	381 Macauley Street	South Albury	Albury City	LGOV
<u>House</u>	552 Macauley Street	Albury	Albury City	LGOV
<u>House</u>	494 Nathan Avenue	Albury	Albury City	LGOV
<u>House</u>	447 Macauley Street	Albury	Albury City	LGOV
<u>House</u>	452 Macauley Street	Albury	Albury City	LGOV
<u>House</u>	26 Pilbara Place	East Albury	Albury City	LGOV
<u>House</u>	357 Rau Street	East Albury	Albury City	LGOV
<u>House</u>	559 Wyse Street	Albury	Albury City	LGOV
<u>House</u>	449 Wilson Street	Albury	Albury City	LGOV
<u>House</u>	442 Guinea Street	Albury	Albury City	LGOV
<u>House</u>	528 George Street	Albury	Albury City	LGOV
<u>House</u>	655 David Street	Albury	Albury City	LGOV
<u>House</u>	730 Fellowes Crescent	Albury	Albury City	LGOV
<u>House</u>	369 Rau Street	East Albury	Albury City	LGOV
<u>House</u>	361 Rau Street	East Albury	Albury City	LGOV
<u>House</u>	791 David Street	Albury	Albury City	LGOV

<u>Guadalupe House</u>	St Johns Road	Thurgoona	Albury City	LGOV
<u>Gun Shop</u>	444 Wilson Street	Albury	Albury City	LGOV
<u>Hanel Street Conservation Area</u>	Hanel Street	East Albury	Albury City	LGOV
<u>Headmaster's Residence</u>	653 Kiewa Street	Albury	Albury City	LGOV
<u>Historic Shop Façade</u>	499 Hume Street	South Albury	Albury City	LGOV
<u>Holmwood Cross Conservation Area</u>	Holmwood Cross	Albury	Albury City	LGOV
<u>House</u>	464 Swift Street	Albury	Albury City	LGOV
<u>House</u>	456 Schubach Street	East Albury	Albury City	LGOV
<u>House</u>	322 Townsend Street	South Albury	Albury City	LGOV
<u>House</u>	332 Townsend Street	South Albury	Albury City	LGOV
<u>House</u>	371 Wilson Street	East Albury	Albury City	LGOV
<u>House</u>	375 Wilson Street	East Albury	Albury City	LGOV
<u>House</u>	288 Walsh Street	East Albury	Albury City	LGOV
<u>House</u>	487 Swift Street	Albury	Albury City	LGOV
<u>House</u>	421 Albert Street	Lavington	Albury City	LGOV
<u>House</u>	449 Douglas Road	Lavington	Albury City	LGOV
<u>House</u>	550 Lyne Street	Lavington	Albury City	LGOV
<u>House</u>	557 Prune Street	Lavington	Albury City	LGOV
<u>House</u>	363 Wilson Street	East Albury	Albury City	LGOV
<u>House</u>	453 Urana Road	Lavington	Albury City	LGOV
<u>House</u>	586 Urana Road	Lavington	Albury City	LGOV
<u>House</u>	540 Young Street	Albury	Albury City	LGOV
<u>House</u>	534 Urana Road	Lavington	Albury City	LGOV
<u>House</u>	364 Townsend Street	South Albury	Albury City	LGOV
<u>House</u>	457 Prune Street	Lavington	Albury City	LGOV
<u>House</u>	485 Swift Street	Albury	Albury City	LGOV
<u>House</u>	471 Smollett Street	Albury	Albury	LGOV

<u>Commonwealth Bank</u>	590 Dean Street	Albury	Albury City	LGOV
<u>Convent of Mercy</u>	441 Olive Street	Albury	Albury City	LGOV
<u>Corner Store</u>	370 Rau Street	East Albury	Albury City	LGOV
<u>Corner Store</u>	461 Smollett Street	Albury	Albury City	LGOV
<u>Corner Store and House</u>	659 David Street	Albury	Albury City	LGOV
<u>Corowa Official Residence 1</u>	2 Church Street	Corowa	Albury City	SGOV
<u>Corowa Official Residence 2</u>	4 Church Street	Corowa	Albury City	SGOV
<u>Corowa Police Station</u>	15 Queen Street	Corowa	Albury City	SGOV
<u>Court House</u>	564 Dean Street	Albury	Albury City	LGOV
<u>Culcairn Police Station and Official Residence</u>	33 Balfour Street	Culcairn	Albury City	SGOV
<u>David Street Conservation Area</u>	David Street	South Albury	Albury City	LGOV
<u>Dean Street Conservation Area</u>	Dean Street	Albury	Albury City	LGOV
<u>Elm Court</u>	435 Townsend Street	Albury	Albury City	LGOV
<u>Ettamogah Vineyard Ruins</u>	Ettamogah Road	Table Top	Albury City	LGOV
<u>Excavation Greers Cellar</u>	Thurgoona Street	Albury	Albury City	LGOV
<u>Farm Building Ruins</u>	Old Sydney Road	Thurgoona	Albury City	LGOV
<u>Fig Tree</u>	521 Smollett Street	Albury	Albury City	LGOV
<u>Fire Station</u>	565 Kiewa Street	Albury	Albury City	LGOV
<u>Forrest Hill Area</u>	Forrest Hill Avenue	Albury	Albury City	LGOV
<u>Forrest Hill Conservation Area</u>	Forrest Hill Avenue	Albury	Albury City	LGOV
<u>Funeral Parlour and Residence</u>	486 Swift Street	Albury	Albury City	LGOV
<u>Garrison Hotel</u>	303 Urana Road	Lavington	Albury City	LGOV
<u>Gas and Fuel Building</u>	419 Townsend Street	South Albury	Albury City	LGOV
<u>Gaslight</u>	Kiewa Street, corner of Poole Street	Albury	Albury City	LGOV
<u>Globe Corner</u>	586 Dean Street	Albury	Albury City	LGOV
<u>Grand Stand</u>	Wodonga Place (Albury Sports Ground)	Albury	Albury City	LGOV

			City	
<u>Bethanga Bridge</u>	Riverina Highway	Lake Hume Village	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Nathan Avenue	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Wyse Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Mitchell Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Kiewa Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Guinea Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	George Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Crisp Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Olive Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Macauley Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Jones Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Griffith Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Bonegilla Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	David Street	Albury	Albury City	LGOV
<u>Bonegilla Conservation Area</u>	Guinea Street	Albury	Albury City	LGOV
<u>Botanic Gardens</u>	Wodonga Place	Albury	Albury City	LGOV
<u>Botanic Gardens Conservation Area</u>	Wodonga Place	Albury	Albury City	LGOV
<u>Bottleshop</u>	438 Smollett Street	Albury	Albury City	LGOV
<u>Bunqambrawatha Conservation Area</u>	Stanley Street	Albury	Albury City	LGOV
<u>Bunge Flour Mill</u>	570 Young Street	Albury	Albury City	LGOV
<u>Burrows House</u>	556 Dean Street	Albury	Albury City	LGOV
<u>Car Club House</u>	292 Wodonga Place	Albury	Albury City	LGOV
<u>Cinema Centre</u>	456 Dean Street	Albury	Albury City	LGOV
<u>Circa 1885 Brick Colonial Georgian Building</u>	406 Wodonga Place	Albury	Albury City	LGOV
<u>Cml Building</u>	499 Dean Street	Albury	Albury City	LGOV
<u>Commercial Hotel Accommodation 'Waterstreet Hotel'</u>	430 Smollett Street	Albury	Albury City	LGOV

<u>Albion Hotel Accommodation</u>	593 Dean Street	Albury	Albury City	LGOV
<u>Albury (Lavington) Gatehouse</u>	Dallinger Street	Lavington	Albury City	SGOV
<u>Albury Ambulance Station and Residence</u>	Dean Street	Albury	Albury City	SGOV
<u>Albury Civic Fire Station</u>	565 Kiewa Street	Albury	Albury City	SGOV
<u>Albury Club</u>	519 Kiewa Street	Albury	Albury City	LGOV
<u>Albury Courthouse</u>	564 Dean Street	Albury	Albury City	SGOV
<u>Albury High School</u>	Kiewa Street	Albury	Albury City	LGOV
<u>Albury Motors</u>	484 Olive Street	Albury	Albury City	LGOV
<u>Albury Police Station Annex</u>	539-543 Olive Street	Albury	Albury City	SGOV
<u>Albury Public School</u>	481 David Street	Albury	Albury City	LGOV
<u>Albury Public School 'The Castle'</u>	465 David Street	Albury	Albury City	LGOV
<u>Albury Public School 'The Manor'</u>	468 Olive Street	Albury	Albury City	LGOV
<u>Albury Railway Precinct</u>	Railway Place (Off Young Street)	Albury	Albury City	SGOV
<u>Albury Railway Precinct</u>	Railway Place (Off Young Street)	Albury	Albury City	SGOV
<u>Albury Railway Station</u>	Young Street	Albury	Albury City	LGOV
<u>Albury Showgrounds</u>	Fallon Street	North Albury	Albury City	LGOV
<u>Albury Wharf Site</u>	Hovell Tree Park - Wodonga Place	Albury	Albury City	LGOV
<u>Albury, Murray River Underbridge</u>	648.465km, Main Southern Railway Line	Albury	Albury City	SGOV
<u>All Saints Anglican Church</u>	415 Bellevue Street	North Albury	Albury City	LGOV
<u>Amp Building</u>	557 Dean Street	Albury	Albury City	LGOV
<u>Anzac House</u>	611 Dean Street	Albury	Albury City	LGOV
<u>Arcade of Shops</u>	AMP Lane	Albury	Albury City	LGOV
<u>Australian Tax Office</u>	567 Smollett Street	Albury	Albury City	LGOV
<u>Bank, Former</u>	500 Dean Street	Albury	Albury City	LGOV
<u>Beehive Building</u>	637 Dean Street	Albury	Albury City	LGOV
<u>Belbridge Hague</u>	522 Kiewa Street	Albury	Albury City	LGOV
<u>Berrigan Police Station</u>	82 Jerilderie Street	Berrigan	Albury	SGOV



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Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search did not return any matching results.

Section 2. Items listed under the NSW Heritage Act.

Your search returned 12 records.


Item name	Address	Suburb	LGA	SHR
Albury Post Office	570 Dean Street	Albury	Albury City	01311
Albury rail bridge over Murray River	Main Southern railway, 648.465km	Albury	Albury City	01020
Albury Railway Station and yard group	Railway Place	Albury	Albury City	01073
Albury Technical College	502 Dean Street	Albury	Albury City	00137
Bethanga Bridge	Riverina Highway	Albury	Albury City	01750
Bonegilla House	587 Kiewa Street	Albury	Albury City	00617
Carriageway, The	506-508 Smollett Street	Albury	Albury City	00040
Commercial Hotel & Cottage	430-436 Smollett Street	Albury	Albury City	00538
Elm Court	435 Townsend Street	Albury	Albury City	00140
Model Store	582 David Street	Albury	Albury City	00359
New Albury Hotel	491 Kiewa Street	Albury	Albury City	00629
Reids Butcher shop & dwelling	462 Guinea Street	Albury	Albury City	00537

Section 3. Items listed by Local Government and State Agencies.

Your search returned 312 records.

Item name	Address	Suburb	LGA	Information source
Abikhairs Building	477 - 479 Dean Street	Albury	Albury City	LGOV
Adamshurst	603 David Street	Albury	Albury City	LGOV
Adamshurst Rehabilitation Hostel	603 David Street (Adamshurst)	Albury	Albury City	SGOV

allow work	Exemptions	<p>HERITAGE ACT 1977 Notice of Order Under Section 57 (2) of the Heritage Act 1977</p> <p>I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order:</p> <p>1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and</p> <p>2. grant standard exemptions from subsection 57(1) of the Heritage Act 1977, described in the Schedule attached.</p> <p>FRANK SARTOR Minister for Planning Sydney, 11 July 2008</p> <p>To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below.</p>	2008
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 **Standard exemptions** for works requiring Heritage Council approval

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - State Heritage Register		01750	26 May 06	68	3217

References, internet links & images

Type	Author	Year	Title	Internet Links
Written			New South Wales Roads and Traffic Authority Heritage Register	
Written	Cridlebaugh Bruce S.		Bridges and Tunnels of Allegheny County, Pennsylvania	View detail 
Written	East, Ronald	1979	Cecchi, Ettore (1853-1946), engineer	
Written	Hughes Trueman Reinhold	1998	Murray River Crossing Study	
Written	Philipp, June	1982	Poor Man's Diggings: Mining and Community at Bethanga, Victoria, 1875-1912	
Written	Philipp, June (ed.)	1993	The making of a mining community : Bethanga, Victoria, 1875-1885	
Written	River Murray Commission (Australia)	1928	Hume Reservoir, Australia	
Written	VicRoads Bridge Design Files	1993	Drawing No 478282, 25/06/1993	
Written	Waddell J.A.L	1891	The Designing of Ordinary Iron Highway Bridges	

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name: Heritage Office
Database number: 5056556
File number: H00/00301

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As a result of the construction of the weir, the water level in the Murray river backed up behind the dam to permanently inundate the floodplain, which was up to several kilometres wide in many places.

Although confirmation of the construction authority is yet to be found, there is later evidence in the form of lantern slides showing the construction of the bridge and clearly intended for public presentation, that the bridge was substantially the work of the SRWSC (SRWSC collection State Library of Victoria Pictures Collection). The involvement of the NSW Public Works Department is also implied by photographs of components fabricated by Charles Ruwolt and Sons held by Museum Victoria. It is therefore very likely that the New South Wales Public Works Department and Victorian State Rivers and Water supply commission were jointly responsible for the design and construction, as was the case with the Hume Dam itself.

Bethanga Bridge is roughly contemporary with and is similar in design to the Yarrawonga Bridge at Lake Mulwala, which was designed by NSW Department of Main Roads Engineer Percy Allen and constructed in 1924, also as a result of the creation of an artificial lake on the Murray River. The other prominent engineers involved in the Hume Project, Ettore Checchi, E M deBurgh, and J S Detheridge, were water supply engineers or had ceased to be involved when the bridge was built.

There was a pattern in NSW/Victoria relationships over the Murray River border for NSW to design Murray River bridges, and Victoria to build them. Other examples of the arrangement can be found in the Swan Hill bridge and many timber bridges. Bethanga bridge is similar to other large NSW bridges such as the Hawkesbury bridges, and uncharacteristic of Victorian bridge design practice.

The sequence of SRWSC lantern slides show the progressive construction of the Bethanga Bridge. Construction commenced in 1927 with clearance of the foundation sites and piling. By 1928 the piers were well under way and staging commenced from each bank. By 1929 all the piers were in place and waters had risen to the base of the piers. Erection of the trusses was underway. Falsework of underslung, divided Warren-type, metal trusses supported on three intermediate steel lattice towers, were used as staging for erecting the Pratt trusses. These were assembled in situ with the use of a travelling crane running across the falsework and hot riveting of preformed, punched and cut angle and flat section steel. As the permanent trusses were completed the staging was dismantled and moved on to the next span (SRWSC collection, State Library Picture Collection). Steel work for the bridge was fabricated at least in part, by Vickers Ruwolt of Burnley Melbourne. Photographs of components such as the truss members and bearings are in the collection of Museum Victoria. At least one of the main trusses was trial assembled at Vickers Ruwolt's Burnley works, probably one of the largest structures to be erected in this fashion.

The bridge was clearly seen as a landmark and complementary to the Hume Dam itself in terms of national pride and potential tourist value. The State Rivers documented the bridge's construction and produced a series of lantern slides showing progress. A number of hand coloured slides and images were produced of the finished bridge to show it at its most impressive. The Victorian Railways also produced its own series of photographs in the 1940s and 50s presenting the bridge as part of a dramatic landscape and engineering achievement, probably for promoting tourist visits (by train) to the region. The bridge has been included in several Postcard series of the natural and man-made features of Albury in the 1950s and 60s under titles such as "A Souvenir of Beautiful Albury" (State Library Picture Collection, Pictoria).

The 13.7 metres approach span on the New South Wales side was constructed in 1963 as part of the upgrading of the Hume Dam.

The town of Bellbridge at the southern end of the bridge, was created to replace facilities inundated by the reservoir. The bridge is currently managed by River Murray Water, although it is understood that the RTA, VicRoads and River Murray Water are negotiating on the future management responsibility for the bridge. A current 33 tonne load limit applies and recent tenders have been advertised for the cleaning and repainting of the bridge (Advertisement for Bethanga Bridge Rehabilitation VicRoads tenders 5858).

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	Building and maintaining public roads-
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	Engineering the public road system-
7. Governing-Governing	Government and Administration-Activities associated with the governance of local areas, regions, the State and the nation, and the administration of public programs - includes both principled and corrupt activities.	Developing roles for government - administering public roads and bridges-

Assessment of significance

SHR Criteria a) [Historical significance]	Bethanga Bridge is of historical significance to New South Wales for its associations with the construction of Hume Dam, a major national undertaking of the early twentieth century. It is also of historical significance for its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of New South Wales, Victoria and South Australia to regulate the flow of the Murray River. The bridge reflects the engineering and design approaches of the State Rivers and Water Supply Commission and New South Wales Public Works Department in the late 1920s and the influence of American engineering Practice in the use of the Pratt truss. The bridge is also a significant marker of the anticipated development that the new Hume Weir was expected to bring to the region, serving, as it did, only a few small farming communities and the copper and gold mining areas of Bethanga and Talamo, which were already in steep decline at the time the bridge was completed.
SHR Criteria c) [Aesthetic significance]	Bethanga Bridge is of technical significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology based on American engineering practice. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure. Bethanga Bridge is a representative example of Pratt Truss design displaying the main characteristics at a scale that demonstrates the effectiveness of the design over long spans and of its repetition to create a bridge of considerable overall length. Its construction methods are also of note in the use of staged construction from abutments along temporary underslung Warren trusses.
SHR Criteria d) [Social significance]	The bridge is of aesthetic significance for its dramatic rural setting over a wide expanse of water (when lake levels are high) and occasionally at great heights over broad river flats (when the lake is down). It is also of aesthetic significance for the vast scale and length and the rhythmic patterning of repeated geometric motifs of the trusses.
SHR Criteria f) [Rarity]	Bethanga Bridge is of local social significance as an important local tourism destination and as the main link between the Bethanga/Granya region and the regional centre of Albury-Wodonga.
Integrity/Intactness:	As a major bridge built by other than a state road or rail authority, Bethanga Bridge is rare and is the most substantial bridge erected by water authorities. It is the only built structure shared by NSW and Victoria.
Assessment criteria:	The original wooden road surface has been raised once and twice replaced, the railings replaced and the NSW approach modified. Nevertheless, Bethanga Bridge remains substantially the same structure erected in the 1920s.
	Items are assessed against the  State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Procedures /Exemptions

Section of act	Description	Title	Comments	Action date
57(2)	Exemption to	Standard	SCHEDULE OF STANDARD EXEMPTIONS	Sep 5

Physical condition and/or Archaeological potential:	<p>straight transverse cross-braces. The main truss spans have ten bays with nine vertical compression chords and eight diagonal tension chords.</p> <p>The road deck was initially timber but was replaced in 1961 with a concrete waffle slab deck. In 1961 the bridge deck and truss structure was also raised by 300mm in response to the upgrading of Hume Dam and works to increase the storage capacity of the dam. In 2005 the the waffle slab decking was replaced to raise the load capacity, new guard rails were installed and the NSW approach to the bridge was widened for safety reasons. These 2005 works were undertaken with the joint advice and approval of Heritage Victoria and the NSW Heritage Office.</p> <p>The Pratt truss was an American style bridge truss that began the tide of change from British to American bridge technology in the nineteenth century. The Bethanga example comes from a period when Pratt trusses were an established design alternative, favoured by railways but generally shunned in Victorian road bridge design. It is a type of truss in which vertical web members are in compression and diagonal web members in tension. Many possible configurations include pitched, flat, or camelback top chords. It may be recognised by diagonal members which appear to form a "V" shape toward the centre of the truss when viewed in profile. Variations include the Baltimore truss and Pennsylvania truss. Elaboration in the form of variable depth from sloping upper chords as in the Camel-back arrangement, reduced the amount of steel required, and also dead weight for a similar strength. The Pratt truss compares to Warren truss and Howe designs in the different compression and tension arrangements of diagonal and vertical members. It was named for Thomas W. and Caleb Pratt (Boston railway engineers), who were issued a patent for a truss bearing their name in April, 1844. (Waddell 1891; Hughes Trueman Reinhold 1998, RTA NSW . The overall length is given in VicRoads inventory as 733 metres although a deck length of 752.4 and total length of 750 metres in their inspection system appears more probable. The nine truss spans are each 82 metres with the NSW approach span being 12.5 m.; clear height is 25 m. and width 7.7 m. Concrete endposts frame the entry to the bridge. The construction date is cast in the one end post.</p> <p>Date condition updated:26 Jul 05</p>
Modifications and dates:	1961; 2005 (see above)
Current use:	Bridge
Former use:	Bridge

History

Historical notes:	<p>The Context</p> <p>The first crossing of the Murray River by white men occurred in November 1824 when Hamilton Hume and William Hovell led an expedition from Yass in search of an overland route to Westport Bay. Their crossing point was some distance up river from Albury and an obelisk near the river commemorates this. Hume and Hovell came upon the river on the 16th of November, 1824, naming it the Hume River, and inscribing a tree near the riverbank the next day before moving on to the south. In 1829, the explorer Captain Charles Sturt discovered the Hume River downstream at it's junction with the Murrumbidgee River. Not realising it was indeed the Hume, he named it the Murray River. Both names persisted for some time, Hume falling into disuse eventually in favour of Murray.</p> <p>The explorers route was shortly followed by white squatters and their livestock, mainly sheep and cattle. Subsequently many families took up parcels of grazing land on the rich river flatlands, among the first being William Wyse and Charles Ebdon. The drovers track that developed along the line of the advancing squatters, and subsequently by their excess stock returning for sale at Melbourne and Sydney markets, led naturally to the same point Hume and Hovell first sighted the river. Although an easier crossing point could be found 10 miles upstream (where the Hume Dam now stands) the original site by Hume and Hovell's inscribed tree became the popular crossing place for people and stock on their way to new settlements in the south.</p> <p>Crossing the river during the drier summer months could normally be achieved on foot. When the river was high after heavy rains or snow melting in the mountains crossing became difficult until a log punt was built in 1844. Stock, however, had to swim. The first bridge over the Murray was built in 1860 near the present crossing at Albury. People up and down stream had to find their own fords, or trek back to Albury.</p> <p>The arrival of the first railroad from Melbourne in 1873 boosted the district and captured the Southern Riverina markets for Melbourne. The rail line from Sydney reached Albury in 1881, but the first railway bridge over the Murray was not opened until 1883.</p> <p>The Bethanga-Talgarno gold and copper field became one of the top copper producers in Victoria although both minerals proved difficult to extract from the intractable ores. The alluvial field was first reported in 1852 and was visited by mining officials in 1854, but the field was not really opened up until the discovery of the New Year's Gift reef on 1 January 1876. This led to a number of highly capitalised mining ventures. Harris and Hollow, a mining partnership from Rutherglen, built a smelting works on the flats of lower Bethanga with a view to smelting copper for the public and opened the first furnace of their Great Eastern Copper Smelting works in January 1878. J.A. Wallace MLC took an interest in the Bethanga Mining Scene and purchased mining leases and major mines at Bethanga, then built his own smelting works to treat the ore, completing three furnaces by June 1878. The Bethanga Goldfields Ltd company made a takeover in 1895 and both metals were mined and treated. Mining however, continued only sporadically into the 20th century, with further leads opened at Mt Corryong and Mt. Talgarno. There was a brief revival in the 1930s and some mines struggled on to at least 1945, but in the latter half of the 20th century mining ceased and the town gradually diminished (Bannear).</p> <p>The concept of damming Australian rivers for irrigation and flood mitigation was first investigated back in the days of the steamers. The Hume Dam was proposed under the River Murray Waters Agreement, which was signed on 9 September 1914, by the Prime Minister, Joseph Cook, and the Premiers of New South Wales, Victoria and South Australia. The first sod was turned by His Excellency, the Right Honourable Sir Ronald Crawford Munro-Ferguson, Governor General of Australia, on 28 November 1919.</p> <p>H. V. Beresford was construction engineer on the Hume Weir from about 1925, but died while still engaged on the project in 1927. At the height of construction, more than 1100 workers were employed at the site. These workers were housed in two fully serviced towns adjacent to the site, one on either side of the river (River Murray Commission 1928).</p> <p>Construction of the weir took seventeen years with the reservoir being completed and officially opened by the Right Honourable Lord Gowrie, Governor of NSW, on 21 November 1936 and a plaque on the northern pier of the dam commemorates the occasion. The Bethanga Bridge was evidently constructed in the middle of this period, probably when water backing-up behind the rising dam wall, began to reach the low level bridge at Bethanga.</p> <p>Three engineers of note were involved in formulating the agreement, E M de Burgh in New South Wales, J S Detheridge in Victoria, and G Stewart in South Australia. The initial designs for Hume Dam were prepared by E M deBurgh, Chief Engineer of the Water Supply Branch of the Public Works Department NSW and J S Detheridge, Commissioner, State Rivers and Water Supply of Victoria. NSW was responsible for construction of the concrete dam and the State Rivers and Water Supply Commission of Victoria was responsible for the southern earth embankments.</p> <p>Another Victorian engineer, Ettore Checchi (1853-1946) was closely connected with the Hume Dam project in the 1920s and 30s. However, as his skills were with hydrographic work, it is unclear what contribution he had to the associated structures such as Bethanga Bridge. The State Rivers and Water supply Commission undertook at least some of the Hume Weir works in conjunction with the NSW Public Works Department. The River Murray Commission evidently had an overriding supervision of the works, but engineering and design details were left to the established public works engineers in the two states.</p> <p>The heavy cost of Victoria's irrigation infrastructure lead to a parliamentary inquiry into the Commission's finances in 1928, and recommendations against further irrigation investment in an era of low export returns from primary produce. However, the Hume scheme appears to have been immune to any cuts due to the State - Federal agreement and advanced stage of the project. The NSW Department of Public Works carried out modifications between 1950 and 1961 to enlarge the dam to about twice its original size to the present capacity of 3038 gigalitres to accommodate diverted water from the Snowy Mountains Scheme.</p>
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The Place



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Bethanga Bridge

Item details

Name of item:	Bethanga Bridge
Type of item:	Built
Group/Collection:	Transport - Land
Category:	Road Bridge
Location:	Lat: -36.0879820891 Long: 147.0557542060
Primary address:	Riverina Highway, Albury, NSW 2640
Local govt. area:	Albury City
Local Aboriginal Land Council:	Albury And District

Property description

Lot/Volume Code	Lot/Volume Number	Section Number	Plan/Folio Code	Plan/Folio Number
PART LOT	7009		DP	103893

The item known as the Bethanga Bridge over the Hume Dam, including all of the bridge and its support structure, its abutments, the roads and embankments and all the land 20 metres to each side of the bridge, as marked on Plan 2094.

Boundary:

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Riverina Highway	Albury	Albury City			Primary Address

Statement of significance:

Bethanga Bridge was built between 1927 and 1930 as a joint venture between New South Wales and Victoria as part of the Hume Dam project as a key element of the River Murray Waters Agreement put in place in 1915 by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River as a provision against drought and to ensure that the three states received their agreed share of water.

The use of Pratt trusses is unusual in Victoria, not being readily taken up as a viable bridge design. However they are more common in New South Wales. The use of the Pratt truss in this instance reflects the mode of construction employed during the construction of the Hume Dam whereby the New South Wales Department of Public Works and the Victorian State Rivers and Water Supply Commission were jointly responsible for the design and construction of the bridge. The bridge was designed in New South Wales by Department of Main Roads engineer Percy Allen and the trusses were built by Vickers Ruwolt in Melbourne.

The Murray River boundary between New South Wales and Victoria is the top of the southern bank of the river. As such all structures of the river are considered to be in New South Wales. Because of its unique location, over the waters of a dam with the border running down the centre of the body of water, the Bethanga bridge is the only built structure shared by both New South Wales and Victoria.

Bethanga Bridge is of historical and scientific (technical) significance to New South Wales

Bethanga Bridge is of historical significance to New South Wales for its associations with the construction of Hume Dam. It is also of historical significance for its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of New South Wales, Victoria and South Australia to regulate the flow of the Murray River.

Bethanga Bridge is of scientific (technical) significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology, its construction. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure.

Date significance updated: 25 Jul 05

Note: There are incomplete details for a number of items listed in NSW. The Heritage Branch intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Construction years: 1927-1930

Physical description: The Bethanga Bridge is a road bridge over a flooded section of a Murray River valley that now forms part of the Hume Dam. The bridge consists of nine spans of 82 metres, each span being supported between double reinforced concrete pylons by a riveted steel camel back Pratt truss plus a 14 metre approach span on the New South Wales side. The overall span is 752 metres. The road deck was initially timber but was replaced in 1961 with the current concrete waffle slab deck. The road deck is 7.7 metres wide. In 1961 the bridge deck and truss structure was also raised by 300mm in response to the upgrading of Hume Dam and works to increase the storage capacity of the dam. In 2005 the the waffle slab decking was replaced to raise their load capacity, new guard rails were installed and the NSW approach to the bridge was widened for safety reasons. These 2005 works were undertaken with the joint advice and approval of Heritage Victoria and the NSW Heritage Office.

Bethanga Bridge comprises riveted steel Pratt through trusses on multiple reinforced concrete piers and reinforced concrete 'waffle slab' deck on steel beams. There are nine identical principle spans of arched upper cord giving a truss variable depth. This form is also known as "Hog-backed" Camel-back" and "Parker" truss in the USA. There are overhead diagonally braced frames and under deck diagonal "X" bracing between riveted plate cross girder beams. The short approach span on the NSW side has RSJ beams with



***Non-Aboriginal Heritage Study
STATEMENT OF HERITAGE IMPACT
Bethanga Bridge and NSW approach
Riverina Highway (HW 20) – Stage 2 Safety Improvement Works
FINAL***

**A report prepared for EnviroKey and
Roads and Maritime Services**

May 2016

Assessment No: A056

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1. Heritage Register search and inventory sheets

EXECUTIVE SUMMARY

INTRODUCTION

NSW Roads and Maritime Services (RMS) are proposing to carry out safety improvement works on a 3.3 kilometre section of the Riverina Highway (HW20) to improve road user safety on the existing alignment. The proposed works would be undertaken from the west end of the Bethanga Bridge to Lake Hume village within the Albury Local Government Area (LGA).

The Bethanga Bridge is listed on the NSW State Heritage Register (SHR Item 01750) under the *NSW Heritage Act 1977*. It is also listed in Schedule 5 of the Albury Local Environment Plan and on the RMS s170 register.

The proposed works may involve potential impacts on areas close to and within the heritage curtilage of the bridge, including the abutments and approaches. In response to the SHR listing, RMS has engaged EnviroKey and On Site CHM to prepare a Statement of Heritage Impact (SOHI) for the works to the Bethanga Bridge and its NSW approach. The results of this study would inform the Review of Environmental Factors (REF) for the Riverina Highway Stage 2 Safety Improvement Works project to be prepared by RMS.

This assessment does not include a non-Aboriginal heritage assessment for the remaining sections of works beyond 200 metres southwest of the Bethanga Bridge and SHR Boundary.

SCOPE OF WORKS

The proposal partially occurs within the heritage curtilage of the Bethanga Bridge. Heritage listing information was reviewed as part of this report in order to understand the historical significance of this item and the potential impacts of the proposal on its identified values. The scope of works developed to address these requirements includes:

- **Historical review** of the Bethanga Bridge including a general and item specific history as applicable.
- **Review of heritage listings** and associated information to understand the historic fabric, context, significance and heritage values.
- **Site Inspection** to understand the potential impact of the proposed works on the item's significance and heritage values.
- **Identify risks for impact on the heritage item** from the proposal based on construction plans, field investigation and through examination of proposed construction methodology.

- A **Statement of Heritage Impact** will be prepared through reference to existing heritage listing information, heritage site location and the nature of proposed project works.
- For heritage items where negative impact will be unavoidable and/or acceptable, the statement of heritage impact will **recommend mitigation measures** to offset the loss of heritage values for these items.

HERITAGE LISTINGS AND SIGNIFICANCE

The Bethanga Bridge is of state significance to both NSW and Victoria and listed on both state heritage registers. The Bethanga Bridge occupies a position across Lake Hume, a man-made reservoir, and crosses the flooded Murray River Valley. The state border between NSW/VIC along the Murray River is along the south bank. Therefore, the state border is along the previous south bank of the river which is now below the bridge. In contrast, all other bridges across the Murray River are in NSW because they generally cease at the south bank of the river.

Both state heritage listings define the whole bridge as significant and do not demarcate its boundaries in relation to the state border. This is despite the fact that the NSW Heritage Act has no statutory powers in Victoria and vice versa. Consequently, as the proposal is confined to a part of the bridge located within NSW only the statutory requirements of the NSW listings are contained in this report. The details of the Victorian listings are also provided in this section to recognise the heritage significance of the item.

The following statutory and non-statutory heritage databases were searched during this project:

- The NSW State Heritage Register (SHR);
- The NSW State Heritage Inventory (SHI);
- The Albury City Council Local Environment Plan 2010 (LEP);
- The RMS s170 Register (Heritage and Conservation Register);
- The VIC Heritage Register (VHR)
- The Towong Shire Municipality Local Heritage Overlay (THO)
- The Australian Heritage Database (Commonwealth Heritage List); and
- The National Trust

Executive Summary of heritage listings and details revealed by inventory searches

Name	Heritage Listing	Heritage Significance	Statutory Requirements
Bethanga Bridge	NSW SHR (#01750)	State	s60 NSW Heritage Act 1977
Bethanga Bridge	LEP (#I359)	State	Albury LEP (NSW)
Bethanga Bridge over the Murray River	RMS (#4302002)	State	s170 NSW Heritage Act
Bethanga Bridge	Towong Heritage Overlay (#HO10)	Local	s43 Towong Planning Scheme (VIC)
Bethanga Bridge	Vic VHR (#H0989)	State	s64 Victorian Heritage Act 1995
Bethanga Bridge over Hume Weir (Murray Arm)	Nat Trust File Number B7225; Bridges Database Reg. No.4293	File Only	None

STATEMENT OF SIGNIFICANCE

The Statement of Significance and NSW SHR listing for the Bethanga Bridge evaluates the item as having representative and rarity values and to be of historical, technical, aesthetic and social significance. It is of historical significance for its associations with the construction of Lake Hume, as well as its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of NSW, Victoria and South Australia to regulate the flow of the Murray River. It is of technical significance for the unusual and rare use in Victoria of Pratt trusses, a predominantly NSW technology, in its construction. The use of this system in this instance, its design by NSW and construction by Victoria, also represents the cooperation of these states in the development and ongoing use of major infrastructure.

SUMMARY STATEMENT OF HERITAGE IMPACT

The proposed works will have a negligible impact on the heritage significance of the Bethanga Bridge Heritage Item. This is primarily due to the fact that the limit of the proposed works is confined to an area of the item that was previously and substantially modified in the past, most recently in 2005. The current proposed works aimed at safety have a similar scope as the previous works. The potential for increased safe usage of the bridge and approaches by the public and the enhanced appreciation or promotion of the heritage item is also considered a reasonable offset for any minor impacts. The primary

experience of this heritage item is from motor vehicle while travelling on the Riverina Highway and across the bridge (there is no pedestrian footpath). Consequently, it is essential that road safety be of foremost importance in future management of this item, both in heritage and general terms.

STATUTORY CONSIDERATIONS AND RECOMMENDATIONS

The following recommendations are made with a focus upon the elimination and/or reduction of negative impact upon any heritage values. The objective of these management recommendations is to provide a reasonable, balanced and precautionary approach that considers current heritage values in consideration of future needs to access heritage knowledge. Recommendations are designed to provide a reasonable, balanced and precautionary approach for due diligence heritage management based upon the results of the assessment of heritage impact from the proposed works. The application of statutory considerations to the study area, with reference to the definitions contained in Section 4 of the *NSW Heritage Act* and with reference to SEPP (Infrastructure) 2007 and the RTA Heritage Guidelines 2004 are discussed in the recommendations below.

Recommendation 1 – Requirement for a Standard Exemption No. 7

While the conclusions of the Statement of Heritage Impact indicate that the proposed works will have a negligible impact on the heritage significance of the Bethanga Bridge they will still be undertaken on a part of the heritage item. Therefore, based on legislative requirements, application to the NSW Heritage Council for a standard exemption permit under s57(2) of the *NSW Heritage Act* is considered necessary for this project.

The *NSW Heritage Act* allows the Minister for Planning, on the recommendation of the Heritage Council, to grant exemptions for certain activities which would otherwise require approval under the Act. There are two types of exemptions which can apply to a heritage item listed on the State Heritage Register:

- 1) Standard exemptions for all items on the State Heritage Register. Typical activities that are exempted include building maintenance, minor repairs, alterations to certain interiors or areas and change of use.*

- 2) Site specific exemptions for a particular heritage item can be approved by the Minister on the recommendation of the Heritage Council.*

In this case the proposed works fall under Standard Exemption 7: Minor Activities with Little or No Adverse Impact on Heritage Significance as described in the NSW Heritage Council

publication *Standard Exemptions for Works requiring Heritage Council Approval*. This standard exemption states that:

1) Anything which in the opinion of the Director-General is of a minor nature and will have little or no adverse impact on the heritage significance of the item does not require approval under subsection 57(1) of the Act.

2) A person proposing to do anything of the kind described in paragraph 1 must write to the Director-General and describe the proposed activity. If the Director-General is satisfied that the proposed activity meets the criteria set out in paragraph 1, the Director-General shall notify the applicant.

In writing to the Director-General to apply for this standard exemption the proponent would need to submit a clear and concise statement of the item's heritage significance and an assessment of whether a proposal impacts on that significance. This statement and assessment would allow the Director-General to decide whether a proposal has an adverse effect on the heritage significance of the item (NSWHC, 2009:19).

Recommendation 2 – Contact Heritage Victoria

While the proposal is within NSW the Bethanga Bridge is also partially within Victoria and heritage listed at both the local and state level. While these heritage listings have no statutory powers in NSW they also demonstrate the importance of this item to the people of Victoria. It is suggested that the proponent contact Heritage Victoria to inform them of the proposed works.

The VHR listing already contains the following permit exemptions so that maintenance works can be easily carried out on the item. This includes a section on road works:

The following works to the road portion of the place is permit exempt: a) the resurfacing of the road and maintenance to the road surface; b) lane marking; c) erection of speed and traffic signs.

Consequently, the proposed works with the exception of the installation of new road barriers are likely to fall under this permit exemption.

Recommendation 3 – Ground disturbance and the provisions of the NSW Heritage Act 1977

While there is no reasonable expectation for unknown and/or significant archaeological resources to be exposed as a result of this project, the attention of the Principal and all

subcontractors and employees is directed to the NSW Heritage Act 1977 and the provisions of the Act in relation to the exposure of relics. The Act requires that if:

iii) a relic is suspected, or there are reasonable grounds to suspect a relic in ground, that is likely to be disturbed damaged or destroyed by excavation; and/or

iv) any relic is discovered in the course of excavation that will be disturbed, damaged or destroyed by further excavation;

Those responsible for the discovery must notify nominated management personnel who will in turn notify the Heritage Council of New South Wales or its delegate, the Office of Environment and Heritage, NSW Heritage Branch, and suspend work that might have the effect of disturbing, damaging or destroying such relic until the requirements of Heritage Council have been satisfied (s139, 146).

Recommendation 4 – Installation of Interpretive Signage

Unfortunately, there are no interpretive signs on either the NSW or Victorian approaches to the Bethanga Bridge that would indicate to the public that this item is heritage listed and significant at a state level in both states. Nor is there signage in the picnic spots and parks on the shorelines on either side of the Lake. While there were plans by the EHA to install an interpretive sign on the NSW approach in the west-bound layby this plan appears has not yet been implemented.

The proposed installation of new road barriers will block off the laybys on both sides of the Riverina Highway for the NSW bridge approach. This will also prevent the passing public from stopping to appreciate the bridge and future usage of this area for interpretive signage.

In addition to the proposed works, an ideal outcome would be for RMS to modify the west-bound layby to facilitate and accommodate safe parking space for the public to stop and appreciate the heritage values of the bridge. Installation of interpretive signage in this area would also assist this goal.

Alternatively interpretative signage could be installed in the picnic spot on the NSW side to the south of the bridge where a good view of the item is also available. There is clearly interest in the bridge among the travelling public and this project presents an opportunity for RMS to provide for safe viewing and appreciation of this heritage item and its values.

It is recommended that RMS consider and explore these options as part of the proposed works.

1.0 INTRODUCTION

NSW Roads and Maritime Services (RMS) are proposing to carry out safety improvement works on a 3.3 kilometre section of the Riverina Highway (HW20) to improve road user safety on the existing alignment (**Figures 1 and 2**). The proposed works would be undertaken from the west end of the Bethanga Bridge to Lake Hume village within the Albury Local Government Area (LGA).

The Bethanga Bridge is listed on the NSW State Heritage Register (SHR Item 01750) under the *NSW Heritage Act 1977*. It is also listed in Schedule 5 of the Albury Local Environment Plan and on the RMS s170 register.

The proposed works may involve potential impacts on areas close to and within the heritage curtilage of the bridge, including the abutments and approaches. In response to the SHR listing, RMS has engaged EnviroKey and On Site CHM to prepare a Statement of Heritage Impact (SOHI) for the works to the Bethanga Bridge and its NSW approach. The results of this study would inform the Review of Environmental Factors (REF) for the Riverina Highway Stage 2 Safety Improvement Works project to be prepared by RMS.

This assessment does not include a non-Aboriginal heritage assessment for the remaining sections of works beyond 200 metres southwest of the Bethanga Bridge and SHR Boundary.



Figure 1: Location of the study area at the west end of the Bethanga Bridge within NSW

1.1 SCOPE AND METHODOLOGY

The proposal partially occurs within the heritage curtilage of the Bethanga Bridge. Heritage listing information was reviewed as part of this report to understand the historical significance of this item and the potential impacts of the proposal on its identified values. The scope of works developed to address these requirements includes:

- **Historical review** of the Bethanga Bridge including a general and item specific history as applicable.
- **Review of heritage listings** and associated information to understand the historic fabric, context, significance and heritage values.
- **Site Inspection** to understand the potential impact of the proposed works on the item's significance and heritage values.
- **Identify risks for impact on the heritage item** from the proposal based on construction plans, field investigation and through examination of proposed construction methodology.
- A **Statement of Heritage Impact** will be prepared through reference to existing heritage listing information, heritage site location and the nature of proposed project works.
- For heritage items where negative impact will be unavoidable and/or acceptable, the statement of heritage impact will **recommend mitigation measures** to offset the loss of heritage values for these items.

1.2 PERSONNEL AND AUTHORSHIP

The project was managed by Gerard Niemoeller, Principal Heritage Consultant. Damian Tybussek, Historic Archaeologist, conducted the field investigation, research, and prepared reporting for this Statement of Heritage Impact. This report has been prepared collaboratively by Gerard Niemoeller and Damian Tybussek.

1.3 REPORT STRUCTURE

Section 2 presents an overview of the proposal.

Section 3 provides a review of the relevant legislation and heritage listings of the Bethanga Bridge.

Section 4 provides a brief history of the Bethanga Bridge and the historical context of its construction and use.

Section 5 provides the results of the site inspection of the Bethanga Bridge and the survey of the study area.

Section 6 provides a Statement of Heritage Impact for the proposed works on the Bethanga Bridge heritage item.

Section 7 provides the heritage management options and the final recommendations of this report.

Section 8 provides a list of references used in the preparation of this report.

2.0 PROPOSAL

According to the brief, RMS propose to undertake safety improvement works on a 3.3 km section of the Riverina Highway between the Bethanga Bridge and 3.3kms west of the within the Albury LGA. The proposed works aim to minimise routine maintenance and improve safety deficiencies along this section of the highway by providing 1.5 metre sealed shoulders, a 5.0 metre clear zone and safety barriers where required. The proposed works would improve the road surface along the Riverina Highway through formation widening, pavement reconstruction, culvert installation and minor curve realignment. Line marking and installation of road furniture would also be undertaken, as well as landscaping of adjacent areas. Temporary construction and ancillary facilities, including construction compounds, stockpile sites and haulage roads would be established and operated for the construction phase.

In detail the objectives of the proposed works by RMS are to:

- Rehabilitate the existing narrow width sections to a safer standard and provide a new pavement with a 40 year design life.
- To provide minimal disruption to the travelling public, a safe working environment for road workers and road users and achieve this in the most efficient way practicable.

The general construction activities for the proposed works would include:

- Installation of environmental controls including erosion and sediment controls
- Site establishment including establishment of compound and stockpile sites
- Removal of ground cover and trimming/removal of vegetation
- Cleaning and shaping of existing table drains
- Culvert extension and installation works
- Pavement overlay
- Widening of the existing road formation to accommodate a sealed pavement width of 10m (providing a 3.5m travel lane with a 1.5m sealed shoulder), widening would also include provision of a 0.5m verge, which in total provides a 10.5 – 11m formation width
- Site clean-up and rehabilitation of disturbed areas
- Potential reinstatement of private accesses
- Signage upgrades and improvements to pavement superelevation with a typical 250mm nominal depth pavement overlay
- Acquisition of land adjacent to highway
- Potential minor utility adjustments
- Potential blasting.

Construction equipment likely to be used in the proposed works includes excavators, dump trucks, bulldozers, scrapers, rollers, cranes, delivery trucks, graders, light vehicles, water carts, and bitumen trucks.



Figure 2: Scope of works for the proposal including preferred site compound and stockpile sites (Diagram from RMS brief).

2.1 POTENTIAL IMPACTS OF THE PROPOSAL WITHIN THE HERITAGE CURTILAGE OF THE BETHANGA BRIDGE

Based on the scope of the proposed works and concept plans in the RMS brief, it is assumed that only minimal work will be carried out on the NSW approach to the Bethanga Bridge (**Figures 2 and 3**). According to the concept plans (**Figure 3**) there appears to be no plans to widen the road on the approach, presumably because the road surface on the bridge itself is quite narrow (7.7m wide). There is also little room on the road sides on the immediate approach, but back past the final curve towards the bridge there is room in the layby areas to widen the road (**Plate 4**).

The concept plan indicates that the only proposed works in the bridge approach area are the replacement of the existing road pavement, the installation of new barriers, the removal of an existing tree, and the clearing of a 5.0m zone along the road side. Consequently, the main impacts of the proposal near the Bethanga Bridge heritage curtilage would be the removal of vegetation along the road verges and the installation of barriers along a new alignment. In contrast to the current barriers the proposal will install them along the south side of the Riverina Highway from the bridge along some distance of the highway (beyond the

boundaries of the concept plans). The barrier along the north side will also be extended further around the curve than the current barrier. This will have the effect of blocking off the two current layby areas to either side of the road approach.

The layby area adjacent to the west-bound lane will also serve as a temporary stockpile site for the proposal. This area is outside the boundaries of the NSW SHR listing for the bridge.

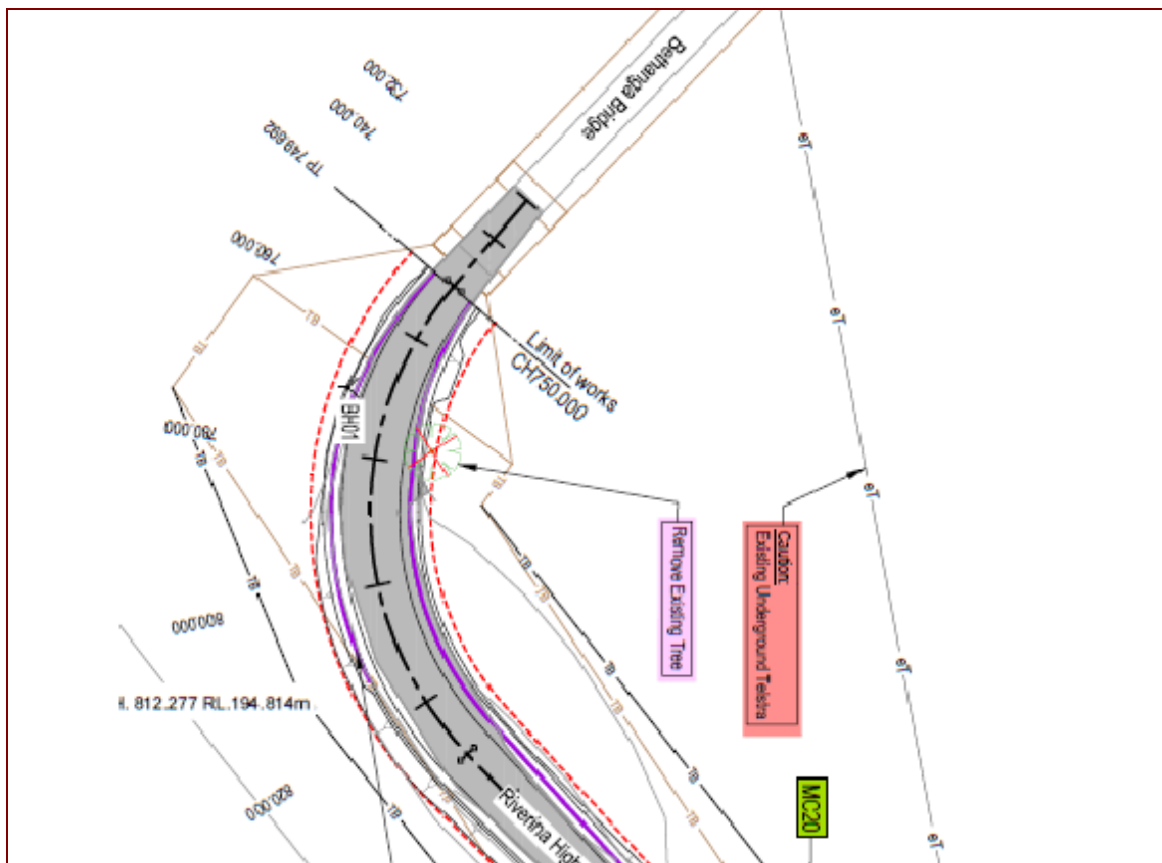


Figure 3: Detail of RMS concept plans for the proposal; note, the purple line indicates the installation of new barriers and the red dotted line the extent of the clear zone (from RMS brief).

3.0 LEGISLATIVE REQUIREMENTS

3.1 STATUTORY CONTROLS

RMS road upgrade works would be carried out as development without consent under clause 94 of the SEPP (Infrastructure) 2007, which provides that road works or construction of road infrastructure is development that is permissible without consent. However, the notes to Part 1 of the SEPP states that the policy does not affect the requirement under the NSW Heritage Act 1977 to obtain approval or a permit for any development specified in Part 3 of the SEPP.

Therefore, the requirements for heritage listed works/items also still apply and the statutory protections of the Heritage Act (s57) will be triggered if items are to be impacted. Similarly, the requirements of the NSW Heritage Act 1977 still apply to archaeological relics and the relics provisions of the Heritage Act may be triggered if relics are to be impacted or are exposed during development works.

3.1.1 Relic's provisions – NSW Heritage Act 1977

Archaeological relics fall within the definition of *environmental heritage* which is protected under the *NSW Heritage Act 1977*. The act provides that environmental heritage may be places, buildings, works, relics, moveable objects, and precincts of State or local heritage significance. The Heritage Act further provides measures for the protection and management of the different types of environmental heritage, and this is dependent upon the type of item under investigation.

The entire Heritage Act serves to protect heritage, but historical archaeological remains are additionally protected from being moved or excavated through the operation of the *relic's* provisions. These provisions protect unidentified relics which may form part of the environmental heritage in NSW, but which may not have been listed on statutory registers or databases.

Section 4(1) of the *NSW Heritage Act 1977* defines a relic as:

Any deposit, artefact, object or material evidence that:

- a) relates to the settlement of the area that comprises NSW, not being Aboriginal settlement; and
- b) is of State or local heritage significance.

According to the Act no disturbance or excavation may proceed that may expose or discover relics except with an Excavation Permit and that an excavation permit is required, if a relic is:

- listed on the State Heritage Register, pursuant to s60 and s63 of the Act; and

- not listed on the State Heritage Register, pursuant to s140 and s141 of the Act.

In circumstances where there is little likelihood that relics exist or that reasonably anticipated relics are unlikely to have heritage value, and/or that disturbance will result in a minor impact and/or where excavation involves removal of fill only, the Act makes provision for the granting of an exception to an excavation permit under s139 (4).

3.1.2 Distinction between *work* and *relic*

The distinction between a *work* and a *relic* should be considered in the process of heritage management and in the formulation of management recommendations. A *work* is not defined by the Heritage Act, but dictionary definitions are adopted such that a *work* is taken to mean '*an engineering structure, such as a building, bridge, dock, etc.*'. In this case, the Bethanga Bridge would be defined as a work under the definitions of the NSW Heritage Act.

Where a *work* will be impacted by proposed project works there is no requirement for statutory permit application under the NSW Heritage Act 1977 except where an item is listed on the State Heritage Register where the statutory powers of Section 57(1) offer it protection.

However, the potential for the relics provisions of the Heritage Act to be triggered by associated project works should be carefully considered. Where there is an assessed potential for the exposure of associated relics (those not defined as *works*) appropriate mitigation management measures should be put into place.

3.2 HERITAGE SIGNIFICANCE ASSESSMENT CRITERIA

To be considered to be of heritage significance to NSW an item of environmental heritage needs to meet one or more of the Heritage Council's criterion for listing. This section explains this heritage significance assessment criterion and how it is used to determine the levels and type of impact in a SOHI assessment.

3.2.1 Introduction

The assessment of the heritage values of an item or site depend upon the assessment of its significance together with the potential it may possess to expand the existing level of knowledge. An appreciation of these factors assists in the estimation of the impact that any disturbance, damage or destruction may have on such heritage values.

Fundamental to any consideration of the heritage values of a site is an appreciation of the impact of the NSW Heritage Act, 1977 (the Act) which defines heritage items to be:

Those buildings, works, relics or places of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance for the state of New South Wales.

Heritage items can be broadly interpreted as features, items, landforms and the like that possess characteristics that are presently of value and likely to be valued by future generations, thus making it worthy of special effort to conserve. These valued characteristics can originate from past associations and/or present circumstances, and do not necessarily have to be old.

3.2.2 Assessment of Heritage Significance

An assessment of significance is undertaken to explain why a particular site or item is important, and to enable appropriate best practice heritage management to be determined. Considerations relevant to a heritage significance assessment include whether a site, or the fabric contained within a site, contributes knowledge or has the potential to do so.

An assessment of significance is influenced by the environmental and historical context of the site at the time of the assessment. In this light, significance can be seen as a variable quality. It follows that the evaluation of heritage significance is not a static value, but rather is evolutionary as a function of changing community perspectives and cultural values.

3.2.3 Assessment Criteria

The NSW heritage assessment criterion encompasses the four values in the Australia ICOMOS¹ Burra Charter and these four broad values are used to assess the heritage significance of an item. It is important for items to be assessed against these values to ensure consistency across the State. While all four values should be referred to during an assessment, in most cases items will be significant under only one or two values. The four values are:

- historic significance;
- aesthetic significance;
- scientific significance; and
- social significance.

In order to apply a standardised approach to the assessment of these four values relative to items and individual elements within or contributing to items, the NSW Heritage Office (2001:9) has defined a series of seven criteria that will be used by the Heritage Council of NSW as an assessment format within NSW. To be assessed as having heritage significance, an item must meet at least one of the criteria detailed below.

Historic significance is identified by:

¹ ICOMOS – International Council on Monuments and Sites

Criterion (a) the importance of an item in the course or pattern of the cultural or natural history of NSW or a local area.

Criterion (b) the existence of a strong or special association between an item and the life or works of a person or group of persons important in NSW or a local area.

Aesthetic significance is identified by:

Criterion (c) the importance of an item in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW or a local area.

Social significance is identified by:

Criterion (d) the existence of a strong or special association between an item and the social, cultural or spiritual essence of a particular community or cultural group within NSW or a local area.

Scientific significance is identified by:

Criterion (e) the potential of an item to provide information that will contribute to an understanding of the cultural or natural history of NSW or a local area.

3.2.4 Degree of significance

In addition to the above criteria, in order to describe the degree of significance, an item may be assessed as being either 'Rare' or 'Representative' within its community/cultural/geographical level as distinguished by criterion (f) for rarity or (g) for representativeness.

Thus, degree of significance is identified by either:

Rarity

Criterion (f) the quality of an item to possess uncommon, rare or endangered aspects of the cultural or natural history of NSW or a local area; or

Representativeness

Criterion (g) the demonstration by an item of the principal characteristics of a class of cultural or natural place or cultural or natural environment within NSW or a local area.

3.2.5 Level of Significance

Another aspect of assessment of significance is the level of significance of an item. This level is assessable in two classifications pursuant to NSW Heritage Office (2001) depending upon the breadth of its identifiable cultural, community, historical or geographical context.

Local level identifies the item as being significant within an identifiable local and/or regional cultural and/or community group and/or historical/geographical heritage context;

State level identifies the item as being significant within an identifiable State-wide cultural and/or community group and/or historical/geographical heritage context;

but on a broader front, recognition of an item at the:

National level identifies the item as being significant within an identifiable national cultural and/or community group and/or historical/geographical heritage context;

International level identifies the item as having implications of significance for an identifiable cultural and/or community group both nationally and abroad and/or a world-wide historical/geographical heritage context.

3.2.6 Condition and Integrity

An assessment of condition and integrity of resources contributes to the overall assessment of significance. *Condition* considers the physical state of the fabric of the resource and its potential for survival. *Integrity* observes the degree to which the residual material evidence is an appropriate representation of the resource in its original form. *Potential Impact* assesses the nature and extent to which the resource will be modified as the result of the projected development.

3.3 REVIEW OF INVENTORY SEARCHES

Heritage registers and inventories are lists of identified items of heritage significance. These registers are searched for any listed heritage items that occur within, or in close proximity to, the study area.

The Bethanga Bridge is of state significance to both NSW and Victoria and listed on both state heritage registers. The Bethanga Bridge occupies a position across Lake Hume, a man-made reservoir, and crosses the flooded Murray River Valley. The state border between NSW/VIC along the Murray River is along the south bank. Therefore, the state border is along the previous south bank of the river which is now below the bridge. In contrast, all other bridges across the Murray River are in NSW because they generally cease at the south bank of the river.

Both state heritage listings define the whole bridge as significant and do not demarcate its boundaries in relation to the state border. This is despite the fact that the NSW Heritage Act has no statutory powers in Victoria and vice versa. Consequently, as the proposal is confined to a part of the bridge located within NSW only the statutory requirements of the NSW listings are contained in this report. The details of the Victorian listings are also provided in this section to recognise the heritage significance of the item.

The following statutory and non-statutory heritage databases were searched during this project:

- The NSW State Heritage Register (SHR);
- The NSW State Heritage Inventory (SHI);
- The Albury City Council Local Environment Plan 2010 (LEP);
- The RMS s170 Register (Heritage and Conservation Register);
- The VIC Heritage Register (VHR)
- The Towong Shire Municipality Local Heritage Overlay (THO)
- The Australian Heritage Database (Commonwealth Heritage List); and
- The National Trust

A summary of the inventory search results are provided in **Table 2**. Heritage listing details from the above Registers and databases are provided at **Appendix 1**.

Table 1: Summary of heritage listings and details revealed by inventory searches

Name	Heritage Listing	Heritage Significance	Statutory Requirements
Bethanga Bridge	NSW SHR (#01750)	State	s60 NSW Heritage Act 1977
Bethanga Bridge	LEP (#I359)	State	Albury LEP (NSW)
Bethanga Bridge over the Murray River	RMS (#4302002)	State	s170 NSW Heritage Act
Bethanga Bridge	Towong Heritage Overlay (#HO10)	Local	s43 Towong Planning Scheme (VIC)
Bethanga Bridge	Vic VHR (#H0989)	State	s64 Victorian Heritage Act 1995
Bethanga Bridge over Hume Weir (Murray Arm)	Nat Trust File Number B7225; Bridges Database Reg. No.4293	File Only	None

3.3.1 NSW Heritage Listings

3.3.1.1 Albury LEP 2010

Local environmental plans (LEPs) provide a framework for development controls in their local area. Heritage schedules within an LEP provide for the identification and protection of heritage items. The proposal is within the Albury LGA and a search of the Albury LEP 2010 shows that the Bethanga Bridge is listed as an item of state heritage significance in Schedule 5. Heritage listing details are provided at **Appendix 1**.

In this listing the boundaries of the item consist of the section of the Bethanga Bridge that lies within NSW and the triangular portion of the bridge reserve on the NSW side (**Figure 4**).

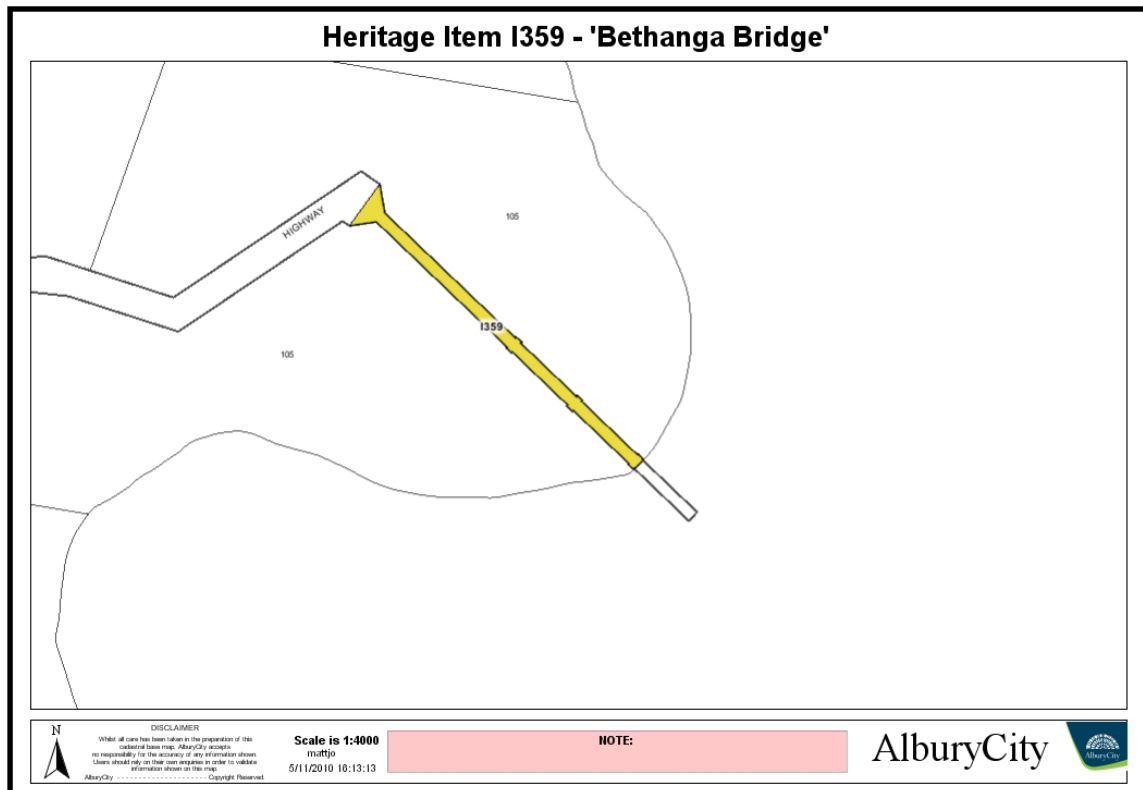


Figure 4: The Bethanga Bridge Albury LEP 2010 listing curtilage

3.3.1.2 NSW State Heritage Register and State Heritage Inventory

The State Heritage Register (SHR) is managed by the NSW Heritage Council and comprises a list of heritage items of particular importance to the people of NSW. Items appearing on the SHR are considered significant to the State and are afforded statutory protection.

The State Heritage Inventory (SHI) is a listing of heritage items within NSW and is also managed by the NSW Heritage Council. It comprises a database of heritage items listed by Local Government and State Agencies across NSW as the result of heritage studies. Items listed on the SHI are considered locally significant and subject to protection through local government processes.

A search of the SHR and SHI showed that the Bethanga Bridge was listed on both registers. However, the listing on the SHI is merely indicative of its listing on the Albury LEP 2010. In both cases the Bethanga Bridge was considered to be of state significance. Heritage listing details are provided in **Appendix 1**.

This SHR listing defines the Bethanga Bridge heritage item as:

The item known as the Bethanga Bridge over the Hume Dam, including all of the bridge and its support structure, its abutments, the roads and embankments and all the land 20 metres to each side of the bridge, as marked on Plan 2094 (Figure 5).

Therefore, the listing incorporates the sections of the bridge in both NSW and VIC, with the section on the NSW side within the Riverina Highway reserve being fairly similar to the Albury LEP listing.

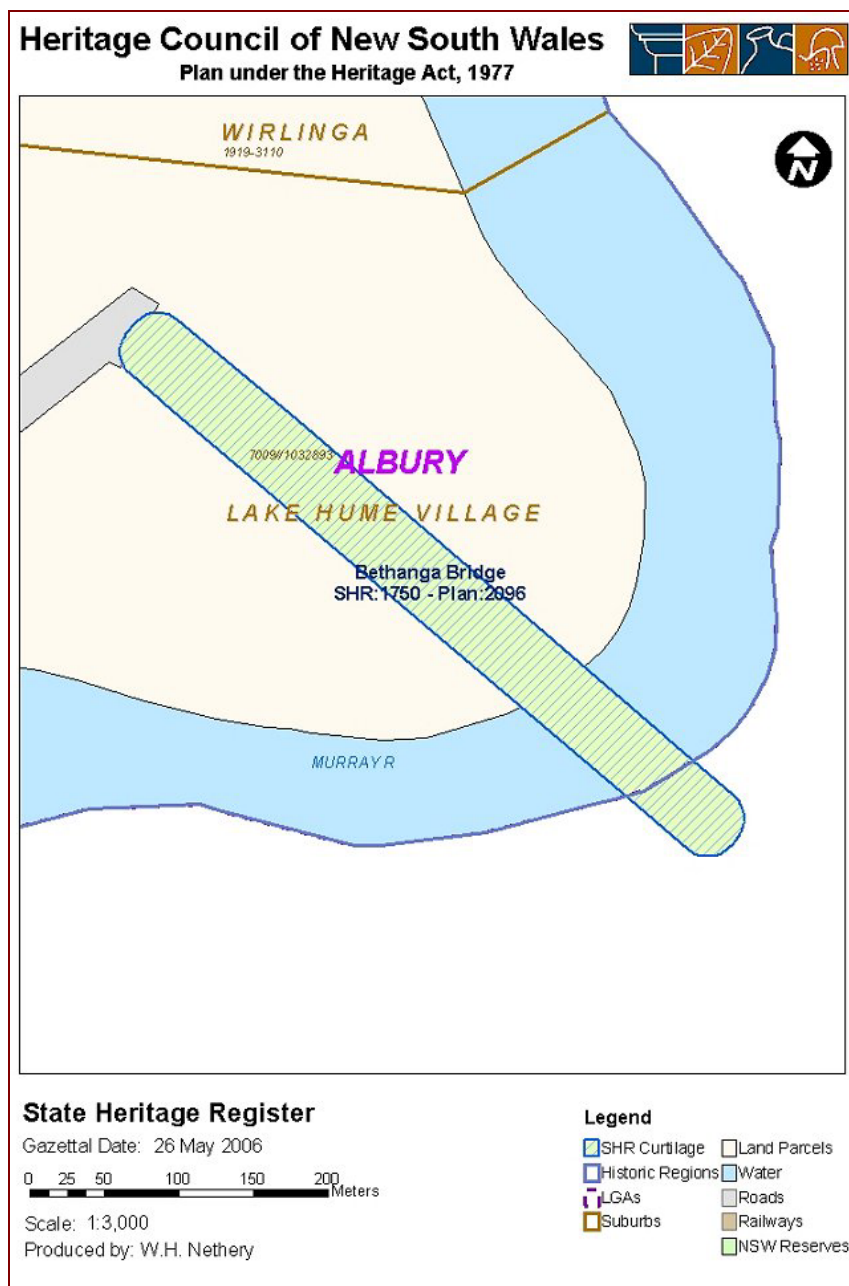


Figure 5: The Bethanga Bridge SHR curtilage

3.3.1.3 RMS s170 Register

Government agencies have a responsibility under Section 170 of the NSW Heritage Act 1977 to identify, conserve and manage heritage assets owned, occupied or managed by that agency. It requires agencies to keep a Register of heritage items, commonly, the s170 Register.

The s170 register consists of a list of heritage assets and an assessment of the significance of each asset. The register identifies buildings and structures, but may also include natural, movable, archaeological, landscape and Aboriginal heritage.

The s170 register forms part of the State Heritage Inventory. State significant items identified in the s170 register are considered for individual listing on the State Heritage Register.

A search of the RMS s170 register for the local government area of Albury LGA showed that the Bethanga Bridge over the Murray River is listed as an item of state heritage significance. Heritage listing details are provided in **Appendix 1**.

The curtilage of this listing is the same as that of the SHR listing shown in **Figure 5**.

3.3.2 Victorian Heritage Listings

Similar to NSW, Victoria had a system of heritage listings where items can be of state and/or local heritage significance. Former items are listed on a state heritage register while latter items are listed on the planning schemes of each local municipality. These items are offered statutory protection by the Victorian Heritage Act 1995.

3.3.2.1 Victorian Heritage Register

The Victorian Heritage Register (VHR) is managed by the Heritage Council of Victoria and comprises a list of heritage items of particular importance to the people of Victoria. Items appearing on the VHR are considered significant to the State and are afforded statutory protection.

A search of the VHR shows that the Bethanga Bridge is listed on this register. Heritage listing details are provided in Appendix 1.

The extent of registration for the Bethanga Bridge on the VHR consists of (Figure 6):

- 1. All of the place known as the Bethanga Bridge over Hume Dam, Bellbridge, including all of the bridge and its support structure, the abutments, the roads and embankments marked (B1) on Diagram 989 held by the Executive Director.*

2. All of the land marked L1 on Diagram 989 held by the Executive Director.

As such, the boundaries of this listing comprise the portions of the item in both NSW and VIC. Particularly on the NSW side the portion of land up to 50m distant on the west side of the bridge is included, as well as the land to 20m of each side of the bridge.

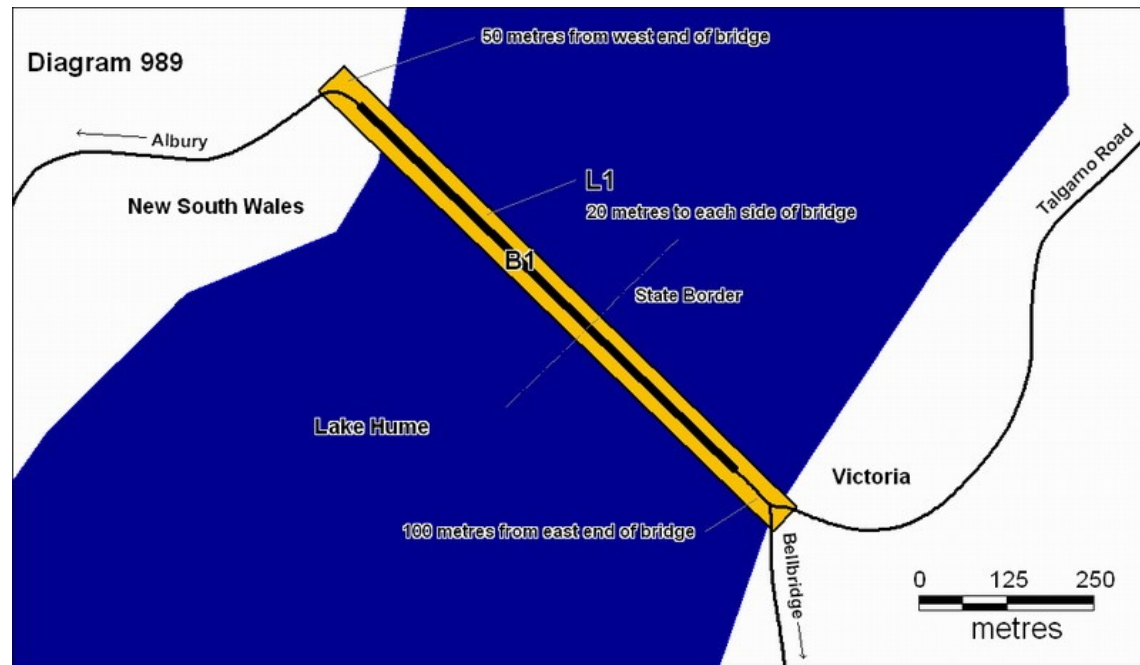


Figure 6: The Bethanga Bridge VHR curtilage

3.3.2.2 Towong Shire Municipality Local Heritage Overlay

Although the proposal is within the Albury LEP the Bethanga Bridge is also within the Towong Shire Municipality. All municipalities in Victoria are covered by land use planning controls, which are prepared and administered by local and state government authorities. The legislation governing such controls is the Planning and Environment Act as amended in 2000. Heritage overlays are one such planning control and include places of local heritage significance, as well as heritage precincts. Through this planning control local councils identify, record, and protect places of value to the local community.

A search of the Towong Planning Scheme shows that the Bethanga Bridge is listed on the local heritage overlay. Heritage listing details are provided at **Appendix 1**.

On this listing the boundaries of the item (**Figure 7**) are poorly presented, but appear to be similar to the VHR listing discussed below.

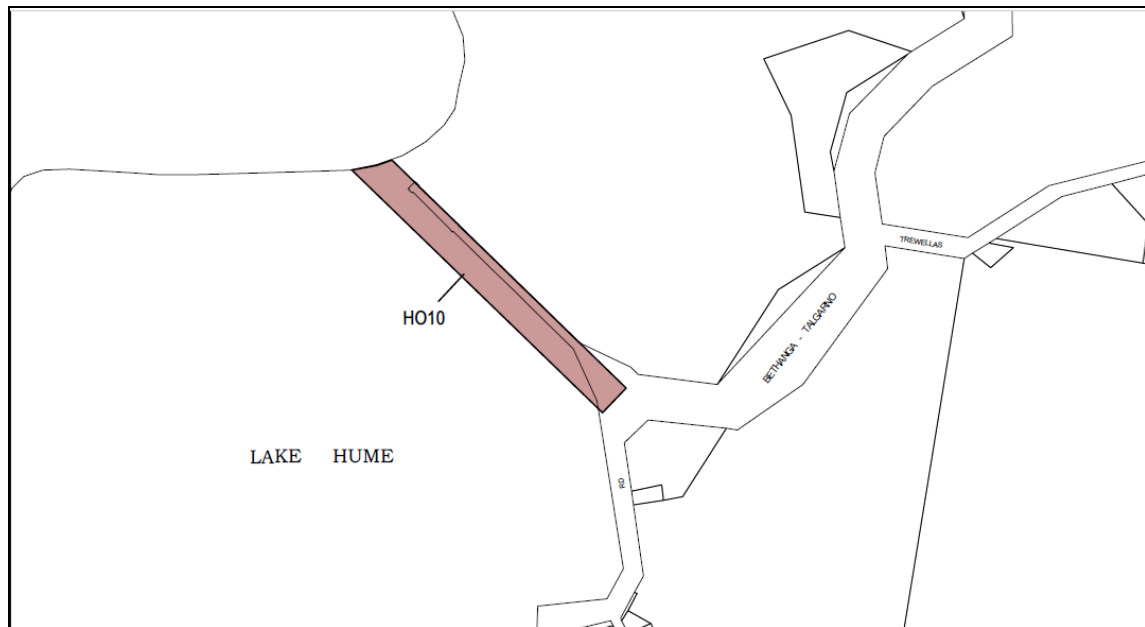


Figure 7: Detail of Towong Heritage Overlay map No. 2HO showing Bethanga Bridge heritage item

3.3.3 National Heritage Listings

3.3.3.1 The Australian Heritage Database

The Australian Heritage Council is an independent agency within the Department of the Environment. The Council is the principal adviser to the Australian Government on heritage matters and assesses nominations for the National Heritage List, and the Commonwealth Heritage List. The Council is responsible for the Australian Heritage Database (AHD). The database includes:

- places in the World Heritage List
- places in the National Heritage List
- places in the Commonwealth Heritage list
- places in the Register of the National Estate
- places in the List of Overseas Places of Historic Significance to Australia
- places under consideration, or that may have been considered for, any one of these lists.

A comprehensive search of the Australian Heritage Database showed that the Bethanga Bridge has not been nominated, is not under assessment and is not listed on any of these registers.

3.3.4 Non-Statutory Community Organisation Listings

3.3.4.1 The National Trust

The National Trust is a community-based, non-government organisation that manages and protects many heritage places across the country. It maintains a register of significant heritage places and items in each state. While it has no statutory power the Trust may campaign and advocate for the protection of heritage places if they become threatened.

The Bethanga Bridge is not listed on the National Trust register for NSW. However, it is likely to be considered for listing in the future (pers. comm. with National Trust NSW).

The Bethanga Bridge is classified by the National Trust (Victoria) at the level of File Only. This means that the state branch retains a file on the place, but that it is not officially classified. At some time in the future it may be officially classified or it may remain as a record only.

3.3.4.2 Engineering Heritage Recognition Program

This program is managed by Engineering Heritage Australia (EHA) through its Heritage Recognition Committee. It aims to bring recognition to engineering works of historic or heritage significance across Australia and to the engineers who created them. It also aims to encourage the conservation of Australian engineering heritage and to raise community awareness of engineering and the benefits it provides.

Significant engineering heritage works are those that have been judged to be valuable to a group of people, or have contributed something of value to the nation, a region, or to the practice of engineering. As such, the program is solely aimed at recognising the history of important engineering works, although EHA recognition of a work may be used in a wider heritage nomination for conservation purposes.

The Program recognises the significance of engineering heritage works in three categories through the installation of markers and interpretive signage:

- Engineering Heritage Marker (EHM)
- Engineering Heritage National Marker (EHNM)
- Engineering Heritage International Marker (EHIM)

The Bethanga Bridge was awarded an EHNM (replacing an older award under a different system) in October 2015 by the Victorian division of the EHA. Part of this recognition involved plans to install an interpretive sign in the layby adjacent to the west-bound lane on the NSW approach to the bridge (EHM, 2015:23). However, at the time of the site inspection associated with this assessment (see **Section 4.0**) this signage had yet to be installed.

While this marker has no statutory impact on the Bethanga Bridge, it does illustrate the engineering significance of the bridge in a national context.

3.4 Summary

3.4.1 Significance

This overview demonstrates that the Bethanga Bridge, due to its heritage significance and position across the NSW/Victorian border, is listed on a range of heritage registers. Most importantly, its significance is evaluated in different ways across the different listings. Typically it is evaluated to have historic, technical, aesthetic, and social significance, but also occasionally research and rarity significance as well (please note there are some differences in how significance is evaluated in NSW and VIC). A summary of how the bridge is evaluated to be significant according to the different listings is provided in **Table 2**.

Table 2: Summary of how the Bethanga Bridge is significant against the different criterion across its different listings

Significance Criterion	SHR (NSW)	Albury LEP 2010 (NSW)	RMS s170 (NSW)	Towong (VIC)	VHR (VIC)	NatTrust (VIC)
a) Historic	Yes	Yes	Yes	n/a	Yes	Yes
b) Association	-	-	-	n/a	-	-
c) Technical	Yes		Yes	n/a	Yes	Yes
c) Aesthetic	Yes	Yes	Yes	n/a	-	Yes
d) Social	Yes	Yes	Yes	n/a	-	Yes
e) Research		Yes	Yes	n/a	-	-
f) Rarity	Yes	Yes		n/a	-	Yes
g) Representativeness	-	-	-	n/a	-	-

The Statement of Significance and NSW SHR listing for the Bethanga Bridge evaluates the item as having representative and rarity values and to be of historical, technical, aesthetic and social significance. It is of historical significance for its associations with the construction of Lake Hume, as well as its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of NSW, Victoria and South Australia to regulate the flow of the Murray River. It is of technical significance for the unusual and rare use in Victoria of Pratt trusses, a predominantly NSW technology, in its construction. The use of this system in this instance, its design by NSW and construction by Victoria, also represents the cooperation of these states in the development and ongoing use of major infrastructure.

Specifically, the Bethanga Bridge is assessed to be of state significance to NSW against the following heritage criteria:

- **Historical Significance (a):** Due to its associations with the construction of Hume Dam, a major national undertaking of the early twentieth century. It is also of historical significance for its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of NSW, Victoria and South Australia to regulate the flow of the Murray River. The bridge reflects the engineering and design approaches of the State Rivers and Water Supply Commission and NSW Public Works Department in the late 1920s and the influence of American engineering practice in the use of the Pratt truss. The bridge is also a significant marker of the anticipated development that the new Hume Weir was expected to bring to the region, serving, as it did, only a few small farming communities and the copper and gold mining areas of Bethanga and Talarno, which were already in steep decline at the time the bridge was completed.
- **Technical Significance (c):** Due to the unusual use in Victoria of Pratt trusses, a predominantly NSW technology based on American engineering practice. The Pratt truss was frequently used in NSW, but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by NSW and construction by Victoria, also represents the cooperation of NSW and Victoria in the development and ongoing use of major infrastructure. Bethanga Bridge is a representative example of Pratt truss design displaying the main characteristics at a scale that demonstrates the effectiveness of the design over long spans and of its repetition to create a bridge of considerable overall length. Its construction methods are also of note in the use of staged construction from abutments along temporary underslung Warren trusses.
- **Aesthetic Significance (c):** Due to its dramatic rural setting over a wide expanse of water (when lake levels are high) and occasionally at great heights over broad river flats (when the lake is down). It is also of aesthetic significance for the vast scale and length and the rhythmic patterning of repeated geometric motifs of the trusses.
- **Rarity (e):** As a major bridge built by an authority other than a state road or rail authority, Bethanga Bridge is rare and is the most substantial bridge erected by water authorities. It is the only built structure shared by NSW and Victoria.
- **Social Significance (d):** As an important local tourism destination and as the main link between the Bethanga/Granya region and the regional centre of Albury-Wodonga

The NSW SHR describes the integrity and intactness of the Bethanga Bridge as:

- **Integrity/Intactness:** The original wooden road surface has been raised once and twice replaced, the railings replaced, and the NSW approach modified. Nevertheless, Bethanga Bridge remains substantially the same structure erected in the 1920s.

3.4.2 Heritage Curtilage

An important point to note for the current proposed works is the various heritage listings and the different curtilages or boundaries. . All of the listings define part of the road approach on the NSW side as being part of the heritage item. However, the amount differs between the different listings. The greatest amount is included in the VHR listing which incorporates 50m from the west end of the bridge and 20m to each side as being part of the item. The THO listing while imprecise appears to feature a similar boundary. The SHR and RMS listings incorporate the same amount of space to each side of the bridge (20m), but only include the area to the west of the bridge inside the boundary of the bridge reserve (or perhaps an area 20m wide – the plan is imprecise). The Albury LEP boundary has this same western boundary to the item, but perhaps not as much space to either side, although its plan is also fairly imprecise. Nonetheless, based on the limits of construction of the proposed works it will impact within the curtilage defined in all of these listings (**Figure 8**).

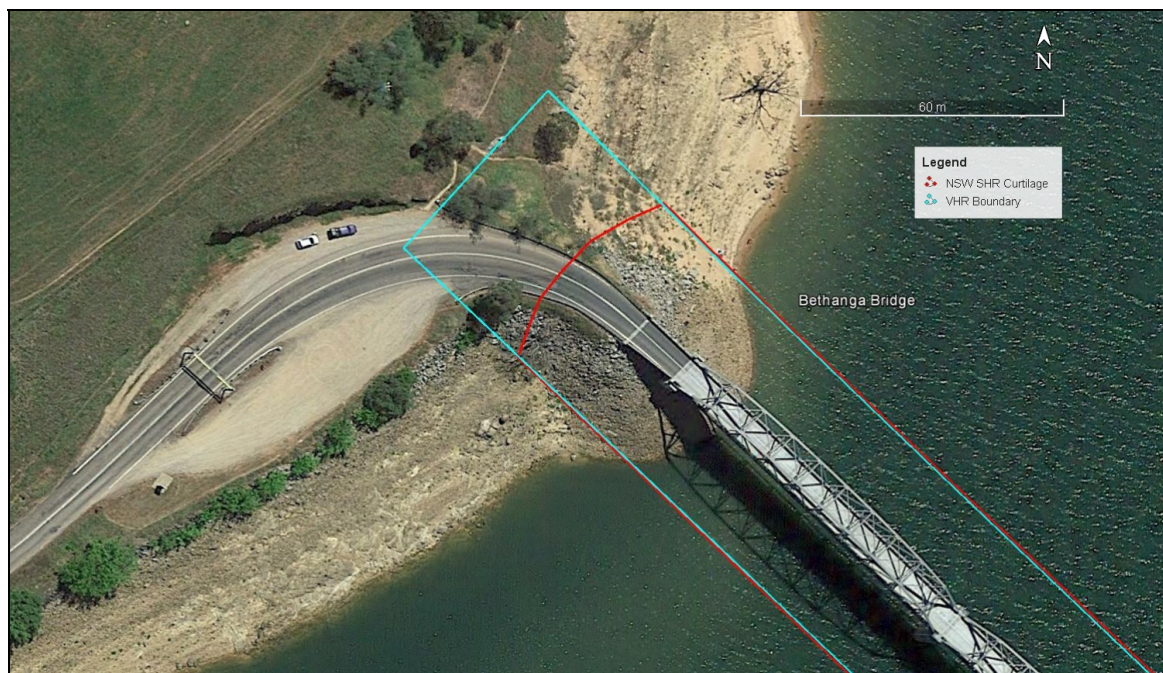


Figure 8: Plan of the different heritage curtilages of the Bethanga Bridge heritage listings (extrapolated from SHR and VHR plans)

4.0 HISTORICAL CONTEXT REVIEW

4.1 CONSTRUCTION OF THE HUME DAM

During the 1850s the Murray River was opened for navigation and a period of prosperous river trade eventuated that assisted in the opening up of large areas of NSW, VIC, and SA for European occupation. However, inconsistencies in the flow of the river and its tributaries during periods of heavy rains and prolonged droughts soon put an end to this trade. Consequently, in 1863 a conference was held between the interested states towards improving the river Murray system for navigation with the favoured outcome being the locking of the main stream. However, in the early 1870s while attempts were being made to devise a scheme for this purpose, VIC began using the river for irrigation. This led by 1880 to the realisation that irrigation in the future would seriously hamper navigation as each state drew water from the river for this purpose (RMC, 1946:12-13).

Over the remainder of the nineteenth century the three states were unable to come to an agreement over the distribution of the waters of the Murray which prevented the implementation of any large scheme to harness its power. Following Federation and increased public pressure in 1902, an Interstate Royal Commission was appointed to inquire and report on this issue. Due to the competing and diverse interests of the states an agreement was still not formed following the handing down of the Commission's report. Thus, it was not until an Interstate Conference of Engineers produced a report in 1913 on the possible effective uses of the Murray River and its tributaries for the three states that an agreement was reached between them in 1914. This agreement was ratified in 1915 by the River Murray Waters Act in the Parliaments of the Commonwealth and the States of NSW, VIC, and SA. This Act incorporated the River Murray Agreement which provided for the construction of associated infrastructure, the allocation of water between the states, and the appointment of the overseeing River Murray Commission (RMC, 1946:13).

The works to be overseen by the RMC included two large reservoirs: one upstream of Albury (Lake Hume) and the other at Lake Victoria (near the SA border). It also included 26 weirs and locks along the Murray River between its mouth and Echuca and nine on the Murrumbidgee. The responsibility of the RMC was to arrange for the construction of these works by the relevant state authorities (in NSW the Department of Public Works). These authorities were to be responsible for the construction of the works allotted to them and be subject to the approval and direction of the RMC. In the future they were also to be responsible for the continued maintenance and management of these works (RMC, 1946:14).

The major work constructed under the River Murray Agreement was the Hume Dam which comprised a concrete and earth embankment situated just below the junction of the Upper Murray and Mitta Mitta Rivers. At the time of its construction it was designed to hold back a

volume of water 100 feet high which backed up the Murray valley 40 miles and the Mitta Mitta valley 20 miles forming a lake 33,000 acres in size. Work on the Hume Weir commenced in 1919 and continued for 17 years with it being completed and officially opened in 1936 (SHR; RMC, 1946:15-16).

4.2 CONSTRUCTION OF THE BETHANGA BRIDGE

Prior to the construction of the Hume Dam a low level bridge, the Gold Creek Bridge, existed across the Murray River upriver of the current Bethanga Bridge and facilitated travel between Albury-Wodonga and Bethanga in VIC. This bridge had been built in 1896 after agitation by local residents of Talgarno, Bethanga, Granya, Bungil, and Albury and the pastoral stations of Hawksview, Bowna, and Cumberoona to facilitate easy travel between either side of the border in this region. Prior to the construction of the bridge the river had been forded at various places or there was a punt near Cumberoona station. This difficult access to either side of the border caused all manner of trouble (stock tax) for Victorians moving stock to the markets or the railhead at Wodonga, as well as the problem of losing stock that crossed the river looking for greener pasture. Other industries such as dairy farming and fruit growing also had problems developing despite promising starts due to transport difficulties in moving produce to the markets at Albury or Wodonga. Thus, once the Gold Creek Bridge was constructed it was a great boon to locals and to business in Albury. As such, local residents saw the construction of the Hume Dam as a potential disaster as it again threatened to sever the transport links across the border in this area; this time irrevocably (EHA, 2015:5-6).

Consequently, it is no surprise that during the construction of the Hume Dam the local councils (Albury City, Wodonga, and Hume) agitated for the construction of a replacement bridge. The planned Bethanga Bridge was designed and initiated with the cooperation of the NSW, VIC, and Federal Governments as part of the River Murray Agreement. In this spirit of cooperation the bridge was designed in NSW by the office of Roads Engineer Percy Allen in 1926 and construction work overseen by the Victorian State Rivers and Water Supply Commission. This was the common arrangement for Murray River bridges or crossings built during this period. After tenders for the steelwork of the bridge were advertised worldwide, the successful tenders, Vickers Ruwold, announced in June 1928 were also based in Victoria in Richmond, Melbourne (NSW SHR; EHA, 2015:10).

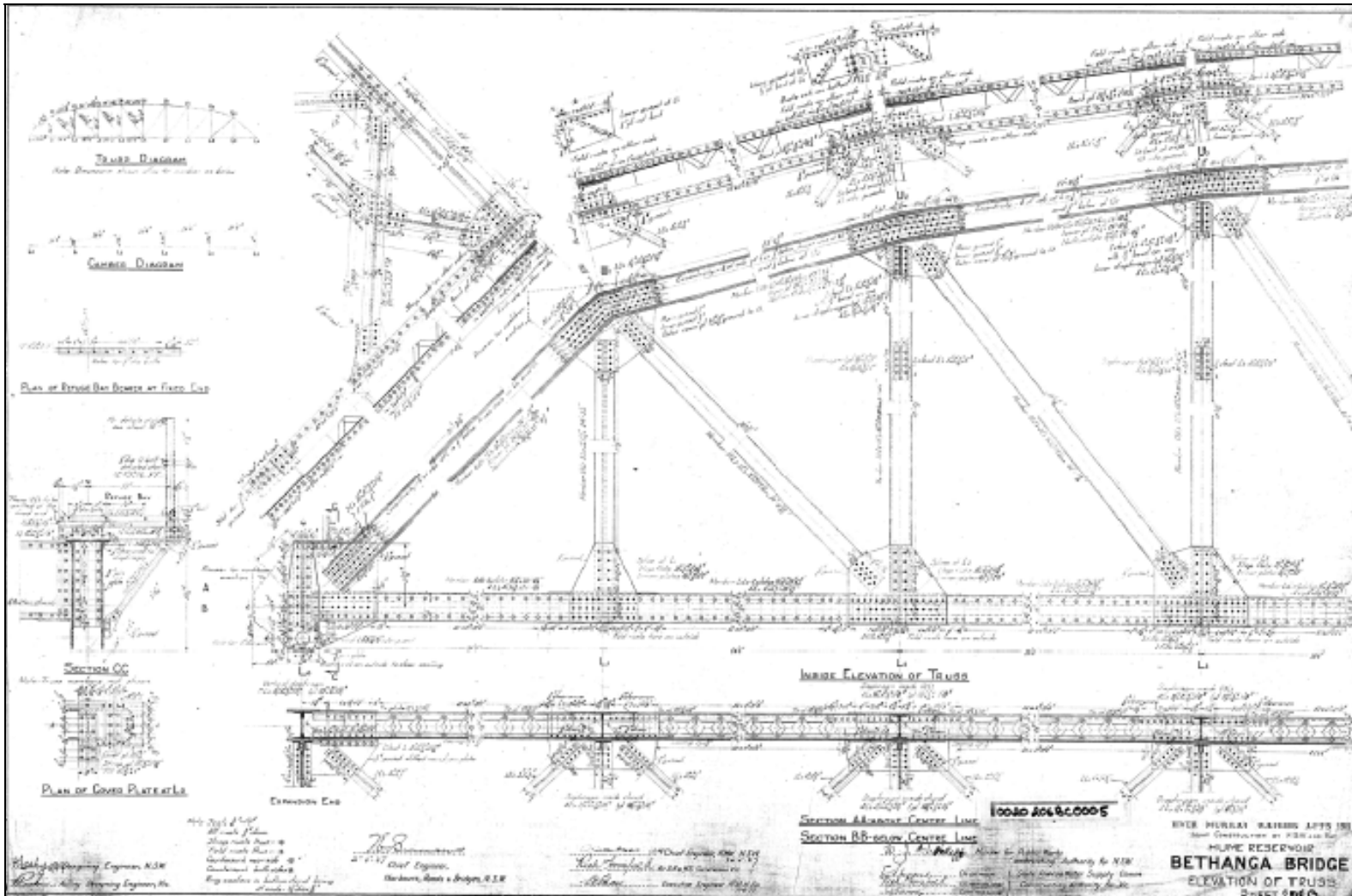


Figure 9: Details of Pratt Truss spans from the Bethanga Bridge design plans (RMS Archives).

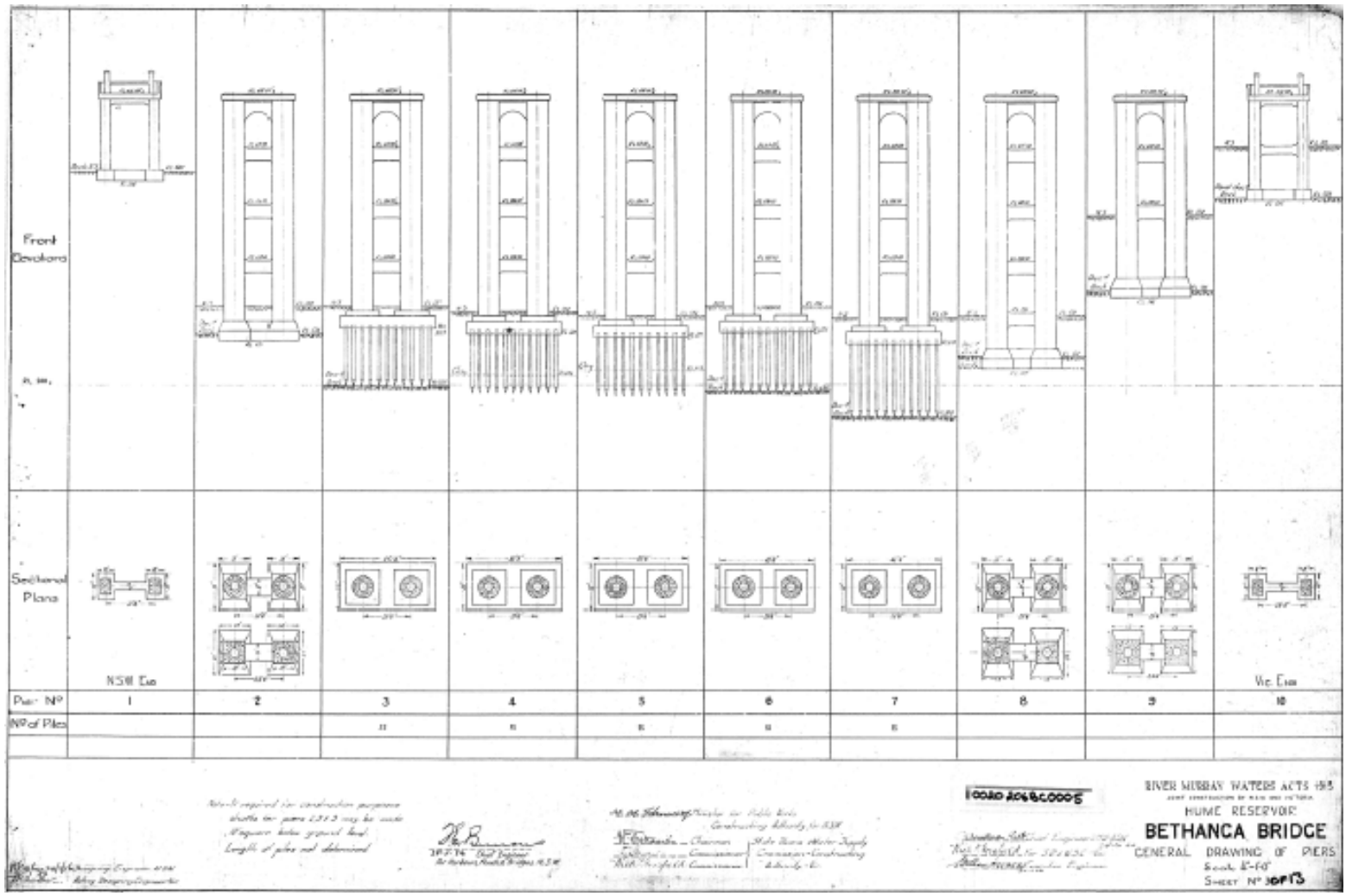


Figure 10: Details of concrete support towers/piers and end buttresses from the Bethanga Bridge design plans (RMS Archives).

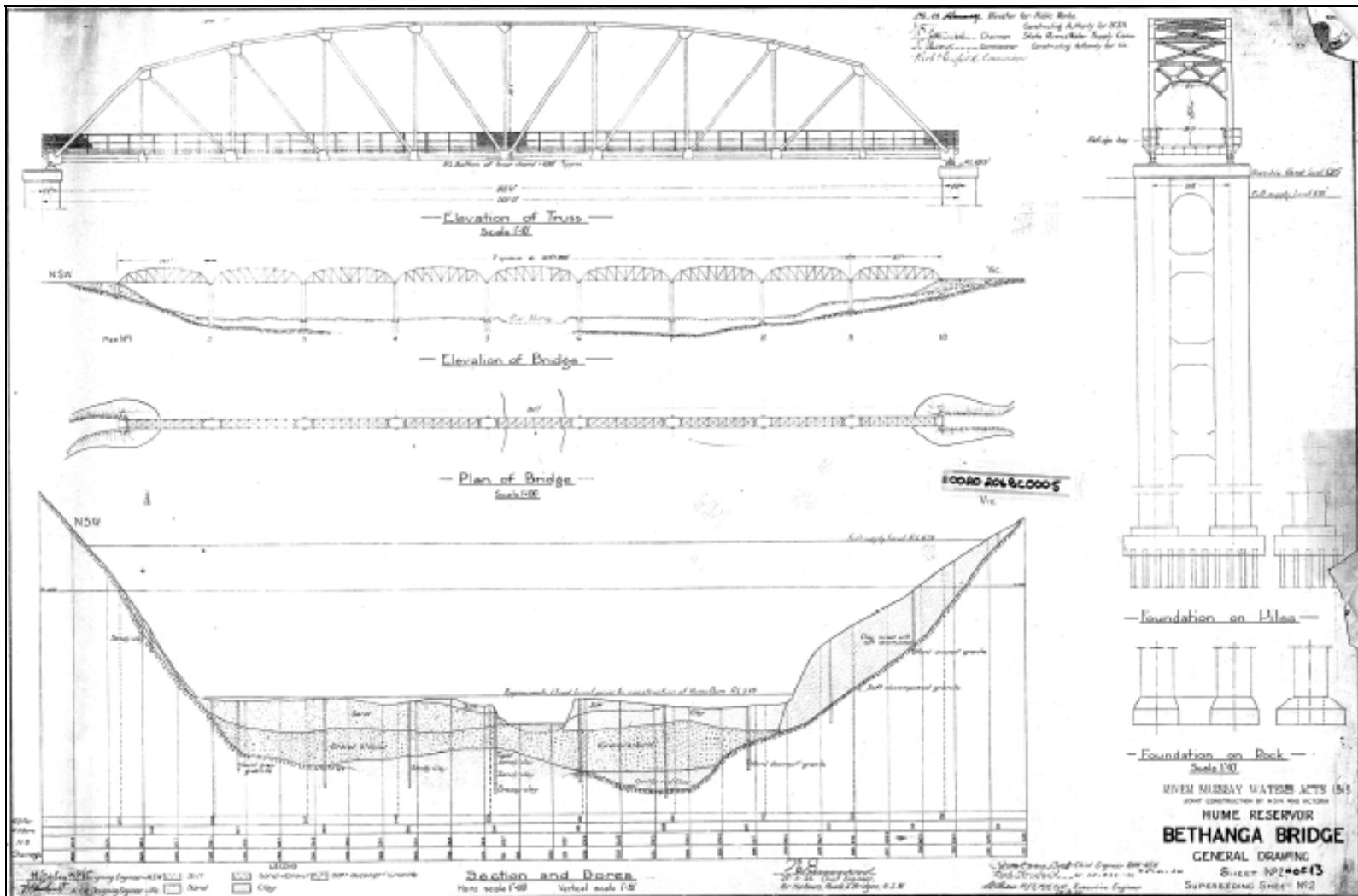


Figure 11: Overall plans of the Bethanga Bridge from the design plans (RMS Archives).

The Bethanga Bridge was designed as a long, nine-span, riveted-steel, variable depth, Pratt Truss road bridge of nine principal spans of 82 metres and a total length of 732 meters (Figures 9 and 11). The road surface of the bridge was designed to be transverse laid timber decking with a width of 7.7m. The bridge was to be supported by a series of eight concrete support towers and buttresses at either end (Figure 10). The Pratt Truss design was common in NSW during this period and was favoured for Railway bridges. This was not the case in Victoria where it was generally shunned. Therefore, the Bethanga Bridge is a rare example of this design in Victoria (SHR).

Construction of the bridge commenced in January 1927 beginning with the erection of a temporary bridge across the Murray River to assist construction. Following this the eight concrete support towers and two end buttresses were built. Each of the towers is over 100ft high with the pillars being 10ft in diameter and hollow with 2ft thick walls. They were constructed in 12 months by two teams of workers working in shifts. By the spring of 1929 the waters of the Murray had begun to rise following the blockage of the river by the continued construction of the Hume Dam. Consequently, floating wooden scaffolding towers and a creeper crane on a purpose-built railway line were used to construct each of the nine spans which each took three weeks to construct. Following painting the Bridge was completed in September 1930. It was opened with little fanfare despite the fact it was one of the longest road bridges in Australia at the time (and completely Australian made unlike the Sydney Harbour Bridge). Fortunately, no workers lives were lost in its construction. (EHA, 2015:10-11).

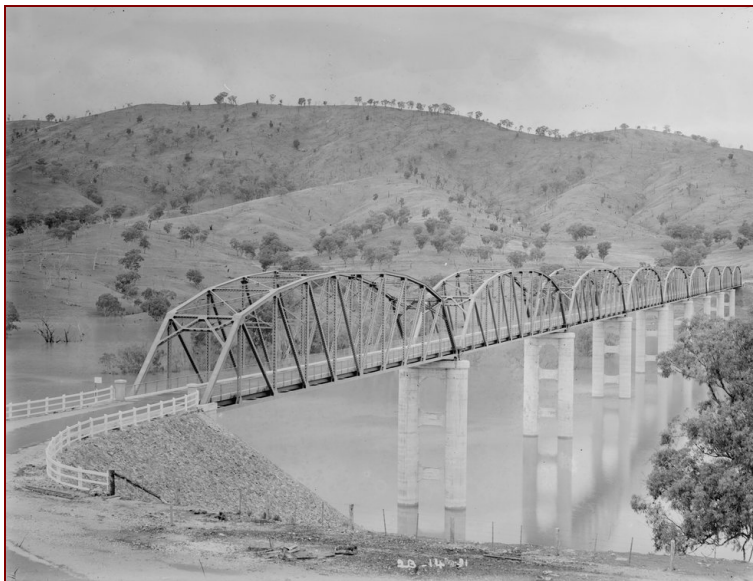


Figure 12: The Bethanga Bridge c1940 showing its original design (State Library of Victoria)².

4.3 ONGOING USE AND MAINTENANCE OF THE BETHANGA BRIDGE

²http://search.slv.vic.gov.au/primo_library/libweb/action/dlDisplay.do?vid=MAIN&search_scope=default_scope&docId=SLV_VOYAGER1686123&fn=permalink

By the late 1940s the capacity of Lake Hume was found to be inadequate for the water that was planned to be funnelled into the Murray River by the Snowy Mountains Scheme which began construction in 1949. Consequently, work was undertaken by the NSW Department of Public Works between 1950 and 1961 to double the size of the weir to its present capacity of 3038 gigalitres. The increase in the size of the weir resulted in the need to make two modifications to the bridge. Firstly, its road surface was raised an additional 300mm and replaced with a concrete waffle slab deck in 1961. Secondly, a 13.7m long steel girder approach span was added on the NSW side in 1963 (Plate 1). It is constructed of RSJ girders with straight transverse cross-bracing (SHR).

Further maintenance and upgrading of the Bethanga Bridge was undertaken in 2005 as a part of a refurbishment (13 million) project to double its load capacity (to 30 tons) and improve its safety. This included replacing the decking with interlocking precast concrete slabs, the installation of new guard rails, the repainting of the bridge, and the widening of the NSW approach for safety reasons (**Plate 2**) (EHA, 2015:11).



Plate 1: Additional span added to the NSW side of the bridge in 1963



Plate 2: The NSW Approach to the Bethanga Bridge looking southeast and showing modification made in 2005. Note repainting on steel trusses to cover graffiti.

5.0 SITE INSPECTION

A site inspection of the area of the proposed works within the Bethanga Bridge heritage item curtilage was undertaken to understand the potential for the proposal to impact on identified heritage values and the significance of this part of the heritage item.

The site inspection was carried out by Damian Tybussek on the 12th April 2016. The inspection comprised a walkover of the area within the Riverina Highway road reserve from the boundary fence to the north of the bridge to a spot approximately 200m down the Riverina Highway to the southwest. Various vistas and views of the bridge were also inspected from the picnic areas to the south of the bridge on the east (VIC) and west (NSW) banks of Lake Hume.

As discussed in **Section 2.0** the proposed works will not be impacting upon any part of the Bethanga Bridge except the NSW road approach. This is an important point in assessing impact and development of management strategies.

According to the RMS brief and concept plans the limit of works is approximately 5.0m distant from the west end of the additional span added to the bridge in 1963 (**Figure 3**). In this area the proposed works will be limited to resurfacing of the road surface, installation of new road barriers, removal of an existing tree, and clearing of a 5.0m zone along the road sides. During the site inspection spray painted construction markings on the road surface approximately 1.0m from the west end of the bridge were noted (**Plate 3**).

Generally, apart from the road surface on the bridge approach that was replaced in 2005 (**Plate 2**), the road surface along this section of the Riverina Highway is in poor condition. Consequently, there is a definite contrast of the road surface leading up to the bridge that detracts from its fresh aesthetic (**Plate 4**). As such, replacing the road surface in this area could only add to the aesthetic appeal of the bridge.

The current road barriers along the road approach only extend a distance of 40-50m from the west end of the bridge (**Plate 4**). In contrast the proposal aims to install barriers constantly along the west-bound lane of the highway and a further distance around the curve approaching the bridge along the east-bound lane (**Figure 3**). This design will close off the layby along the west-bound lane and perhaps that along the east-bound lane as well. The west-bound layby is currently unpaved, but is an area that many travellers use to stop and admire the bridge (**Plate 5**). Although EHA had plans to install an interpretive panel here there is currently none. There are also no interpretive signs on the Victorian side of the bridge. Although far smaller, the two laybys on the Victorian side are still used by travellers to stop and admire the bridge. The absence of interpretive signage to each side of the bridge means there is no way for the passing public to know that the bridge is of state heritage significance and listed.

The current road barriers are attached to the concrete pillars at the west end of the bridge which is just beyond the limit of works of the proposal (**Plate 3**). Considering that at this abutment there is a clear break between the guard rails of the bridge and the current road barriers their replacement by the proposed works will not affect the aesthetic values of the bridge.

Along the west-bound lane of the NSW approach and its layby there is one young, but large, tree and several other bushes growing out of the embankment below (**Plate 4**). The large tree is marked on the concept plans of the proposal for removal (**Figure 3**) and it is assumed that the clearing of the road sides during construction will result in the removal of much of the other roadside vegetation in this area. Currently the large tree and other vegetation obscure the view of the bridge as travellers approach it along the Riverina Highway (**Plate 4**). Consequently, there is a case to be made that they are detracting from the heritage significance of the item, since they are preventing the appreciation of it by the travelling public.

The proposal also aims to establish a stockpile site in the layby along the west-bound lane on the NSW approach to the bridge. This layby is outside of the NSW heritage listing curtilages, but are partially along the border of the Victorian heritage listing curtilage (**Figure 13**). There is little potential for these stockpile sites to directly impact on the heritage item, unless construction materials are left in this area post-construction. These stockpiles would detract from the aesthetic significance of the item. Therefore, providing these sites are managed carefully, cleaned-up and rehabilitated following the completion of the proposed works they should not impact on the heritage significance of the item.

The site inspection of the bridge showed that it was generally in a good condition, apart from the wear on the approaching road surface and the vegetation growth along the road sides. However, the NSW end of the bridge has suffered from graffiti attacks in the recent past, both on the steel trusses of the first span and on the concrete buttresses and supports beneath the bridge. This graffiti does detract from the aesthetic appeal of the bridge even after it has been removed and repainted and it would be appropriate for steps to be taken to prevent or discourage this behaviour. When the water level of Lake Hume is low the shore to the north side of bridge is used for camp fires and celebrations, and it appears that it would be difficult to protect the bridge from further graffiti attacks in the future.

No other heritage items were identified in the surveyed area. All of the area around the NSW approach has been heavily impacted on by the construction of the bridge and the lake. Indeed, much of the current exposed shore is usually under water when the lake is full as demonstrated by the vegetation line in **Plate 2**.



Plate 3: Detail of the NSW road approach and west end of the Bethanga Bridge looking southeast showing abutment to which the bridge guard rails and road barriers is attached, also note spray painted construction markings on road possibly signifying limit of works of proposal.



Plate 4: NSW approach of the Bethanga Bridge looking west, note existing tree (to the right of the road) proposed to be removed obscuring the view of the bridge.



Plate 5: West-bound layby on NSW approach, looking south.



Figure 13: Plan of heritage listing boundaries of the Bethanga Bridge along with proposed stockpile site (mapped in purple)

6.0 STATEMENT OF HERITAGE IMPACT

A statement of heritage impact (SOHI) is prepared to assist in the review and approval process when there is a perception that a proposed project could impact upon the heritage values of an item or site. The purpose of a SOHI is to explain how the heritage value of an item might be affected by the proposal. Impact may be positive when an item is to be conserved or enhanced, or impact may be detrimental if the site is to be disturbed or destroyed.

The accepted guidelines specify that the following statements are addressed in a SOHI in response to a proposed project:

- The following aspects of the proposal respect or enhance the heritage significance of the study area for the following reasons.
- The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts.
- The following sympathetic solutions have been considered and discounted for the following reasons.

This section examines the way in which the established heritage values of the Bethanga Bridge might be impacted by the proposed works.

The following aspects of the proposal respect or enhance the heritage significance of the study area for the following reasons.

1. The proposed works respects the heritage significance of the Bethanga Bridge by not directly impacting on the significant fabric of the bridge (the steel spans, embankments or concrete buttressing/supports). Instead the proposed works will be confined to the bridge approach, an element not considered integral to its significance and already subject to substantial modification (1963). This section was modified in 2005 to improve safety and the current proposed works are also aimed at improving the safety for users of the bridge. As such, the proposed works continues a history of evolution of the bridge through over its lifespan that supports its continued safe use, while not impacting on the original 1930 bridge structure and associated heritage values.
2. The proposal to remove the existing tree and clear the other vegetation from along the road side will also enhance the opportunity for public appreciation of the aesthetic significance of the item by clearing vistas of the bridge upon the approach while travelling on the Riverina Highway.

The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts.

Perhaps the only aspect of the bridge's heritage significance that the proposed works has some potential to detrimentally impact upon is its aesthetic significance. The Bethanga Bridge's aesthetic significance is evaluated in two different ways by its various heritage listings:

SHR and NT: The bridge is of aesthetic significance for its dramatic rural setting over a wide expanse of water (when lake levels are high) and occasionally at great heights over broad river flats (when the lake is down). It is also of aesthetic significance for the vast scale and length and the rhythmic patterning of repeated geometric motifs of the trusses.

RMS and Albury LEP: The Bethanga Bridge is probably the most impressive bridge or object associated with the Murray River. Because of the large body of water it crosses it has a strong visual impression. The use of a series of steel trusses with each truss element being a compound section of riveted plates produces a lightweight and transparent structure. There are numerous similarities in design, proportion and date of construction to the Sydney Harbour Bridge.

These two different evaluations of the aesthetic significance of the Bethanga Bridge clearly focus on the fabric and design of the Bridge itself and its association with the waters of Lake Hume below. They do not mention or include the road approach on either side except in the broad case of the mention of the rural setting of the bridge in the first description. The minor nature of the proposed works within the context of the overall setting and surroundings is not considered to adversely impact the aesthetic significance. In this regard the proposed works respects this aspect of the item's significance while carrying out necessary works to improve the safe function of the bridge and the community's experience of it.

For the majority of distant views of the bridge, the proposed works will have no visible impact considering that the Riverina Highway is almost always seen in profile from the nearby vantage points on the NSW and Victorian sides (picnic spots) (**Plates 6 and 7**). The removal of the trees and vegetation along the NSW approach will have no impact on distant views and vistas of the bridge and indeed, may enhance some of those views.



Plate 6: The landscape view of the Bethanga Bridge from the south on the Victorian shore of Lake Hume showing its vast scale and length, as well as ‘the rhythmic patterning of repeated geometric motifs of the trusses’ (SHR).



Plate 7: Detailed landscape view of the NSW approach to the Bethanga Bridge from the south on the Victorian shore of Lake Hume.

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

An alternative proposal would be to cease the planned improvement works to the Riverina Highway at the boundaries of the Bethanga Bridge Heritage Item. This would mean that a section of the NSW approach to the bridge would not be upgraded to the same safety standards as the rest of Riverina Highway. Consequently, this alternative has been discounted because it affects road safety on the NSW approach to the bridge. It could also be argued that this alternative would also impact on the item's aesthetic significance by creating contrast between the old and new road pavement sections.

6.1 SUMMARY STATEMENT OF HERITAGE IMPACT

The proposed works will have a negligible impact on the heritage significance of the Bethanga Bridge Heritage Item. This is primarily due to the fact that the limit of the proposed works is confined to an area of the item that was previously and substantially modified in the past, most recently in 2005. The current proposed works aimed at safety have a similar scope as the previous works. The potential for increased safe usage of the Bridge and approaches by the public and the enhanced appreciation or promotion of the heritage item is also considered a reasonable offset for any minor impacts. The primary experience of this heritage item is from motor vehicle while travelling on the Riverina Highway and across the bridge (there is no pedestrian footpath). Consequently, it is essential that road safety be of foremost importance in future management of this item, both in heritage and general terms.

7.0 HERITAGE MANAGEMENT AND RECOMMENDATIONS

7.1 HERITAGE MANAGEMENT OVERVIEW

There are three important principles to consider in regard to the management of heritage within a planning process:

1. The legislative obligations under NSW law to take appropriate action to manage heritage items.
2. Heritage significance is based on established assessment criteria. If the value of a heritage item is not clear, a precautionary approach should be adopted until a definitive assessment can be made.
3. Management of an item should be based on the significance of the item and practical realities for its retention and/or conservation. Management does not preclude adaptive reuse or the installation of modern facilities. It does not preclude demolition where there is no feasible alternative.

7.2 STATUTORY CONSIDERATIONS AND HERITAGE MANAGEMENT RECOMMENDATIONS

The NSW Heritage Act 1977 (Section 4) defines "environmental heritage" to mean those places, buildings, works, relics, moveable objects, and precincts, of historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value that are assessed as significant to the State of New South Wales or significant within the local area.

Ideally, significant heritage resources should remain undisturbed to be conserved *in situ* within the framework of the Burra Charter. Such a course is frequently impossible or impractical and questions are posed by the conflicting interests of heritage on the one hand, and progress and development on the other. Relevant to the parallel issues of site conservation and the need for development, redevelopment and remediation, is NSW heritage legislation and its application within the SEPP (Infrastructure) 2007.

The following recommendations are made with a focus upon the elimination and/or reduction of negative impact upon any heritage values. The objective of these management recommendations is to provide a reasonable, balanced and precautionary approach that considers current heritage values in consideration of future needs to access heritage knowledge. Recommendations are designed to provide a reasonable, balanced and precautionary approach for due diligence heritage management based upon the results of the

assessment of heritage impact from the proposed works. The application of statutory considerations to the study area, with reference to the definitions contained in Section 4 of the Heritage Act and with reference to SEPP (Infrastructure) 2007 and the RTA Heritage Guidelines 2004 are discussed in the recommendations below.

Recommendation 1 – Requirement for a Standard Exemption No. 7

While the conclusions of the Statement of Heritage Impact outlined in **Section 6.1** indicate that the proposed works will have a negligible impact on the heritage significance of the Bethanga Bridge they will still be undertaken on a part of the heritage item. Therefore, based on legislative requirements, application to the NSW Heritage Council for a standard exemption permit under s57(2) of the *NSW Heritage Act* is considered necessary for this project.

The *NSW Heritage Act* allows the Minister for Planning, on the recommendation of the Heritage Council, to grant exemptions for certain activities which would otherwise require approval under the Act. There are two types of exemptions which can apply to a heritage item listed on the State Heritage Register:

1) Standard exemptions for all items on the State Heritage Register. Typical activities that are exempted include building maintenance, minor repairs, alterations to certain interiors or areas and change of use.

2) Site specific exemptions for a particular heritage item can be approved by the Minister on the recommendation of the Heritage Council.

In this case the proposed works fall under Standard Exemption 7: Minor Activities with Little or No Adverse Impact on Heritage Significance as described in the NSW Heritage Council publication *Standard Exemptions for Works requiring Heritage Council Approval*. This standard exemption states that:

1) Anything which in the opinion of the Director-General is of a minor nature and will have little or no adverse impact on the heritage significance of the item does not require approval under subsection 57(1) of the Act.

2) A person proposing to do anything of the kind described in paragraph 1 must write to the Director-General and describe the proposed activity. If the Director-General is satisfied that the proposed activity meets the criteria set out in paragraph 1, the Director-General shall notify the applicant.

In writing to the Director-General to apply for this standard exemption the proponent would need to submit a clear and concise statement of the item's heritage significance and an assessment of whether a proposal impacts on that significance. This statement and assessment

would allow the Director-General to decide whether a proposal has an adverse effect on the heritage significance of the item (NSWHC, 2009:19).

Recommendation 2 – Contact Heritage Victoria

While the proposal is within NSW the Bethanga Bridge is also partially within Victoria and heritage listed at both the local and state level. While these heritage listings have no statutory powers in NSW they also demonstrate the importance of this item to the people of Victoria. It is suggested that the proponent contact Heritage Victoria to inform them of the proposed works.

The VHR listing already contains the following permit exemptions so that maintenance works can be easily carried out on the item. This includes a section on road works:

The following works to the road portion of the place is permit exempt: a) the resurfacing of the road and maintenance to the road surface; b) lane marking; c) erection of speed and traffic signs.

Consequently, the proposed works with the exception of the installation of new road barriers, are likely to fall under this permit exemption.

Recommendation 3 – Ground disturbance and the provisions of the NSW Heritage Act 1977

While there is no reasonable expectation for unknown and/or significant archaeological resources to be exposed as a result of this project, the attention of the Principal and all subcontractors and employees is directed to the NSW Heritage Act 1977 and the provisions of the Act in relation to the exposure of relics. The Act requires that if:

iii) a relic is suspected, or there are reasonable grounds to suspect a relic in ground, that is likely to be disturbed damaged or destroyed by excavation; and/or

iv) any relic is discovered in the course of excavation that will be disturbed, damaged or destroyed by further excavation;

Those responsible for the discovery must notify nominated management personnel who will in turn notify the Heritage Council of New South Wales or its delegate, the Office of Environment and Heritage, NSW Heritage Branch, and suspend work that might have the effect of disturbing, damaging or destroying such relic until the requirements of Heritage Council have been satisfied (s139, 146).

Recommendation 4 – Installation of Interpretive Signage

Unfortunately, there are no interpretive signs on either the NSW or Victorian approaches to the Bethanga Bridge that would indicate to the public that this item is heritage listed and significant at a state level in both states. Nor is there signage in the picnic spots and parks on the shorelines on either side of the Lake. While there were plans by the EHA to install an interpretive sign on the NSW approach in the west-bound layby this plan appears has not yet been implemented.

The proposed installation of new road barriers will block off the laybys on both sides of the Riverina Highway for the NSW bridge approach. This will also prevent the passing public from stopping to appreciate the bridge and future usage of this area for interpretive signage.

In addition to the proposed works, an ideal outcome would be for RMS to modify the west-bound layby to facilitate and accommodate safe parking space for the public to stop and appreciate the heritage values of the bridge. Installation of interpretive signage in this area would also assist this goal.

Alternatively interpretative signage could be installed in the picnic spot on the NSW side to the south of the bridge where a good view of the item is also available. There is clearly interest in the bridge among the travelling public and this project presents an opportunity for RMS to provide for safe viewing and appreciation of this heritage item and its values.

It is recommended that RMS consider and explore these options as part of the proposed works.

8 REFERENCES

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Engineering Heritage Australia, Heritage Recognition Program. 2015. *Nomination for the Bethanga Bridge*.

Heritage Council of NSW. 2009. *Heritage Information Series: Standard Exemptions for Works Requiring Heritage Council Approval*. Heritage Branch, Department of Planning, Parramatta.

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The River Murray Commission (RMC). 1946. *Harnessing Australia's Greatest River: The Work of the River Murray Commission (Compiled by A. F. Ronalds)*. J. J. Gourley, Government Printer, Melbourne.

Towong Shire Municipality Planning Scheme. Available online @ <http://planningschemes.dpcd.vic.gov.au/schemes/towong>

Heritage Listings

Bethanga Bridge, Riverina Highway, Albury. NSW State Heritage Register. Available online @ <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5056556>

Bethanga Bridge, Riverina Highway, Lake Hume Village. NSW State Heritage Inventory. Available online @ <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=1000355>

Bethanga Bridge over the Murray River, Riverina Highway, Albury. S170 RMS Heritage Register. Available online @ <http://www.rms.nsw.gov.au/cgi-bin/index.cgi?action=heritage.show&id=4302002>

Bethanga Bridge, Talgarno Road Bellbridge and Bethanga, Towong Shire. Victorian Heritage Register. Available online @ <http://vhd.heritagecouncil.vic.gov.au/places/12738>

Bethanga Bridge over the Hume Weir (Murray Arm), Talgarno and Murray River Road, Bellbridge, Towong Shire. National Trust (VIC) Register. Available online @ <http://vhd.heritagecouncil.vic.gov.au/places/71578>

Historical Design Plans

Bethanga Bridge Design Plans from the RMS archives

APPENDIX 1



Home > Topics > Heritage places and items > [Search for heritage](#)

Bethanga Bridge

Item details

Name of item:	Bethanga Bridge
Type of item:	Built
Group/Collection:	Transport - Land
Category:	Road Bridge
Location:	Lat: -36.0879820891 Long: 147.0557542060
Primary address:	Riverina Highway, Albury, NSW 2640
Local govt. area:	Albury City
Local Aboriginal Land Council:	Albury And District

Property description

Lot/Volume Code	Lot/Volume Number	Section Number	Plan/Folio Code	Plan/Folio Number
PART LOT	7009		DP	103893

The item known as the Bethanga Bridge over the Hume Dam, including all of the bridge and its support structure, its abutments, the roads and embankments and all the land 20 metres to each side of the bridge, as marked on Plan 2094.

Boundary:

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Riverina Highway	Albury	Albury City			Primary Address

Statement of significance:

Bethanga Bridge was built between 1927 and 1930 as a joint venture between New South Wales and Victoria as part of the Hume Dam project as a key element of the River Murray Waters Agreement put in place in 1915 by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River as a provision against drought and to ensure that the three states received their agreed share of water.

The use of Pratt trusses is unusual in Victoria, not being readily taken up as a viable bridge design. However they are more common in New South Wales. The use of the Pratt truss in this instance reflects the mode of construction employed during the construction of the Hume Dam whereby the New South Wales Department of Public Works and the Victorian State Rivers and Water Supply Commission were jointly responsible for the design and construction of the bridge. The bridge was designed in New South Wales by Department of Main Roads engineer Percy Allen and the trusses were built by Vickers Ruwolt in Melbourne.

The Murray River boundary between New South Wales and Victoria is the top of the southern bank of the river. As such all structures of the river are considered to be in New South Wales. Because of its unique location, over the waters of a dam with the border running down the centre of the body of water, the Bethanga bridge is the only built structure shared by both New South Wales and Victoria.

Bethanga Bridge is of historical and scientific (technical) significance to New South Wales

Bethanga Bridge is of historical significance to New South Wales for its associations with the construction of Hume Dam. It is also of historical significance for its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of New South Wales, Victoria and South Australia to regulate the flow of the Murray River.

Bethanga Bridge is of scientific (technical) significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology, its construction. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure.

Date significance updated: 25 Jul 05

Note: There are incomplete details for a number of items listed in NSW. The Heritage Branch intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Construction years: 1927-1930

Physical description: The Bethanga Bridge is a road bridge over a flooded section of a Murray River valley that now forms part of the Hume Dam. The bridge consists of nine spans of 82 metres, each span being supported between double reinforced concrete pylons by a riveted steel camel back Pratt truss plus a 14 metre approach span on the New South Wales side. The overall span is 752 metres. The road deck was initially timber but was replaced in 1961 with the current concrete waffle slab deck. The road deck is 7.7 metres wide. In 1961 the bridge deck and truss structure was also raised by 300mm in response to the upgrading of Hume Dam and works to increase the storage capacity of the dam. In 2005 the the waffle slab decking was replaced to raise their load capacity, new guard rails were installed and the NSW approach to the bridge was widened for safety reasons. These 2005 works were undertaken with the joint advice and approval of Heritage Victoria and the NSW Heritage Office.

Bethanga Bridge comprises riveted steel Pratt through trusses on multiple reinforced concrete piers and reinforced concrete 'waffle slab' deck on steel beams. There are nine identical principle spans of arched upper cord giving a truss variable depth. This form is also known as "Hog-backed" Camel-back" and "Parker" truss in the USA. There are overhead diagonally braced frames and under deck diagonal "X" bracing between riveted plate cross girder beams. The short approach span on the NSW side has RSJ beams with

Physical condition and/or Archaeological potential:	<p>straight transverse cross-braces. The main truss spans have ten bays with nine vertical compression chords and eight diagonal tension chords.</p> <p>The road deck was initially timber but was replaced in 1961 with a concrete waffle slab deck. In 1961 the bridge deck and truss structure was also raised by 300mm in response to the upgrading of Hume Dam and works to increase the storage capacity of the dam. In 2005 the the waffle slab decking was replaced to raise the load capacity, new guard rails were installed and the NSW approach to the bridge was widened for safety reasons. These 2005 works were undertaken with the joint advice and approval of Heritage Victoria and the NSW Heritage Office.</p> <p>The Pratt truss was an American style bridge truss that began the tide of change from British to American bridge technology in the nineteenth century. The Bethanga example comes from a period when Pratt trusses were an established design alternative, favoured by railways but generally shunned in Victorian road bridge design. It is a type of truss in which vertical web members are in compression and diagonal web members in tension. Many possible configurations include pitched, flat, or camelback top chords. It may be recognised by diagonal members which appear to form a "V" shape toward the centre of the truss when viewed in profile. Variations include the Baltimore truss and Pennsylvania truss. Elaboration in the form of variable depth from sloping upper chords as in the Camel-back arrangement, reduced the amount of steel required, and also dead weight for a similar strength. The Pratt truss compares to Warren truss and Howe designs in the different compression and tension arrangements of diagonal and vertical members. It was named for Thomas W. and Caleb Pratt (Boston railway engineers), who were issued a patent for a truss bearing their name in April, 1844. (Waddell 1891; Hughes Trueman Reinhold 1998, RTA NSW .</p> <p>The overall length is given in VicRoads inventory as 733 metres although a deck length of 752.4 and total length of 750 metres in their inspection system appears more probable. The nine truss spans are each 82 metres with the NSW approach span being 12.5 m.; clear height is 25 m. and width 7.7 m. Concrete endposts frame the entry to the bridge. The construction date is cast in the one end post.</p> <p>Date condition updated:26 Jul 05</p>
Modifications and dates:	1961; 2005 (see above)
Current use:	Bridge
Former use:	Bridge

History

Historical notes:

The Context

The first crossing of the Murray River by white men occurred in November 1824 when Hamilton Hume and William Hovell led an expedition from Yass in search of an overland route to Westport Bay. Their crossing point was some distance up river from Albury and an obelisk near the river commemorates this. Hume and Hovell came upon the river on the 16th of November, 1824, naming it the Hume River, and inscribing a tree near the riverbank the next day before moving on to the south.

In 1829, the explorer Captain Charles Sturt discovered the Hume River downstream at it's junction with the Murrumbidgee River. Not realising it was indeed the Hume, he named it the Murray River. Both names persisted for some time, Hume falling into disuse eventually in favour of Murray.

The explorers route was shortly followed by white squatters and their livestock, mainly sheep and cattle. Subsequently many families took up parcels of grazing land on the rich river flatlands, among the first being William Wyse and Charles Ebdon. The drovers track that developed along the line of the advancing squatters, and subsequently by their excess stock returning for sale at Melbourne and Sydney markets, led naturally to the same point Hume and Hovell first sighted the river. Although an easier crossing point could be found 10 miles upstream (where the Hume Dam now stands) the original site by Hume and Hovel's inscribed tree became the popular crossing place for people and stock on their way to new settlements in the south.

Crossing the river during the drier summer months could normally be achieved on foot. When the river was high after heavy rains or snow melting in the mountains crossing became difficult until a log punt was built in 1844. Stock, however, had to swim. The first bridge over the Murray was built in 1860 near the present crossing at Albury. People up and down stream had to find their own fords, or trek back to Albury.

The arrival of the first railroad from Melbourne in 1873 boosted the district and captured the Southern Riverina markets for Melbourne. The rail line from Sydney reached Albury in 1881, but the first railway bridge over the Murray was not opened until 1883.

The Bethanga-Talgarno gold and copper field became one of the top copper producers in Victoria although both minerals proved difficult to extract from the intractable ores. The alluvial field was first reported in 1852 and was visited by mining officials in 1854, but the field was not really opened up until the discovery of the New Year's Gift reef on 1 January 1876. This led to a number of highly capitalised mining ventures. Harris and Hollow, a mining partnership from Rutherglen, built a smelting works on the flats of lower Bethanga with a view to smelting copper for the public and opened the first furnace of their Great Eastern Copper Smelting works in January 1878. J.A. Wallace MLC took an interest in the Bethanga Mining Scene and purchased mining leases and major mines at Bethanga, then built his own smelting works to treat the ore, completing three furnaces by June 1878. The Bethanga Goldfields Ltd company made a takeover in 1895 and both metals were mined and treated. Mining however, continued only sporadically into the 20th century, with further leads opened at Mt Corryong and Mt. Talgarno. There was a brief revival in the 1930s and some mines struggled on to at least 1945, but in the latter half of the 20th century mining ceased and the town gradually diminished (Bannear).

The concept of damming Australian rivers for irrigation and flood mitigation was first investigated back in the days of the steamers. The Hume Dam was proposed under the River Murray Waters Agreement, which was signed on 9 September 1914, by the Prime Minister, Joseph Cook, and the Premiers of New South Wales, Victoria and South Australia. The first sod was turned by His Excellency, the Right Honourable Sir Ronald Crawford Munro-Ferguson, Governor General of Australia, on 28 November 1919.

H. V. Beresford was construction engineer on the Hume Weir from about 1925, but died while still engaged on the project in 1927. At the height of construction, more than 1100 workers were employed at the site. These workers were housed in two fully serviced towns adjacent to the site, one on either side of the river (River Murray Commission 1928).

Construction of the weir took seventeen years with the reservoir being completed and officially opened by the Right Honourable Lord Gowrie, Governor of NSW, on 21 November 1936 and a plaque on the northern pier of the dam commemorates the occasion. The Bethanga Bridge was evidently constructed in the middle of this period, probably when water backing-up behind the rising dam wall, began to reach the low level bridge at Bethanga.

Three engineers of note were involved in formulating the agreement, E M de Burgh in New South Wales, J S Detheridge in Victoria, and G Stewart in South Australia. The initial designs for Hume Dam were prepared by E M deBurgh, Chief Engineer of the Water Supply Branch of the Public Works Department NSW and J S Detheridge, Commissioner, State Rivers and Water Supply of Victoria. NSW was responsible for construction of the concrete dam and the State Rivers and Water Supply Commission of Victoria was responsible for the southern earth embankments.

Another Victorian engineer, Ettore Checchi (1853-1946) was closely connected with the Hume Dam project in the 1920s and 30s. However, as his skills were with hydrographic work, it is unclear what contribution he had to the associated structures such as Bethanga Bridge. The State Rivers and Water supply Commission undertook at least some of the Hume Weir works in conjunction with the NSW Public Works Department. The River Murray Commission evidently had an overriding supervision of the works, but engineering and design details were left to the established public works engineers in the two states.

The heavy cost of Victoria's irrigation infrastructure lead to a parliamentary inquiry into the Commission's finances in 1928, and recommendations against further irrigation investment in an era of low export returns from primary produce. However, the Hume scheme appears to have been immune to any cuts due to the State - Federal agreement and advanced stage of the project. The NSW Department of Public Works carried out modifications between 1950 and 1961 to enlarge the dam to about twice its original size to the present capacity of 3038 gigalitres to accommodate diverted water from the Snowy Mountains Scheme.

The Place

As a result of the construction of the weir, the water level in the Murray river backed up behind the dam to permanently inundate the floodplain, which was up to several kilometres wide in many places.

Although confirmation of the construction authority is yet to be found, there is later evidence in the form of lantern slides showing the construction of the bridge and clearly intended for public presentation, that the bridge was substantially the work of the SRWSC (SRWSC collection State Library of Victoria Pictures Collection). The involvement of the NSW Public Works Department is also implied by photographs of components fabricated by Charles Ruwolt and Sons held by Museum Victoria. It is therefore very likely that the New South Wales Public Works Department and Victorian State Rivers and Water supply commission were jointly responsible for the design and construction, as was the case with the Hume Dam itself.

Bethanga Bridge is roughly contemporary with and is similar in design to the Yarrawonga Bridge at Lake Mulwala, which was designed by NSW Department of Main Roads Engineer Percy Allen and constructed in 1924, also as a result of the creation of an artificial lake on the Murray River. The other prominent engineers involved in the Hume Project, Ettore Checchi, E M deBurgh, and J S Detheridge, were water supply engineers or had ceased to be involved when the bridge was built.

There was a pattern in NSW/Victoria relationships over the Murray River border for NSW to design Murray River bridges, and Victoria to build them. Other examples of the arrangement can be found in the Swan Hill bridge and many timber bridges. Bethanga bridge is similar to other large NSW bridges such as the Hawkesbury bridges, and uncharacteristic of Victorian bridge design practice.

The sequence of SRWSC lantern slides show the progressive construction of the Bethanga Bridge. Construction commenced in 1927 with clearance of the foundation sites and piling. By 1928 the piers were well under way and staging commenced from each bank. By 1929 all the piers were in place and waters had risen to the base of the piers. Erection of the trusses was underway. Falsework of underslung, divided Warren-type, metal trusses supported on three intermediate steel lattice towers, were used as staging for erecting the Pratt trusses. These were assembled in situ with the use of a travelling crane running across the falsework and hot riveting of preformed, punched and cut angle and flat section steel. As the permanent trusses were completed the staging was dismantled and moved on to the next span (SRWSC collection, State Library Picture Collection). Steel work for the bridge was fabricated at least in part, by Vickers Ruwolt of Burnley Melbourne. Photographs of components such as the truss members and bearings are in the collection of Museum Victoria. At least one of the main trusses was trial assembled at Vickers Ruwolt's Burnley works, probably one of the largest structures to be erected in this fashion.

The bridge was clearly seen as a landmark and complementary to the Hume Dam itself in terms of national pride and potential tourist value. The State Rivers documented the bridge's construction and produced a series of lantern slides showing progress. A number of hand coloured slides and images were produced of the finished bridge to show it at its most impressive. The Victorian Railways also produced its own series of photographs in the 1940s and 50s presenting the bridge as part of a dramatic landscape and engineering achievement, probably for promoting tourist visits (by train) to the region. The bridge has been included in several Postcard series of the natural and man-made features of Albury in the 1950s and 60s under titles such as "A Souvenir of Beautiful Albury" (State Library Picture Collection, Pictoria).

The 13.7 metres approach span on the New South Wales side was constructed in 1963 as part of the upgrading of the Hume Dam.

The town of Bellbridge at the southern end of the bridge, was created to replace facilities inundated by the reservoir. The bridge is currently managed by River Murray Water, although it is understood that the RTA, VicRoads and River Murray Water are negotiating on the future management responsibility for the bridge. A current 33 tonne load limit applies and recent tenders have been advertised for the cleaning and repainting of the bridge (Advertisement for Bethanga Bridge Rehabilitation VicRoads tenders 5858).

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	Building and maintaining public roads-
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	Engineering the public road system-
7. Governing-Governing	Government and Administration-Activities associated with the governance of local areas, regions, the State and the nation, and the administration of public programs - includes both principled and corrupt activities.	Developing roles for government - administering public roads and bridges-


Assessment of significance

SHR Criteria a) [Historical significance]	Bethanga Bridge is of historical significance to New South Wales for its associations with the construction of Hume Dam, a major national undertaking of the early twentieth century. It is also of historical significance for its associations with The River Murray Waters Agreement and the River Murray Commission which had the task of putting the agreement into effect. The Agreement was a landmark document that drew on the cooperation of New South Wales, Victoria and South Australia to regulate the flow of the Murray River. The bridge reflects the engineering and design approaches of the State Rivers and Water Supply Commission and New South Wales Public Works Department in the late 1920s and the influence of American engineering Practice in the use of the Pratt truss. The bridge is also a significant marker of the anticipated development that the new Hume Weir was expected to bring to the region, serving, as it did, only a few small farming communities and the copper and gold mining areas of Bethanga and Talamo, which were already in steep decline at the time the bridge was completed.
SHR Criteria c) [Aesthetic significance]	Bethanga Bridge is of technical significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology based on American engineering practice. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure. Bethanga Bridge is a representative example of Pratt Truss design displaying the main characteristics at a scale that demonstrates the effectiveness of the design over long spans and of its repetition to create a bridge of considerable overall length. Its construction methods are also of note in the use of staged construction from abutments along temporary underslung Warren trusses.
SHR Criteria d) [Social significance]	The bridge is of aesthetic significance for its dramatic rural setting over a wide expanse of water (when lake levels are high) and occasionally at great heights over broad river flats (when the lake is down). It is also of aesthetic significance for the vast scale and length and the rhythmic patterning of repeated geometric motifs of the trusses.
SHR Criteria f) [Rarity]	Bethanga Bridge is of local social significance as an important local tourism destination and as the main link between the Bethanga/Granya region and the regional centre of Albury-Wodonga.
Integrity/Intactness:	As a major bridge built by other than a state road or rail authority, Bethanga Bridge is rare and is the most substantial bridge erected by water authorities. It is the only built structure shared by NSW and Victoria.
Assessment criteria:	The original wooden road surface has been raised once and twice replaced, the railings replaced and the NSW approach modified. Nevertheless, Bethanga Bridge remains substantially the same structure erected in the 1920s.
	Items are assessed against the  State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Procedures /Exemptions

Section of act	Description	Title	Comments	Action date
57(2)	Exemption to	Standard	SCHEDULE OF STANDARD EXEMPTIONS	Sep 5

allow work	Exemptions	<p>HERITAGE ACT 1977 Notice of Order Under Section 57 (2) of the Heritage Act 1977</p> <p>I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order:</p> <p>1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and</p> <p>2. grant standard exemptions from subsection 57(1) of the Heritage Act 1977, described in the Schedule attached.</p> <p>FRANK SARTOR Minister for Planning Sydney, 11 July 2008</p> <p>To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below.</p>	2008
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 **Standard exemptions** for works requiring Heritage Council approval

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - State Heritage Register		01750	26 May 06	68	3217

References, internet links & images

Type	Author	Year	Title	Internet Links
Written			New South Wales Roads and Traffic Authority Heritage Register	
Written	Cridlebaugh Bruce S.		Bridges and Tunnels of Allegheny County, Pennsylvania	View detail 
Written	East, Ronald	1979	Cecchi, Ettore (1853-1946), engineer	
Written	Hughes Trueman Reinhold	1998	Murray River Crossing Study	
Written	Philipp, June	1982	Poor Man's Diggings: Mining and Community at Bethanga, Victoria, 1875-1912	
Written	Philipp, June (ed.)	1993	The making of a mining community : Bethanga, Victoria, 1875-1885	
Written	River Murray Commission (Australia)	1928	Hume Reservoir, Australia	
Written	VicRoads Bridge Design Files	1993	Drawing No 478282, 25/06/1993	
Written	Waddell J.A.L.	1891	The Designing of Ordinary Iron Highway Bridges	

Note: internet links may be to web pages, documents or images.



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Bethanga Bridge

Item details

Name of item:	Bethanga Bridge
Other name/s:	Bethanga Bridge Over The Murray River, Rta Bridge No. 5575
Type of item:	Built
Group/Collection:	Transport - Land
Category:	Road Bridge
Location:	Lat: 147.05575421 Long: -36.08798209
Primary address:	Riverina Highway, Lake Hume Village, NSW 2640
Parish:	Albury
County:	Goulburn
Local govt. area:	Albury City

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Riverina Highway	Lake Hume Village	Albury City	Albury	Goulburn	Primary Address

Statement of significance:

Bethanga Bridge is of State significance. Built between 1927 and 1930, it was the product of the Hume Dam joint venture project of the NSW and Victorian governments. It was a important component of the 1915 River Murray Waters Agreement signed by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River and manage water rights between the three states.

The construction of the Hume Dam whereby the New South Wales Department of Public Works and the Victorian State Rivers and Water Supply Commission were jointly responsible for the design and construction of the bridge. The bridge was designed in New South Wales by Department of Main Roads engineer Percy Allen and the trusses were built by Vickers Ruwolt in Melbourne.

Bethanga Bridge is of scientific (technical) significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology, its construction. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure.

It is a very fine representative of its type and is rare in its location being specifically sited to cross a reservoir and consequently being of great length and having considerable aesthetic appeal

Date significance updated: 13 Oct 10

Note: There are incomplete details for a number of items listed in NSW. The Heritage Division intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Physical description: The Bethanga Bridge was designed by the Department of Public Works in 1926 and was built in 1930. It consisted of nine spans all of which were steel trusses and each of which was 82m in length, except for the first and last which were 81.4m long. In 1963 an extra approach span was added to the NSW side. It is a steel beam span 13.7m in length. The orientation of the bridge is NW - SE.

The deck was originally timber but in 1967 it was replaced by prestressed concrete. In 1969 the trusses were raised 0.31m and the new concrete deck added to the thickness by 0.15m. The handrail is pipe and there is no footway.

According to the RTA bridge card, abutment A is at the Victorian side and abutment B is at the NSW side. Abutment A is supported by a concrete wall the first two supports, last two supports and abutment B consist of concrete columns on concrete footings. The central five support structures are concrete columns on concrete pile caps with driven concrete piles beneath.

Similar bridges on the Murray : Yarrawanga, Abbotsford

Physical condition and/or Archaeological potential:

Original condition assessment: 'Generally sound.' (Last updated: 21/05/1998.) 2007-08 condition update: 'Good.'

Date condition updated: 13 Oct 10

Further information: The Bethanga Bridge is listed on the Victorian Heritage Database (VHR Number H0989).

Current use: Road bridge

Former use: Road bridge

History

Historical notes: After decades of inter- state debate over the implications of diverting the waters of the Murray-Darling system for irrigation, the River Murray Waters Agreement was ratified in 1915 by the parliaments of New South Wales, Victoria, South Australia and the Commonwealth. The agreement, implemented by the River Murray Commission, had as one of its cornerstones the damming of the upper Murray upstream from Albury and Wodonga. When completed in 1936 the Hume Dam was the largest water storage in Australia and Lake Hume which formed behind it backed up water in the Murray Valley for some 90 kilometres. To provide access from Albury to the Victorian peninsula between the Murray and Mitta Mitta rivers when flooding was complete, the Bethanga Bridge was built across the valley and the river in 1926, 1.6 kilometres upstream of the dam. Lake Hume filled around the bridge. With the raising of the dam spillway in 1953-4, the storage capacity of Lake Hume increased and an additional, tenth span was added on the New South Wales side in 1963.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Technology-Activities and processes associated with the knowledge or use of mechanical arts and applied sciences	(none)-
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	(none)-
4. Settlement-Building settlements, towns and cities	Utilities-Activities associated with the provision of services, especially on a communal basis	(none)-

Assessment of significance

SHR Criteria a) [Historical significance] The need for the bridge and the construction of the bridge are directly related to the construction of the Hume Dam. As such it is significant not only as a bridge but as an integral part of this large engineering project which had and still has for reaching control over the development of the area.

The Hume Dam has been ranked in a paper delivered to the 9th National Conference on Engineering Heritage as the 13th most important dam in Australia and the 7th most important

in New South Wales and the most important in Victoria.

SHR Criteria c)

[Aesthetic significance]

The Bethanga Bridge is probably the most impressive bridge or object associated with the Murray River. Because of the large body of water it crosses it has a strong visual impression.

The use of a series of steel trusses with each truss element being a compound section of riveted plates produces a lightweight and transparent structure. There are numerous similarities in design, proportion and date of construction to the Sydney Harbour Bridge.

SHR Criteria d)


[Social significance]

Other than through its historical significance (Criterion 1) the bridge has no additional social significance other than as a link between the states of Victoria and New South Wales by virtue of being a border crossing.

SHR Criteria e)

[Research potential]

The use of compound riveted sections in the steel trusses and the refined details of connections and bearings are representative of bridges of this age (the Sydney harbour bridge has similar detailing). These bridges represent the final level of refinement in steel truss bridges.

Assessment criteria: Items are assessed against the  **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan	Bethanga Bridge	I359	13 Aug 10	105	

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	RMC	1961	The Work of the River Murray Commission	

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name: Local Government

Database number: 1000355

Every effort has been made to ensure that information contained in the State Heritage Inventory is correct. If you find any errors or omissions please send your comments to the [Database Manager](#).

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Heritage and conservation register

Item

Name of Item	Bethanga Bridge over the Murray River
Item Number	4302002
Type of Item	Built
Item Sub-Type	Steel Truss
Roadloc	
Address	**** Riverina Highway (SH 20) Albury 2640
Local Government Area	****
Owner	****
Current Use	Road bridge
Former Use	Road bridge

Statement of significance

Statement of significance	<p>Bethanga Bridge is of State significance. Built between 1927 and 1930, it was the product of the Hume Dam joint venture project of the NSW and Victorian governments. It was a important component of the 1915 River Murray Waters Agreement signed by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River and manage water rights between the three states.</p> <p>The construction of the Hume Dam whereby the New South Wales Department of Public Works and the Victorian State Rivers and Water Supply Commission were jointly responsible for the design and construction of the bridge. The bridge was designed in New South Wales by Department of Main Roads engineer Percy Allen and the trusses were built by Vickers Ruwolt in Melbourne.</p> <p>Bethanga Bridge is of scientific (technical) significance for the unusual use in Victoria of Pratt trusses, a predominantly NSW technology, its construction. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure.</p> <p>It is a very fine representative of its type and is rare in its location being specifically sited to cross a reservoir and consequently being of great length and having considerable aesthetic appeal</p>
Date Significance Updated	13 May 2009

Description

Designer	****
Builder	****
Construction years	**** - 1930
Physical description	<p>The Bethanga Bridge was designed by the Department of Public Works in 1926 and was built in 1930. It consisted of nine spans all of which were steel trusses and each of which was 82m in length, except for the first and last which were 81.4m long. In 1963 an extra approach span was added to the NSW side. It is a steel beam span 13.7m in length. The orientation of the bridge is NW - SE.</p> <p>The deck was originally timber but in 1967 it was replaced by prestressed concrete. In 1969 the trusses were raised 0.31m and the new concrete deck added to the thickness by 0.15m. The handrail is pipe and there is no footway.</p> <p>According to the RTA bridge card, abutment A is at the Victorian side and abutment B is at the NSW side. Abutment A is supported by a concrete wall the first two supports, last two supports and abutment B consist of concrete columns on concrete footings. The central five support structures are concrete columns on concrete pile caps with driven concrete piles beneath.</p> <p>Similar bridges on the Murray : Yarrawanga, Abbotsford</p>
Physical Condition and/or Archaeological Potential	Original condition assessment: 'Generally sound.' (Last updated: 21/05/1998.) 2007-08 condition update: 'Good.' (Last updated: 17/4/09.)
Modifications and dates	****
Date condition updated	17 April 2009

History

Historical notes	<p>After decades of inter- state debate over the implications of diverting the waters of the Murray-Darling system for irrigation, the River Murray Waters Agreement was ratified in 1915 by the parliaments of New South Wales, Victoria, South Australia and the Commonwealth. The agreement, implemented by the River Murray Commission, had as one of its cornerstones the damming of the upper Murray upstream from Albury and Wodonga. When completed in 1936 the Hume Dam was the largest water storage in Australia and Lake Hume which formed behind it backed up water in the Murray Valley for some 90 Idlometres. To provide access from Albury to the Victorian peninsula between the Murray and Mitta Mitta rivers when flooding was complete, the Bethanga Bridge was built across the valley and the river in 1926, 1.6 kilometres upstream of the dam. Lake Hume filled around the bridge. With the raising of the dam spillway in 1953-4, the storage capacity of Lake Hume increased and an additional, tenth span was added on the New South Wales side in 1963.</p>
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Listings

Heritage Listing	Reference Number	Gazette Number	Gazette Page
Heritage Act - s.170 NSW State agency heritage register			
Heritage Act - State Heritage Register	01750	68	3217

Assessment of Significance

Historical Significance	The need for the bridge and the construction of the bridge are directly related to the construction of the Hume Dam. As such it is significant not only as a bridge but as an integral part of this large engineering project which had and still has for reaching control over the development of the area. The Hume Dam has been ranked in a paper delivered to the 9th National Conference on Engineering Heritage as the 13th most important dam in Australia and the 7th most important in New South Wales and the most important in Victoria.
Historical Association	****
Aesthetic/Technical Significance	The Bethanga Bridge is probably the most impressive bridge or object associated with the Murray River. Because of the large body of water it crosses it has a strong visual impression. The use of a series of steel trusses with each truss element being a compound section of riveted plates produces a lightweight and transparent structure. There are numerous similarities in design, proportion and date of construction to the Sydney Harbour Bridge.
Social Significance	Other than through its historical significance (Criterion 1) the bridge has no additional social significance other than as a link between the states of Victoria and New South Wales by virtue of being a border crossing.
Research Significance	The use of compound riveted sections in the steel trusses and the refined details of connections and bearings are representative of bridges of this age (the Sydney harbour bridge has similar detailing). These bridges represent the final level of refinement in steel truss bridges.
Rarity	****
Representativeness	****
Integrity/Intactness	****
Assessed Significance	State

References

Type	Author	Year	Title
Written	RMC	1961	The Work of the River Murray Commission

Study details

Title	Year	Author	Inspected by	Guidelines used
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Custom fields

Roads and Maritime Services Region	South West
Bridge Number	5575
CARMS File Number	****
Property Number	Bridge
Conservation Management Plan	****

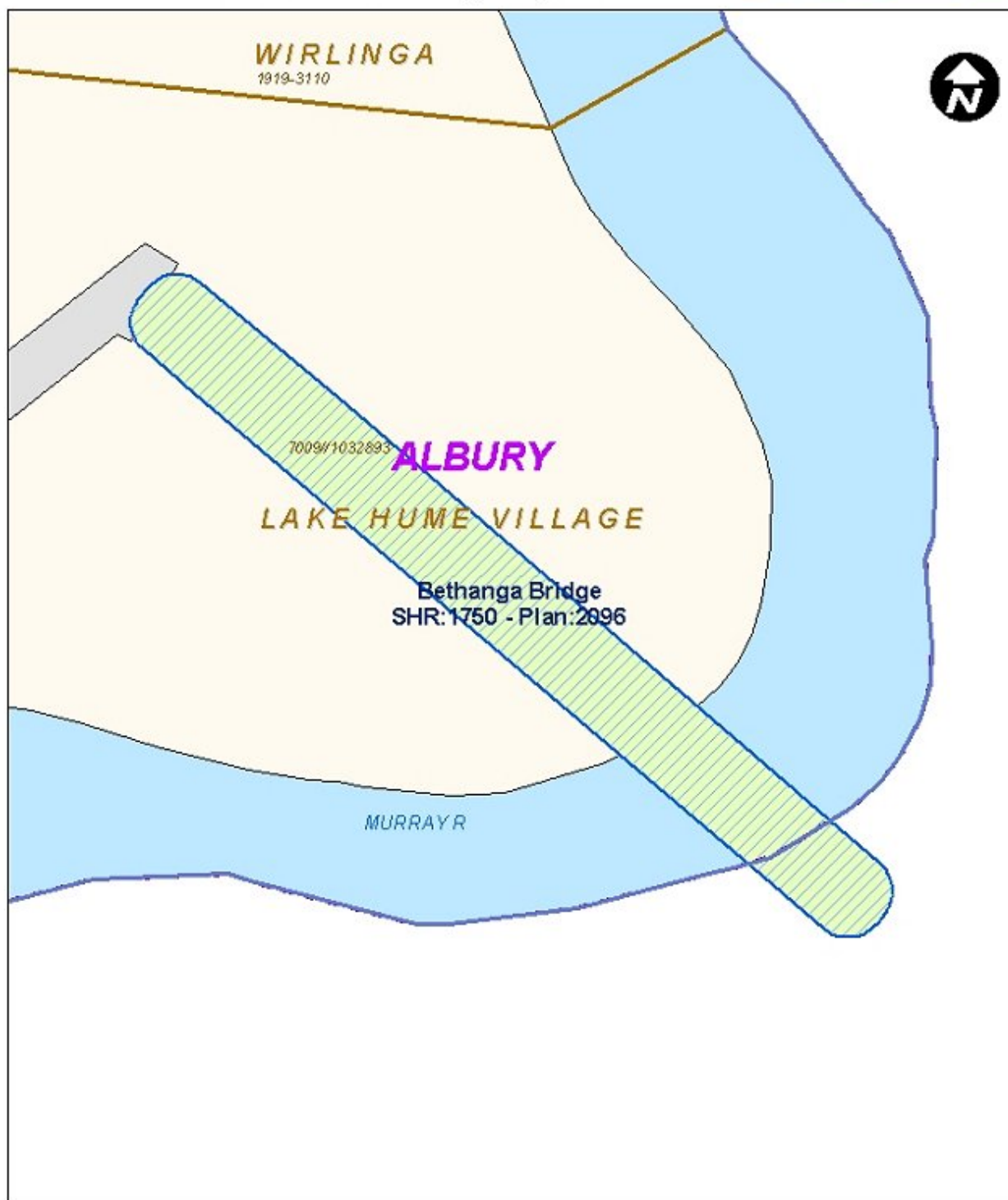
Images



Bethanga Bridge over the Murray River

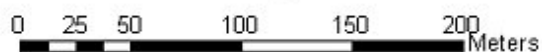
Heritage Council of New South Wales

Plan under the Heritage Act, 1977



State Heritage Register

Gazettal Date: 26 May 2006



Scale: 1:3,000

Produced by: W.H. Nethery

Legend

- SHR Curtilage
- Historic Regions
- LGAs
- Suburbs
- Land Parcels
- Water
- Roads
- Railways
- NSW Reserves

State Heritage Register Curtilage Plan: Bethanga Bridge

Victorian Heritage Database Report

Report generated 28/03/16

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BETHANGA BRIDGE



BETHANGA BRIDGE SOHE 2008



h00989 01 bethanga bridge south from vic 01 jun20044 mz



h00989 bethanga bridge bellbridge south side from nsw jun20044 mz



h00989 bethanga bridge bellbridge north nsw side jun20044 mz



h00989 bethanga bridge bellbridge pratt truss north nsw 01 jun20044 mz



h00989 bethanga bridge bellbridge pratt truss north nsw 02 jun20044 mz



h00989 bethanga bridge bellbridge deck structure jun20044 mz



h00989 bethanga bridge bellbridge pylons 01 jun20044 mz



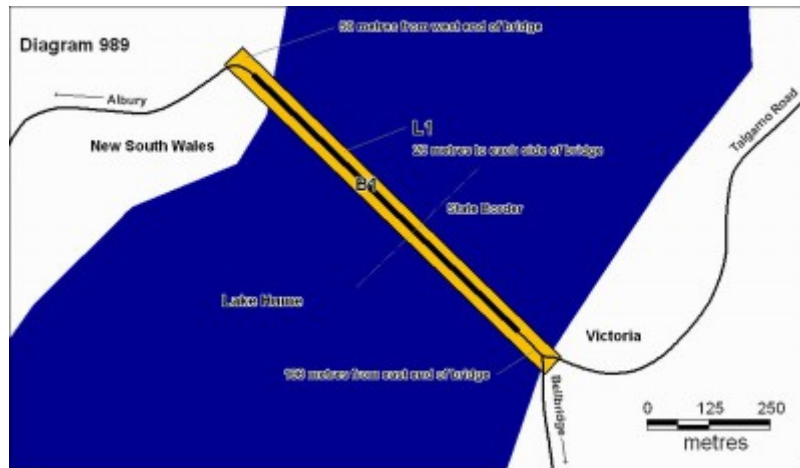
h00989 bethanga bridge bellbridge pylons 02 jun20044 mz



h00989 bethanga bridge south from vic 02 jun20044 mz



h00989 bethanga bridge bellbridge border jun20044 mz



h00989 bethanga bridge bellbridge plan dec2004 mz

Location

TALGARNO ROAD BELLBRIDGE and BETHANGA, Towong Shire (partially in NSW)

Municipality

TOWONG SHIRE

Level of significance

Registered

Victorian Heritage Register (VHR) Number

H0989

Heritage Overlay Numbers

HO10

VHR Registration

July 14, 2005

Heritage Listing

Victorian Heritage Register

Statement of Significance

Last updated on - July 21, 2005

What is Significant?

The Bethanga Bridge, was built between 1927 and 1930 as a joint venture between New South Wales and Victoria as part of the Hume Dam project and as a key element of the River Murray Waters Agreement. The Agreement was put in place in 1915 by the Victorian, New South Wales, South Australian and Federal governments to regulate the flow of the Murray River as a provision against drought and to ensure that the three states received their agreed share of water. The River Murray Commission was created to manage the task of putting the agreement into effect.

The Bethanga Bridge is a road bridge over a flooded section of a Murray River valley that now forms part of the Hume Dam. The bridge consists of nine spans of 82 metres, each span being supported between double reinforced concrete pylons by a riveted steel camel back Pratt truss plus a 14 metre approach span on the New South Wales side. The overall span is 752 metres. The road deck was initially timber but was replaced in 1961 with the current concrete waffle slab deck. The road deck is 7.7 metres wide. In 1961 the bridge deck and truss structure was also raised by 300mm in response to the upgrading of Hume Dam and works to increase the storage capacity of the dam.

The use of Pratt trusses is unusual in Victoria, not being readily taken up as a viable bridge design. However they are more common in New South Wales. The use of the Pratt truss in this instance reflects the mode of construction employed during the construction of the Hume Dam whereby the New South Wales Department of Public Works and the Victorian State Rivers and Water Supply Commission were jointly responsible for the design and construction of the bridge. The bridge was designed in New South Wales by Department of Main Roads engineer Percy Allen and the trusses were built by Vickers Ruwolt in Melbourne.

The Murray River border between New South Wales and Victoria is the top of the southern bank of the river. As such all structures over the river are generally considered to be in New South Wales. However, because of its unique location, over the waters of a dam with the border running down the centre of the body of water, the Bethanga bridge is the only built structure shared by both New South Wales and Victoria.

How is it Significant?

Bethanga Bridge is of historical and scientific (technical) significance to the State of Victoria

Why is it Significant?

Bethanga Bridge is of historical significance to the State of Victoria for its associations with the construction of Hume Dam. It is also of historical significance for its associations with the River Murray Waters Agreement and the River Murray Commission.

Bethanga Bridge is of scientific (technical) significance to the State of Victoria for the use of Pratt trusses in its construction. The Pratt truss was frequently used in New South Wales but this represents a rare example of its use in Victoria. The use of this system in this instance, its design by New South Wales and construction by Victoria, also represents the cooperation of New South Wales and Victoria in the development and ongoing use of major infrastructure.

Permit Exemptions

General Conditions: 1.

All exempted alterations are to be planned and carried out in a manner which prevents damage to the fabric of the registered place or object. **General Conditions: 2.**

Should it become apparent during further inspection or the carrying out of works that original or previously hidden or inaccessible details of the place or object are revealed which relate to the significance of the place or object, then the exemption covering such works shall cease and the Executive Director of Heritage Victoria shall be notified as soon as possible. Note: All archaeological places have the potential to contain significant sub-surface artefacts and other remains. In most cases it will be necessary to obtain approval from Heritage Victoria before the undertaking any works that have a significant sub-surface component. **General Conditions: 3.**

If there is a conservation policy and plan approved by the Executive Director, all works shall be in accordance with it. Note: The existence of a Conservation Management Plan or a Heritage Action Plan endorsed by Heritage

Victoria provides guidance for the management of the heritage values associated with the site. It may not be necessary to obtain a heritage permit for certain works specified in the management plan. **General Conditions: 4.**

Nothing in this determination prevents the Executive Director from amending or rescinding all or any of the permit exemptions. **General Conditions: 5.**

Nothing in this determination exempts owners or their agents from the responsibility to seek relevant planning or building permits from the responsible authorities where applicable. **Regular Site Maintenance :**

The following site maintenance works are permit exempt under section 66 of the Heritage Act 1995, a) regular site maintenance provided the works do not involve the removal or destruction of any significant above-ground features or sub-surface archaeological artefacts or deposits; b) the maintenance of an item to retain its conditions or operation without the removal of or damage to the existing fabric or the introduction of new materials; c) cleaning including the removal of surface deposits, organic growths, or graffiti by the use of low pressure water and natural detergents and mild brushing and scrubbing; d) repairs, conservation and maintenance to plaques, memorials, roads and paths, fences and gates and drainage and irrigation. e) the replacement of existing services such as cabling, plumbing, wiring and fire services that uses existing routes, conduits or voids, and does not involve damage to or the removal of significant fabric. Note: Surface patina which has developed on the fabric may be an important part of the item's significance and if so needs to be preserved during maintenance and cleaning. Note: Any new materials used for repair must not exacerbate the decay of existing fabric due to chemical incompatibility, obscure existing fabric or limit access to existing fabric for future maintenance. Repair must maximise protection and retention of fabric and include the conservation of existing details or elements. **Public Safety and Security :**

The following public safety and security activities are permit exempt under section 66 of the Heritage Act 1995, a) public safety and security activities provided the works do not involve the removal or destruction of any significant above-ground structures or sub-surface archaeological artefacts or deposits; b) the erection of temporary security fencing, scaffolding, hoardings or surveillance systems to prevent unauthorised access or secure public safety which will not adversely affect significant fabric of the place including archaeological features; c) development including emergency stabilisation necessary to secure safety where a site feature has been irreparably damaged or destabilised and represents a safety risk to its users or the public. Note: Urgent or emergency site works are to be undertaken by an appropriately qualified specialist such as a structural engineer, or other heritage professional. **Signage and Site Interpretation :**

The following Signage and Site Interpretation activities are permit exempt under section 66 of the Heritage Act 1995, a) signage and site interpretation activities provided the works do not involve the removal or destruction of any significant above-ground structures or sub-surface archaeological artefacts or deposits; b) the erection of non-illuminated signage for the purpose of ensuring public safety or to assist in the interpretation of the heritage significance of the place or object and which will not adversely affect significant fabric including landscape or archaeological features of the place or obstruct significant views of and from heritage values or items; c) signage and site interpretation products must be located and be of a suitable size so as not to obscure or damage significant fabric of the place; d) signage and site interpretation products must be able to be later removed without causing damage to the significant fabric of the place; Note: The development of signage and site interpretation products must be consistent in the use of format, text, logos, themes and other display materials. Note: Where possible, the signage and interpretation material should be consistent with other schemes developed on similar or associated sites. It may be necessary to consult with land managers and other stakeholders concerning existing schemes and strategies for signage and site interpretation. **Minor Works :**

Note: Any Minor Works that in the opinion of the Executive Director will not adversely affect the heritage significance of the place may be exempt from the permit requirements of the Heritage Act. A person proposing to undertake minor works may submit a proposal to the Executive Director. If the Executive Director is satisfied that the proposed works will not adversely affect the heritage values of the site, the applicant may be exempted from the requirement to obtain a heritage permit. If an applicant is uncertain whether a heritage permit is required, it is recommended that the permits co-ordinator be contacted.

Painting:

Painting will not require permit approval if the painting: a) does not involve the disturbance or removal of earlier paint layers other than that which has failed by chalking, flaking, peeling or blistering; b) involves over-coating with an appropriate surface as an isolating layer to provide a means of protection for significant earlier layers or to provide a stable basis for repainting; c) employs the same colour scheme and paint type as an earlier scheme if they are appropriate to the substrate and do not endanger the survival of earlier paint layers.

If the painting employs a different colour scheme and paint type from an earlier scheme a permit will not be required if a) the Executive Director is satisfied that the proposed colour scheme, paint type, details of surface preparation and paint removal will not adversely affect the heritage significance of the item; b) the person proposing to undertake the painting has received a notice advising that the Executive Director is satisfied.

If the painting employs a different colour scheme and paint type from an earlier scheme a permit will not be required if a) the Executive Director is satisfied that the proposed colour scheme, paint type, details of surface preparation and paint removal will not adversely affect the heritage significance of the item; b) the person proposing to undertake the painting has received a notice advising that the Executive Director is satisfied. Any proposal to undertake such work should be submitted to the Executive Director, detailing the proposed colour scheme, paint type, details of surface preparation and paint removal involved in the repainting, for approval.

Road Works

The following works to the road portion of the place is permit exempt: a) The resurfacing of the road and maintenance to the road surface; b) lane marking; c) erection of speed and traffic signs.

The installation of traffic lights may be permit exempt if the Executive Director is satisfied that the heritage significance and the significant fabric of the place will not be adversely affected by such an installation. Any proposal to undertake such work should be submitted to the Executive Director for approval.

Heritage Act Categories Heritage place,

Hermes Number 12738

Property Number

History

Built 1927-30; raised and strengthened 1961; new deck ("waffle slab") 1970.

Extent of Registration

1. All of the place known as the Bethanga Bridge over Hume Dam, Bellbridge, including all of the bridge and its support structure, the abutments, the roads and embankments marked (B1) on Diagram 989 held by the Executive Director.

2. All of the land marked L1 on Diagram 989 held by the Executive Director.

[Note: northern half of bridge is in New South Wales]

This place/object may be included in the Victorian Heritage Register pursuant to the Heritage Act 1995. Check the Victorian Heritage Database, selecting 'Heritage Victoria' as the place data owner.

For further details about Heritage Overlay places, contact the relevant local council or go to Planning Schemes Online <http://planningschemes.dpcd.vic.gov.au/>

Victorian Heritage Database Report

Report generated 28/03/16



Bethanga Bridge over Hume Weir (Murray Arm)

Location

Talgarno Road and Murray River Road, BELLBRIDGE, TOWONG SHIRE

Municipality

TOWONG SHIRE

Level of significance

File only

Victorian Heritage Register (VHR) Number

H0989

Heritage Listing

National Trust

Statement of Significance

Last updated on - July 27, 2005

STATEMENT OF CULTURAL HERITAGE SIGNIFICANCE (Draft only)

What is significant? The Bethanga Bridge is a long, nine-span, riveted-steel, variable depth, Pratt Truss road bridge of nine principle spans of 82m. and a total length of 752m. over the flooded valley of the Murray River, now part of Hume reservoir. The bridge dates back to 1927-1930 when the Hume Weir was completed and the backed-up waters inundated this section of the river and consequently cut off the old low level bridge over the Murray. The State Rivers and Water Supply Commission and the New South Wales Department of Public Works were responsible for the construction works for the Hume Weir under the River Murray Waters Agreement. It is apparent that the similar joint arrangement was made for the construction of the Bethanga Bridge as part of the Hume Weir works. Victor Ruwolt fabricated the truss spans.

How is it significant? Bethanga Bridge is of historical significance for its association with the construction of Hume Weir as a major national undertaking in the early twentieth century. Apart from the weir itself, it is the most substantial visible construction at the Hume Weir, which relates to the Murray Rivers Water Agreement signed by the three states and the Federal Government in 1914. The bridge reflects the engineering and design approaches of the Victorian State Rivers and Water Supply Commission and New South Wales Public Works Department in the late 1920s and the influence of American engineering practice in the use of the Pratt Truss. The bridge is also significant as a marker of the anticipated development that the new weir was expected to bring

to the region, serving as it did, only a few small farming communities and the copper and gold mining areas of Bethanga and Talgarno, which were already in steep decline at the time the bridge was completed.

As a major bridge built by other than a state road or rail authority, it is unusual, and is the most substantial bridge erected by water authorities, which otherwise were responsible for large numbers of smaller bridges needed to cross the drainage and irrigation channels downstream of irrigation reserves such as Hume. It compares with the other known SRWSC constructed bridge - Glenmaggie Bridge - but on a much larger scale commensurate with the scale of the Hume Weir.

It is of technical significance as the second longest metal road bridge in Victoria (after only the West Gate Bridge), the longest metal truss road bridge, with the greatest number of spans (9) of any truss bridge in Victoria, and the fourth longest bridge of any type in Victoria. It is also significant for the form of a Pratt Truss design, which is rare in Victoria and Australia, occurring on only a handful of large road and rail bridges. Its construction methods are also of note in the use of staged construction from abutments along temporary underslung warren trusses. It is of interest for the documented trial assembly of the spans at Vickers Ruwolt in Melbourne, which was probably one of the largest structures to be constructed by this significant Victorian engineering works.

It is of aesthetic or architectural significance for its dramatic rural setting over a wide expanse of water at high lake levels, and occasionally at great heights over broad river flats when the lake is down. It is also of aesthetic significance for the vast scale and length and the rhythmic patterning of repeated geometric motifs of the trusses.

It is of social significance as an important local tourism destination, and as the main link between the Bethanga/Granya region and the main regional cities of Albury-Wodonga. The expanse of Hume Weir that extends 70 kilometres up the Murray River and 40 kilometres up the Mitta Mitta almost encircles the area between and means the Bethanga Bridge is the only practical access route.

Other Names National Trust Bridges Database Reg. No.4293, VicRoads Structure ID> SN8099,

Hermes Number 71578

Property Number

This place/object may be included in the Victorian Heritage Register pursuant to the Heritage Act 1995. Check the Victorian Heritage Database, selecting 'Heritage Victoria' as the place data owner.

For further details about Heritage Overlay places, contact the relevant local council or go to Planning Schemes Online <http://planningschemes.dpcd.vic.gov.au/>

Appendix 7

EPBC Protected Matters Search

Acknowledgements

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

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Parks and Wildlife Commission NT, Northern Territory Government](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence
Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

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

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

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+61 2 6274 1111

Caveat

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

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

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-36.0934 147.0452

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		within area Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Plants

Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name	State	
Lake Hume	VIC	
Ryan's Lagoon	VIC	

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Bonegilla N.C.R.	VIC
Bonegilla Wetland B.R.	VIC
River Murray Reserve	VIC
River Murray Reserve (non-PV)	VIC
Ryans Lagoon N.C.R.	VIC

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
North East Victoria RFA	Victoria

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

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

Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area

Migratory Wetlands Species

Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Defence - WIRLINGA ORDNANCE DEPOT

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

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Status	Type of Presence
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Caladenia concolor Crimson Spider-orchid, Maroon Spider-orchid [5505]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tensa Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat likely to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needle-tail [682]		Species or species habitat likely to occur within area

Details

Matters of National Environmental Significance

National Heritage Properties			[Resource Information]
Name	State	Status	
Historic			
Bonegilla Migrant Camp - Block 19	VIC	Listed place	

Wetlands of International Importance (Ramsar)		[Resource Information]
Name	Proximity	
Banrock station wetland complex	600 - 700km upstream	
Barmah forest	100 - 150km upstream	
Gunbower forest	200 - 300km upstream	
Hattah-kulkyne lakes	400 - 500km upstream	
Nsw central murray state forests	100 - 150km upstream	
Riverland	500 - 600km upstream	
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream	

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Breeding known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area

Fish

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	19
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	34
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

Report created: 02/02/16 14:57:33

[Summary](#)

[Details](#)

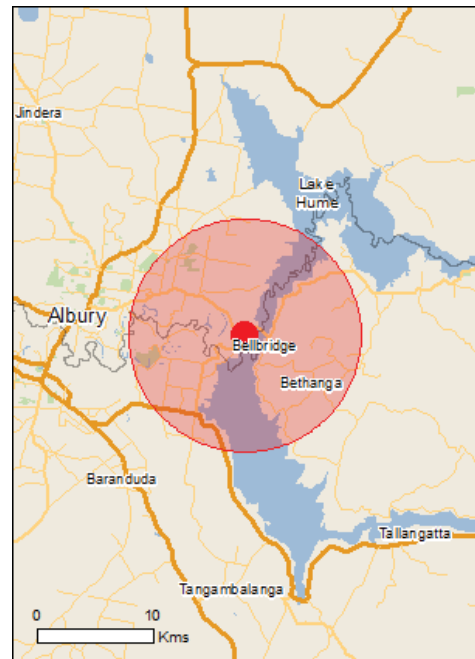
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

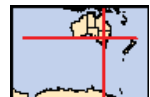
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Appendix 8

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
<p>a. Any environmental impact on a community? Positive socio-economic impact on the communities of Lake Hume Village and surrounds (see Section 6.9). Safeguards include clear delineation of vegetation removal where vegetation to be retained would be fenced. See Section 6.1.</p>	<p>Minor positive/ minor negative</p>
<p>b. Any transformation of a locality? Removal of vegetation, excavation and fill deposition, new road construction would result in a temporary reduction in visual amenity. All measures would be carried out to minimise this impact. See Section 6.9.</p>	<p>Minor negative – short term</p>
<p>c. Any environmental impact on the ecosystems of the locality? Native and non-native vegetation would be removed as part of the proposal. Safeguards include the clear delineation of the vegetation removal area. An assessment of significance has been carried out for potential threatened biota in the BIA, Appendix 3. Also see Section 6.1.</p>	<p>Minor negative</p>
<p>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? Removal of vegetation, excavation and fill deposition and construction would result in a temporary reduction in visual amenity. All measures would be carried out to minimise this impact. See Section 6.9.</p>	<p>Minor negative – short term</p>
<p>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? Removal of vegetation, excavation and fill deposition and construction would result in a temporary reduction in visual amenity. All measures would be carried out to minimise this impact It is unlikely that this proposal would have a significant impact on visual amenity. See Section 6.9.</p>	<p>Minor negative - short term</p>
<p>f. Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)? There is the potential for removal a small amount of habitat for Squirrel Glider and of a minor amount of potential foraging habitat for some threatened and migratory species. An assessment of the significance has been carried out in the BIA, Appendix 3.</p>	<p>Minor negative</p>
<p>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? An assessment of significance has been carried out, for threatened species which occur or have the potential to occur in the area in the BIA, Appendix 3. The Significance Assessments concluded that a significant impact is unlikely.</p>	<p>Nil</p>

Factor	Impact
<p>h. Any long-term effects on the environment? The proposed work would have positive long-term effects on the environment due to improved safety for road users.</p>	Long term positive
<p>i. Any degradation of the quality of the environment? The proposal would have a minimal impact on the quality of the environment. Safeguards and management measures area described in Section 6 to mitigate potential impact.</p>	Minor negative
<p>j. Any risk to the safety of the environment? The work would increase the safety of the environment by creating a safe road environment for road users.</p>	Long term positive
<p>k. Any reduction in the range of beneficial uses of the environment? Vegetation removal would result in the reduction of fauna habitat however this is considered a very minor reduction of beneficial uses of the natural environment considering the marginal nature of the habitat present. See Section 6.1.</p>	Minor negative
<p>l. Any pollution of the environment? There is the potential for pollution of the environment however mitigation measures described in Section 6 would mitigate this potential impact.</p>	Minor negative - short term
<p>m. Any environmental problems associated with the disposal of waste? The proposal would not create any environmental problems associated with the disposal of waste.</p>	Nil
<p>n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not increase demands on resources in short supply.</p>	Nil
<p>o. Any cumulative environmental effect with other existing or likely future activities? Cumulative environmental effects include the reduction in potential for vehicle accidents at the intersection improving the flow of this section of Riverina Highway. There would also be some cumulative impact associated with other road work in the region on traffic, social and biodiversity (see Section 6).</p>	Minor negative - short term, Positive long term
<p>p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? There would be no impact to coastal processes or hazards.</p>	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment.

If an impact is likely, state whether it is likely to be minor or significant. If no impact is likely, write "nil".

Factor	Impact
a. Any impact on a World Heritage property?	Nil
b. Any impact on a National Heritage place?	Nil
c. Any impact on a wetland of international importance?	Nil
d. Any impact on a listed threatened species or communities? There is the potential for removal of some habitat for Squirrel Glider and a minor amount of potential foraging habitat for some threatened and migratory species. An assessment of the significance has been carried out in the BIA, Appendix 3. The impact is considered to be minor and unlikely to significantly impact these species.	Minor
e. Any impacts on listed migratory species? There is the potential for removal of a minor amount of potential foraging habitat for some migratory species. An assessment of the significance has been carried out in the BIA, Appendix 3. The impact is considered to be minor and unlikely to significantly impact these species.	Minor
f. Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine are	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposal would not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposal would not impact (either directly or indirectly) on Commonwealth land.	Nil



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