Great Western Highway Upgrade - Medlow Bath

Review of Environmental Factors

Transport for NSW | July 2021

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Executive summary

The proposal

Transport for NSW (TfNSW) is proposing to upgrade a 1.2 kilometre section of the Great Western Highway at Medlow Bath, between Railway Parade and around 330 metres south of Bellevue Crescent (the proposal). The upgrade will provide a safer, more efficient link between Central West NSW and the Sydney Motorway network. Key features of the proposal include:

- upgrade of the existing highway to a four-lane divided carriageway allowing for two lanes of traffic in each direction, either side of a central median with planted trees
- upgrade of the Bellevue Crescent intersection with new turning lanes, U-turn bay and traffic signals
- a new right turn lane providing access to the Hydro Majestic Hotel
- improvements on Railway Parade to formalise parking provisions, U-turns and rail customer parking
- new indented bus bays on both sides of the highway close to Medlow Bath Station
- construction of a new pedestrian bridge, stairs and lifts to provide an accessible path of travel between the bus bays, the Medlow Bath Station platforms and Railway Parade
- new shared path for pedestrians and cyclists on the western side of the highway
- ancillary works such as the replacement of road surfaces, reconstruction works associated with local roads, driveways, footpaths, kerbs, gutters and retaining walls, drainage works and relocation of services.

Construction of the proposal is anticipated take around 20 months to complete, weather permitting.

The proposal is located about 90 kilometres west of the Sydney Central Business District in the Blue Mountains local government area (LGA). The Great Western Highway at Medlow Bath follows a narrow and difficult alignment constrained by the Blue Mountains National Park, steep topography, a railway line and existing villages for which the highway acts as the main street.

Need for the proposal

The Great Western Highway Upgrade will reduce congestion, deliver safer, more efficient and reliable journeys for those travelling in, around and through the Blue Mountains, and better connect communities in the Central West. Over the last decade, the NSW Government has progressively upgraded sections of the Great Western Highway to make it safer and more reliable for all road users. The Upgrade Program will complete and realise the potential of decades of work in upgrading the Great Western Highway across the Blue Mountains, completing the final 34 kilometre link in a modern dual carriageway roadway.

The upgrade of the Great Western Highway between Katoomba and Lithgow, including Medlow Bath, is supported by reference to several strategic planning and policy documents including *NSW Future Transport Strategy 2056* (TfNSW, 2018a) and the *NSW Freight and Ports Plan* (TfNSW, 2018b). The proposal is needed to provide a safer and more efficient link between Central West NSW and the Sydney Motorway network for freight, tourist and general traffic.

Average daily traffic volumes vary from around 20,000 vehicles per day near Katoomba to around 8,500 vehicles per day towards Forty Bends and are growing between 1-1.7 per cent per annum. There is a relatively high proportion of heavy vehicles along the corridor (between 12 and 24 per cent) with 18,500 tonnes of freight transported each day (10,300 towards Sydney and 8,500 towards the Central West). Upgrading the highway from two lanes to four lanes would provide travel time savings for all traffic users and would largely maintain those savings well into the future. Without an upgrade, travel times would worsen, while congestion would deteriorate to unacceptable levels.

The results of crash data analysis in Medlow Bath over a five-year period ending in 2019 revealed an existing safety concern at Bellevue Crescent with 44 per cent of total crashes occurring at this location. The pedestrian refuge island is also highly susceptible to near miss incidents involving pedestrians and highway traffic due to its geometry and placement. The proposal would address known safety concerns and provide ongoing safety benefits for local traffic and pedestrians.

Proposal objectives

The objectives of the proposal are to:

- reduce actual and perceived safety risks
- improve ability to drive regional economic development and freight productivity
- provide a dependable and adaptable transport network that enables continuity of transport and essential services
- improve transport network efficiency
- maintain and enhance local amenity and character, and protect environmental and cultural assets.

Options considered

Since the 1950s, corridor options have been considered through Medlow Bath and beyond. All corridor options at Medlow Bath have focused on using the existing corridor which was set aside for future widening. The bridge over the railway was completed in 2002, made allowances for a future four-lane highway alignment.

In 2013, planning and investigations for the duplication of the Great Western Highway for the entire corridor between Katoomba and Lithgow were undertaken to inform the Local Environmental Plan corridor reservation. All options reconfirmed the use of the existing corridor through Medlow Bath.

The options analysis included consideration of function, constructability, environment, property, community and costs issues, and it was determined that a strategic design for the upgrade of the highway at Medlow Bath including intersection improvements and a new pedestrian bridge would be prepared as the preferred option. Since the strategic design was placed on public display in July 2020, further design refinements have been undertaken for the preferred option in response to feedback received, this included:

- traffic lights at Bellevue Crescent to make accessing the crescent safer and to slow and control traffic entering the 60 kilometre per hour zone in Medlow Bath
- a U-turn bay at Bellevue Crescent to help traffic change direction to access the service station and other properties on the eastern side of the highway
- Station Street would remain open to two-way traffic and the existing property access would remain
- retaining walls along Station Street have been removed by keeping levels close to the existing conditions
- better separation between the shared pathway and the highway with a one metre vegetated buffer in addition to the road shoulder
- improved landscaping using as many of the existing council-planted trees, along with new trees to improve the look and feel of Medlow Bath. Every tree removed including the failing radiata pines along the highway would be replaced as part of the upgrade program
- safer access for residents whose properties directly access the highway, with relocated driveways to be installed as part of the proposal.

As part of the Great Western Highway Upgrade Program, two options were considered for the upgrade of the Medlow Bath section of the highway (the proposal):

- a 'do nothing' option would retain the Great Western Highway with no change to the existing infrastructure. This option was not progressed as part of the options analysis as it would not achieve the objectives of the proposal.
- upgrade of the highway at Medlow Bath including intersection improvements and a new pedestrian bridge (the proposal).

Statutory and planning framework

The proposal is for a road and road infrastructure facilities and is to be carried out on behalf of TfNSW. Under the provisions of the *State Environmental Planning Policy (Infrastructure) 2007*, such works can be undertaken by a public authority without development consent and can be assessed and determined under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

TfNSW is the determining authority for the proposal. This review of environmental factors (REF) fulfils TfNSW's obligation under Section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The proposal does not require development consent or approval under the *State Environmental Planning Policy (Coastal Management) 2018*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (State Significant Precincts) 2005*.

The proposal is not likely to significantly impact threatened species and ecological communities, within the meaning of the *Biodiversity Conservation Act 2016* (BC Act), therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to have a significant impact on an endangered ecological community, within the meaning of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance. However, a referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted to TfNSW, under the EPBC Act by the Australian Government in September 2015.

The following approvals, licenses and permits would be required before proposed work is undertaken:

- road occupancy licence under the *Roads Act 1993* for temporary road closures
- A Section 60 application under the *Heritage Act 1977* would be required for proposed works within the State Heritage Register (SHR) curtilage of Medlow Bath Railway Station
- An environment protection licence for scheduled development work and the carrying out of scheduled activities (as set out in Schedule 1 of the *Protection of the Environment and Operations Act 1997.*

Community and stakeholder consultation undertaken to date

TfNSW has consulted with the community and relevant agencies and stakeholders throughout the strategic and concept design development of the proposal.

Community consultation has focused on but not limited to the residents and business owners of Medlow Bath and relevant government agencies including Blue Mountains City Council, Sydney Trains, NSW TrainLink, WaterNSW, Sydney Water and utility providers.

Consultation with the Aboriginal community was undertaken following the TfNSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). A PACHCI Stage 2 report and *Great Western Highway, Katoomba to Mount Victoria: Aboriginal Archaeological Survey Report* (PACHCI Stage 2)

(Artefact, 2015a) was prepared and details the results of the consultation. Further consultation was undertaken with the Registered Aboriginal Parties for the proposal and documented within the *Great Western Highway Duplication – Katoomba to Lithgow Archaeological Survey Report* (Jacobs, 2020).

More information on consultation undertaken as part of the wider Great Western Highway Upgrade program is available at **nswroads.work/gwhd**

Environmental impacts

A number of technical specialist assessments were undertaken to assess the potential impacts of the proposal and to identify measures to avoid, minimise and mitigate potential environmental impacts. An overview of the key environmental impacts of the concept design for the proposal is provided below.

Biodiversity

The concept design for the proposal has utilised, where possible, disturbed areas in preference to native vegetation but would result in the clearing of about 0.36 hectares of vegetation. This includes 0.34 hectares of vegetation identified as plant community type (PCT 1248) Sydney Peppermint – Silvertop Ash which was observed to be of moderate and poor condition. No Threatened Ecological Communities would be directly impacted by the proposal.

The loss of vegetation would have a minor impact on the habitat of highly mobile threatened fauna species in the local area including foraging habitat for species capable of utilizing roadside margins such as the Gang Gang Cockatoo, Little Lorikeet, Scarlet Robin and Varied Sittella.

An assessment of significance was prepared in accordance with the BC Act and EPBC Act for identified impacts on potentially affected threatened species and ecological communities. The assessment concluded that the proposal is not likely to have a significant impact to threatened biodiversity.

As there will be residual impacts to biodiversity, mitigation measures guided by the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) would be implemented during construction and operation to further reduce the potential ecological impacts of the proposal. No biodiversity offsets are required for the proposal.

Hydrology and flooding

Construction activities would involve earthworks and other ground disturbing activities that would increase the risk of sedimentation either through vehicle movements, or wind/water runoff. Such earthworks may also increase the risk of blockages to waterways and drainage lines resulting in localised flooding or scour impacts. These impacts are expected to be minor and would be managed through the implementation of standard sedimentation and drainage measures.

The proposal includes changes in the road geometry and widening which would create an increase in the paved area. This can change existing flood behaviour and alter the flood risk to receivers during operation. Based on hydrological modelling, upstream impacts are generally considered minor given there would be limited vertical changes, and the flows could largely be accommodated by the existing and upgraded drainage structures to be provided. Downstream flooding impacts would be managed through the installation of new detention basins and drainage upgrades.

Scour potential would be increased with higher velocities and larger flow rates than experienced under existing conditions. Appropriate scour protection to ensure suitable velocity and peak flow protection would be undertaken during detailed design.

Surface and groundwater

In addition to sedimentation and scour impacts which can contribute to poor water quality there is also a risk of releasing potentially harmful chemicals and other substances in the environment due to spills both during construction and operation. Groundwater impacts during construction and operation include risks to

groundwater quality as a result of spills or poor management of groundwater encountered during earthworks.

While the proposal would increase the pavement area and introduce new drainage discharge structures which can contribute to water quality risks, a number of mitigation measures have been included as part of the concept design including level spreaders to limit scour potential at discharge locations and detention basins with integrated bioretention to provide stormwater filtration and treatment before releasing flows to the environment.

The Neutral or Beneficial Effect (NorBE) assessment carried out for the proposal (which is a requirement as the proposal is located within the Sydney Drinking Water Catchment) found that assuming the mitigation recommendations are adopted, the proposal would achieve a beneficial outcome with regard to surface water quality. Impacts to groundwater were considered to be negligible.

Soils and contamination

Ground disturbing activities such as vegetation clearance, earthworks, stockpiling etc increase erosion potential which can lead to sedimentation from increased soil exposure, and which in turn can affect local surface water quality. There is potential for recently disturbed soils to be susceptible to erosion, which could occur during initial periods of landscaping and re-establishment of vegetation. This may occur in areas where soft landscaping is proposed for the proposal, including open space areas at Medlow Bath Station, adjacent to disturbed areas, along embankments and in the reinstatement of temporary ancillary facilities prior to vegetation establishing. In terms of soil stability, retaining walls are proposed along the highway alignment to provide support and ensure long term erosion or collapse risks are eliminated.

Preliminary investigations of the proposal area identified potential sources of contamination which included a petrol station, unknown fill material, utility conduits presumed to contain asbestos and stockpiled materials. During construction there is a risk of disturbance to soil layers that potentially contain these contaminants. During operation, the likely sources of contamination would be from exhaust particles and discharges from vehicle engines, litter and other waste, materials from vehicle incidents and wear from vehicle parts such as tyres. This would be managed through the installation of dedicated diversion equipment for the storage of spills to avoid direct discharge to receiving watercourses.

Traffic and transport

During construction, traffic and transport impacts and risks include:

- potential increases in vehicle movements and changes to traffic flows which may lead to short traffic delays, for example:
    - a temporary road closure of one hour would be required to allow for the operation of a crane to lift in and install the new pedestrian bridge
    - other temporary partial road or lane closures would be required at times to allow for road works (such as new pavement, kerb and gutter works) however it is proposed that alternating one-way traffic flow would be able to be maintained
- changes for pedestrians and cyclists accessing the station and surrounding footpath/road network which could mean detours and longer walking/cycling distances
- delays to buses on the Great Western Highway and temporary reduction in accessibility to bus stops as some bus stops would need to be relocated particularly where work activities being undertaken within the highway corridor.

The number of truck movements to the work sites during construction is unknown at this stage, however based on similar projects is likely to be less than 200 per day. Trucks movements would be distributed throughout the day equating to less than 30 movements per hour based on an eight-hour workday. This additional traffic is unlikely to have a significant impact on the road network. Similarly, there is expected to be an increase in light vehicle movements but the traffic assessment concluded that there is sufficient capacity to accommodate the additional traffic.

There are a number of properties with direct access to the road network within the proposal area. Access to affected properties would be maintained throughout. Temporary property access would be provided where required.

Overall, the proposal would improve the existing performance of the highway including accommodating future increases to traffic volumes in 2036. Alterations to the existing alignment, particularly the signalised control system and U-turn bay at Bellevue Crescent and the addition of right turn bays eastbound into key amenities would improve the safety of vehicles and the community.

Other positive impacts of the proposal include:

- improved traffic flows which would benefit local and regional traffic. In particular, the upgraded highway would be able to support longer, heavier vehicles that are able to transport more freight per vehicle
- improved safety for vehicles with upgraded intersections at Bellevue Crescent and the Hydro Majestic Hotel with new turning lanes, U-turn bay, signalisation, lane markings and signage
- minimising potential for pedestrian/vehicle conflicts through the installation of a new pedestrian bridge, stairs and lifts that would provide an accessible path of travel across the highway and to public transport facilities
- enhanced public transport facilities including new kiss and ride and indented bus bays which would provide a safe location for customers to transfer between modes
- a new shared path for pedestrians and cyclists which would also help to improve safety, as well as promote better health and encourage tourism by enhancing connections to existing trails
- additional commuter parking at Railway Parade, including accessible parking.

Noise and vibration

Background noise monitoring was undertaken in December 2020 and used to calculate Noise Management Levels for the construction phase of the proposal in accordance with the methodology in the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009).

Noise modelling of the indicative construction activities and stages indicates there would be exceedances of the Noise Management Levels during construction works, due to the small offset distance between the proposal and sensitive receivers. During construction, a small number of receivers would be highly affected with noise levels potentially exceeding 75 dBA at some point during the works. The noisiest stage is predicted to be vegetation clearing due to the operation of equipment like chainsaws, but which would last only two weeks. Out of hours works, which may include evening or night-time works, would be required for certain activities such as pedestrian bridge works and road works and may also result in exceedances of Noise Management Levels.

With respect to additional traffic movements, the increase in noise from construction traffic is predicted to be less than 0.1 dB, and the additional movements would have a negligible impact on the local noise environment.

Minimum safe working distances have been included in the REF to minimise vibration impacts to human comfort and buildings (including heritage items).

Operational noise has been assessed in accordance with the *Road Noise Policy* (Department of Environment, Climate Change and Water, 2011) and the *Noise Criteria Guideline* (Roads and Maritime, 2015a). High existing noise levels were identified throughout the proposal area which would continue in the future, with or without proposal. A total of 13 receivers have been identified in the noise modelling as exceeding applicable design noise criteria and are eligible for consideration of additional noise mitigation, such as architectural treatment, which would be undertaken during detailed design.

Aboriginal cultural heritage

Construction would include excavation and other ground disturbing activities which can potentially impact Aboriginal archaeology, if present. There are no known Aboriginal sites identified within the proposal area. In addition, the proposal area has undergone extensive landscape modification and high level of disturbance from previous transport development which has been documented as part of previous Aboriginal heritage investigations (Jacobs, 2020). Therefore, there is a low likelihood that the proposal would impact any previously unidentified culturally sensitive items.

Non-Aboriginal heritage

There are a number of listed heritage items located within the proposal area, adjacent to or in the vicinity of the proposal, along with a number of potential heritage items that were identified during site inspections. Impacts to heritage items can be direct (eg physical impacts to heritage fabric such as their partial or complete removal) or indirect (such as affecting views or vistas of heritage value). There are also risks to subsurface archaeology where historical evidence of past land use may be adversely impacted by ground disturbing works.

A summary of the impacts to those items potentially directly impacted by the proposal is included in the table below. This includes works within the curtilage of the State heritage listed Medlow Bath Railway Station and a Section 60 application under the NSW *Heritage Act 1977* would be submitted seeking approval for the proposal from the Heritage Council of NSW.

Impacts to other listed or potential heritage items adjacent to or in the vicinity of the proposal have also been assessed and include generally minor to major visual impacts. The proposal area has been assessed to be of low archaeological potential. Potential impacts due to excavation is considered to be unlikely. However, the proposal may have a moderate to major adverse impact on the archaeological potential of the proposal area, if archaeological resources survive.

Item	Significance	Potential impact	Potential impact on significance by proposal
Medlow Bath Railway Station Group	State	While the proposal would not physically impact significant fabric, the partial removal of elements such as the garden beds and the alteration of its heritage setting would impact the overall significance of the station. The addition of a pedestrian bridge would add an additional built form to the station complex which would visually dominate the heritage item.	The proposal would have a minor adverse physical impact and a major adverse visual impact on this heritage item.
Avenue of Trees	Local	The proposal would impact and greatly reduce the heritage curtilage and likely impact critical root zones of trees, or require the removal of trees altogether. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item.	The proposal would have a moderate to major adverse physical impact and a moderate to major visual impact on this heritage item.
Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic)	Local	No physical impact is proposed within the heritage curtilage of this item for the preferred design option. No walking tracks associated with this heritage item appear to be within the alternate design proposal area, therefore the alternate design proposal would have no physical impact on significant fabric of this heritage item.	The proposal 'preferred option' would have little to no physical impact and a moderate adverse visual impact on this heritage item. However, the proposed 'alternate design' for Bellevue Crescent would have an additional minor adverse impact on this heritage item through the

Item	Significance	Potential impact	Potential impact on significance by proposal
			reduction of its heritage curtilage
Hydro Majestic	Local	No physical impact is proposed within the heritage curtilage, however vibration from construction may have a minor to moderate adverse impact to the significant fabric of the stone fence by causing destabilisation. Additionally, excavation works associated with the proposal may have a minor to moderate adverse impact on significant trees *radiata pinus* located within the Hydro Majestic's heritage curtilage through impact to critical root zones. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item. The proposed alternate design for Bellevue Crescent would have an additional minor adverse impact on this heritage item through the reduction of its heritage curtilage and impact on potentially significant pine plantings and archaeological resources.	The proposal may have a minor to moderate adverse physical impact and would have a moderate to major adverse visual impact on this heritage item.
Medlow Bath Bus Shelter (potential heritage item)	Local	While removal of the bus shelter is required for the proposal, this would be mitigated by relocating the bus shelter elsewhere within the township, enabling it to retain its mural and setting within Medlow Bath and the Blue Mountains LGA	The proposal would have a minor physical impact and a moderate adverse visual impact on this potential heritage item.
Advertising Sign (potential heritage item)	Local	The potential heritage item may require removal and subsequent demolition to accommodate the proposed turning bay into Bellevue Crescent.	The proposal may have a major adverse impact on this potential heritage item.

Landscape character and visual impact

The village of Medlow Bath is located between Blackheath to the north, and Katoomba to the south, and mostly consists of single story dwellings, guest-houses and retreats. The western edge of the Great Western Highway is physically and visually dominated by the locally heritage listed Hydro Majestic Hotel, which is positioned atop the Megalong Valley escarpment. The escarpment is locally protected due to its high scenic values. To the east of the Great Western Highway, vegetation creates a buffer between Medlow Bath residential tree-lined streets and the existing highway and rail corridor. Further east, low density housing backs onto the national park.

Visual impacts have been mitigated in the proposal by:

- locating new infrastructure as much as possible within or near to the existing road corridor
- refinement of the design to compliment the existing setting and make new elements less dominant whilst maintaining key views
- addition of vegetation to further establish the village character of Medlow Bath, assist in integrating the proposal within the landscape setting and minimise impacts on views.

Artist impressions to show what the proposal may look like once complete were prepared for seven key viewpoints and were used to inform the visual impact assessment which considers the magnitude of a change, and the sensitivity of receiver location to then assign an overall impact level. From this assessment it was identified the proposal would result in the following overall visual impacts, mainly as a result of the introduction of a new pedestrian bridge:

- High visual impact at one viewpoint looking east toward the alternative Bellevue Crescent option.
- High-moderate visual impact three viewpoints
    - at northern corner of Bellevue Crescent and Great Western Highway looking north
    - at Station Street looking south
    - at Railway Parade looking south
- Moderate visual impact at two viewpoints
    - along the existing shared user path, adjacent to the Great Western Highway and Hydro Majestic Hotel, looking north
    - on Medlow Bath Station platform looking north towards the new pedestrian bridge
- Moderate-Low visual impact at one viewpoint:
    - Along the existing shared user path, adjacent to Blue Mountains Mazda, looking south.

Socio-economic

The proposal would result in temporary adverse traffic, noise, air quality and visual amenity impacts during construction which have been addressed in the relevant sections of the REF and can contribute to socio-economic impacts with respect to how the community can enjoy living and working in Medlow Bath.

It may be necessary for some properties to be to be partially or fully acquired by TfNSW to facilitate the proposal. The details for property acquisition would be determined during detailed design and any property acquisition would be undertaken in accordance with the provisions of the NSW *Property Acquisition (Just Terms Compensation) Act 1991*. Consultation would be conducted with property owners prior to the relocation of this infrastructure. TfNSW has commenced consultation with potentially affected property owners and would continue to engage with them through the detailed design phase about specific property impacts, including the acquisition process.

There are a number of positive benefits associated with the operation of the proposal which are outlined in the traffic and transport section above. Additional vegetation planting along the road and on the median, which would enhance the overall amenity of the area.

Justification and conclusion

The upgrade of the Great Western Highway between Katoomba and Lithgow, including Medlow Bath, is supported by reference to several strategic planning and policy documents including *NSW Future Transport Strategy 2056* (TfNSW, 2018a) and the *NSW Freight and Ports Plan* (TfNSW, 2018b). The proposal is needed to provide a safer and more efficient link between Central West NSW and the Sydney Motorway network for freight, tourist and general traffic.

Measures to avoid, minimise or offset potential environmental impacts have been considered during the options process and development of the concept design, and would continue through the detailed design phase. This executive summary has discussed the potential environment and community impacts likely to be expected throughout the construction and operational phases of the proposal.

On balance, the proposal would deliver long term benefits to the Medlow Bath community and wider region and it is considered that the potential environmental impacts would be appropriately managed through the implementation of the mitigation measures recommended in this REF.

Display of the review of environmental factors

This REF is on display for comment between 26 July 2021 and 25 August 2021. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the TfNSW website at **nswroads.work/gwhdconsult.**

A virtual engagement room, virtual information and the opportunity to register for updates is available at the online portal **nswroads.work/gwhdconsult.**

Printed copies

Due to COVID-19 restrictions, hard copies will not be available.

You can view the Medlow Bath Upgrade REF and Concept Design at our virtual consultation room at **nswroads.work/gwhdconsult.**

Public display

The project team will be delivering the following information sessions (all online via Microsoft Teams live-stream):

- Wednesday 28 July 2021, 1:00pm – 2:30pm
- Saturday 31 July 2021, 12:30pm – 2:00pm
- Tuesday 3 August 2021, 6:30pm – 8:00pm
- Thursday 5 August 2021, 6:30pm – 8:00pm

Register for our live-stream at **nswroads.work/gwhdconsult**

Currently face-to-face sessions will not be held due to COVID-19 restrictions.

How can I make a submission?

We welcome all feedback on the Medlow Bath Upgrade REF and Concept Design.

To have your input formally considered, and receive a response in the consultation report:

- use our online submission form at nswroads.work/gwhdconsult,
- or mail a printed submission to Great Western Highway Upgrade Program, PO Box 2332, Orange NSW 2800

Submissions must be received by 25 August 2021. Submissions will be managed in accordance with the TfNSW Privacy Statement which can be found here https://www.transport.nsw.gov.au/privacy-statement or by contacting 1800 953 777 for a copy.

What happens next?

TfNSW will collate and consider the submissions received during public display of the REF.

After consideration, TfNSW will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the proposal is determined to proceed, TfNSW will continue to consult with the community and stakeholders prior to and during construction.

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1. Introduction

1.1 Proposal identification

Transport for NSW (TfNSW) is proposing to upgrade a 1.2 kilometre section of the Great Western Highway at Medlow Bath, between Railway Parade and around 330 metres south of Bellevue Crescent (the proposal). The upgrade will provide a safer, more efficient link between Central West NSW and the Sydney Motorway network.

The proposal is located about 90 kilometres west of the Sydney Central Business District in the Blue Mountains local government area (LGA). It involves an upgrade to a section of the Great Western Highway, which is a 201 kilometre crossing of the Great Dividing Range through the World Heritage listed Blue Mountains, connecting Sydney to Bathurst and the surrounding Central West and Orana regions. The highway follows a narrow and difficult alignment constrained by the Blue Mountains National Park, steep topography, a railway line and existing villages for which the highway acts as the main street.

The Medlow Bath section of the Great Western Highway is a primary north – south connection between Katoomba and Blackheath and provides one of the only two mountain crossings between Sydney and Lithgow.

The location of the proposal is shown in Figure 1-1. Key features of the proposal are shown in Figure 1-2. Further detail is provided in the general arrangement plans included in Appendix M.

Key features of the proposal include the following:

- upgrade of the existing highway to a four-lane divided carriageway allowing for two lanes of traffic in each direction, either side of a central median with planted trees
- upgrade of the Bellevue Crescent intersection with new turning lanes, U-turn bay and traffic signals
- a new right turn lane providing access to the Hydro Majestic Hotel
- improvements on Railway Parade to formalise parking provisions, U-turns and rail customer parking
- new indented bus bays on both sides of the highway close to Medlow Bath Station
- construction of a new pedestrian bridge, stairs and lifts to provide an accessible path of travel between the bus bays, the Medlow Bath Station platforms and Railway Parade
- new shared path for pedestrians and cyclists on the western side of the highway
- ancillary works such as the replacement of road surfaces, reconstruction works associated with local roads, driveways, footpaths, kerbs, gutters and retaining walls, drainage works and relocation of services.

In addition to the road modifications to enhance safety and improve traffic efficiency, the proposal would also improve links to walking and cycling infrastructure and public transport facilities. Chapter 3 describes the proposal in more detail.

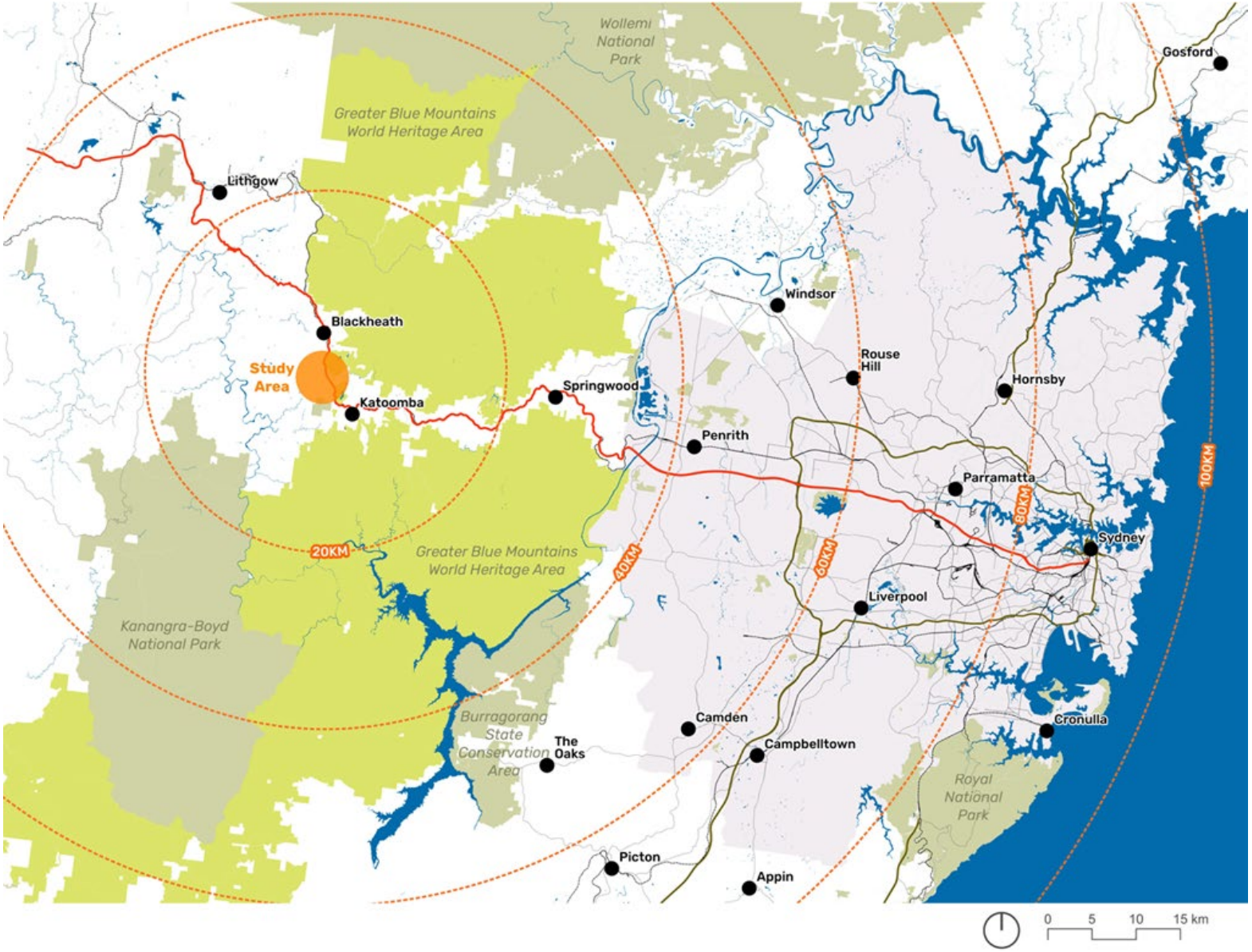

Figure 1-1: Location of the proposal

Figure 1-2: Key features of the proposal (Spackman Mossop Michaels, 2021)

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by MRB (a joint venture between Mott MacDonald, RPS and BG&E), on behalf of TfNSW (Infrastructure & Place). For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Department of Planning, 1995), the *Roads and Related Facilities EIS Guideline* (Department of Urban Affairs and Planning, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act, including that TfNSW 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 strategic assessment approval granted by the Australian Government under the EPBC Act in September 2015, with respect to the impacts of TfNSW's road activities on nationally listed threatened species, ecological communities and migratory species.

The findings of this 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 and Public Spaces under Division 5.2 of the EP&A Act
- the significance of any impact on threatened species as defined by the BC Act and/or FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- the significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- the potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

2.1 Strategic need for the proposal

The upgrade of the Great Western Highway between Katoomba and Lithgow, including Medlow Bath, is supported by reference to several strategic planning and policy documents including *NSW Future Transport Strategy 2056* (TfNSW, 2018a) and the *NSW Freight and Ports Plan* (TfNSW, 2018b). The proposal is needed to provide a safer and more efficient link between Central West NSW and the Sydney Motorway network for freight, tourist and general traffic.

The current performance of the corridor constrains local and inter regional traffic. Average daily traffic volumes vary from around 20,000 vehicles per day near Katoomba to around 8,500 vehicles per day towards Forty Bends and are growing between 1-1.7 per cent per annum. There is a relatively high proportion of heavy vehicles along the corridor (between 12 and 24 per cent) with 18,500 tonnes of freight transported each day (10,300 towards Sydney and 8,500 towards the Central West).

Upgrading the highway from two lanes to four lanes would provide travel time savings for all traffic users and would largely maintain those savings well into the future. Without an upgrade, travel times would worsen, while congestion would deteriorate to unacceptable levels.

The results of crash data analysis in Medlow Bath over a five year period ending in 2019 revealed an existing safety concern at Bellevue Crescent with 44 per cent of total crashes occurring at this location. The pedestrian refuge is also highly susceptible to near miss incidents involving pedestrians and highway traffic due to its geometry and placement.

The proposal would address known safety concerns and provide ongoing safety benefits for local traffic and pedestrians:

- improved traffic flows which would benefit local and regional traffic. In particular, the upgraded highway would be able to support longer, heavier vehicles that are able to transport more freight per vehicle
- improved safety for vehicles with upgraded intersections at Bellevue Crescent and the Hydro Majestic Hotel with new turning lanes, U-turn bay, signalisation, lane markings and signage
- minimising potential for pedestrian/vehicle conflicts through the installation of a new pedestrian bridge, stairs and lifts that would provide an accessible path of travel across the highway and to public transport facilities
- enhanced public transport facilities including new kiss and ride and indented bus bays which would provide a safe location for customers to transfer between modes
- a new shared path for pedestrians and cyclists which would also help to improve safety, as well as promote better health and encourage tourism by enhancing connections to existing trails
- additional commuter parking at Railway Parade, including accessible parking.

2.2 Transport accessibility

The NSW Government is committed to facilitating and encouraging the use of public transport, such as trains, by upgrading stations to make them more accessible, and improving interchanges around stations with other modes of transport such as buses, bikes and cars.

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The Transport Access Program aims to provide:

- stations that are accessible to people with disabilities or limited mobility, parents/carers with prams and customers with luggage
- modern buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers
- safety improvements including extra lighting, lift alarms, fences and security measures for car parks and interchanges, including stations, bus stops and wharves
- signage improvements so customers can more easily use public transport and transfer between modes at interchanges.

Medlow Bath Station has been identified for an accessibility upgrade as it does not currently meet the key requirements for the Disability Standards for Accessible Public Transport (DSAPT) or the Commonwealth *Disability Discrimination Act 1992* (DDA).

The following accessibility issues have been identified at Medlow Bath Station and will be addressed in the design of the upgrade and be further assessed:

- the existing paths from the public domain footpaths to the station entries are not currently compliant with DDA standards
- access to platforms is currently via a level crossing and steep ramp or stairs that are not compliant with DDA standards
- existing tactile ground surface indicators on the platform are non-compliant with DDA standards
- there are no existing accessible car parking spaces within the rail customer car park along Railway Parade.

As part of this proposal, a new pedestrian bridge is proposed to improve accessibility between adjoining streets, bus interchanges and the station where there is currently poor accessibility.

2.2.1 Strategic planning and policy framework

The proposal has been reviewed against, and is found to be consistent with, relevant strategic plans as summarised below.

NSW Premier's and State priorities

The New South Wales Government has committed to achieve 12 Premier's priorities and 18 state priorities to grow the economy, deliver infrastructure, protect the vulnerable, and improve health, education and public services across NSW.

The proposal supports and is relevant to the following Premier's priority:

- Building infrastructure - Key infrastructure projects to be delivered on time and on budget across NSW.

The proposal supports and is relevant to the following state priorities:

- Improving road travel reliability - 90 per cent of peak travel on key road routes is on time
- A safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056.

Together with other safety upgrades in the Great Western Highway corridor, the proposal would reduce travel time and improve road safety by improving traffic flow. Therefore, the proposal is considered to be consistent with the Premier's and state priorities.

Future Transport Strategy 2056

The *NSW Future Transport Strategy 2056* (TfNSW, 2018a) outlines a clear framework to address transport challenges in NSW over the next 40 years and is an update of the *NSW Long Term Transport Master Plan* released in 2012. It integrates planning for roads, freight and all other modes of transport and sets out initiatives, solutions and actions to meet NSW transport challenges.

By providing an upgraded road constructed to current design standards, the proposal would directly support the following regional NSW transport customer outcomes:

- supporting centres with appropriate transport services and infrastructure.
- the appropriate movement and place balance is established enabling people and goods to move efficiently through the network whilst ensuring local access and vibrant places.
- economic development is enabled by regional transport services and infrastructure.
- a safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056.
- customers enjoy improved connectivity, integrated services and better use of capacity.

Prepared alongside the *Greater Sydney Region Plan* (Greater Sydney Commission, 2018a), *NSW Future Transport Strategy 2056* (TfNSW, 2018a) aims to align the long term planning of the transport network within Greater Sydney, through acknowledging its role in land use, tourism, and economic development of the region.

Future Transport Strategy 2056 identifies future directions for road customers including the provision of better road connections, an expanded network of bus lanes, and safer roads, particularly during extreme weather events. The proposal aims to meet these directions by improving road capacity, providing bus prioritisation at intersections and improving flood immunity.

Regional NSW Services and Infrastructure Plan

The *Regional NSW Services and Infrastructure Plan* (TfNSW, 2018c) is the NSW Government's blueprint for transport in regional NSW from now until 2056. It sets out the Government's thinking on the big trends, issues, services and infrastructure needs which are now, or will soon shape transport in regional NSW.

The plan includes the following that are directly relevant to the proposal:

- 0 to 10 years for investigation – Great Dividing Range long term solution study
- 0 to 10 years for investigation – Great Dividing Range long term solution corridor preservation
- 20 years plus initiative – Delivery of Great Dividing Range long term solution – Delivery of solution to improve freight connectivity across the Great Dividing Range in order to connect inland areas to Sydney/Wollongong/Newcastle.

Tourism and Transport Plan

The *Tourism and Transport Plan* (TfNSW, 2018d) is a companion document to the *NSW Future Transport Strategy 2056* (TfNSW, 2018a) that recognises the connection between transport and tourism and identifies the potential to support and enhance existing tourism as well as create new economic development opportunities.

The plan includes the following four customer outcomes:

- Customer Outcome 1: Enhancing the visitor experience
- Customer Outcome 2: Greater access to more of NSW
- Customer Outcome 3: Making transport the attraction
- Customer Outcome 4: A seamless experience.

By improving transport infrastructure on the main route to the Central West region, the proposal aligns with Customer Outcome 2. There may also be opportunities to contribute to Customer Outcomes 1 and 3 as the proposal development process continues.

Central West and Orana Regional Plan 2036

The *Central West and Orana Regional Plan 2036* (Department of Planning and Environment, 2017) provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions for the region. The proposal is consistent with the following directions under Goal 3: Quality freight, transport and infrastructure networks:

- Direction 18: Improve freight connections to markets and global gateways
- Direction 19: Enhance road and rail freight links.

Western City District Plan

The *Western City District Plan* (Greater Sydney Commission, 2018b) is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision of the *Greater Sydney Region Plan*, providing a bridge between regional and local planning. This will assist the Greater Sydney Commission, responsible for metropolitan planning in a partnership between State and local government, to coordinate and align the planning that will shape the future of Greater Sydney and make it more liveable, productive and sustainable.

The *Western City District Plan* aims to ensure well-coordinated, integrated and effective planning for land use, transport and infrastructure within the Blue Mountains and Western Sydney District; guides the implementation of the *draft Greater Sydney Region Plan* at a district level; and guides the implementation of a *Metropolis of Three Cities – The Greater Sydney Region Plan* across the five Districts that form the metropolitan area.

The proposal aligns with Planning Priority N1 of the *Western City District Plan* which is planning for a city supported by infrastructure.

NSW Road Safety Strategy 2012-2021

The *NSW Road Safety Strategy 2012-2021* (TfNSW, 2012) sets the direction for road safety in NSW. This strategy is underpinned by the safe system approach to improving road safety. This takes a holistic view of the road transport system and interactions among the key components of that system – the road user, the roads and roadsides, the vehicle and travel speeds.

The proposal would provide the opportunity to reduce crashes and help achieve the targets set by the strategy by providing road safety improvements including increased flood immunity, upgraded intersections which would reduce congestion, and to improve pedestrian and cyclist facilities.

Road Safety Plan 2021

The *Road Safety Plan 2021* (TfNSW, 2018e) outlines how the NSW Government will work towards the State Priority Target of reducing fatalities by 30 per cent by the end of 2021 compared to average annual fatalities over 2008–2010. It also aligns the Towards Zero vision with *NSW Future Transport Strategy 2056*, which aims to have a NSW transport network with zero trauma by 2056.

The proposal is consistent with the directions set out in *Road Safety Plan 2021* because it would provide a better standard of road with improved safety through the separation of carriageways and the implementation of contemporary design standards.

NSW Freight and Ports Strategy 2013

The *NSW Freight and Ports Strategy* (TfNSW, 2013) targets specific challenges associated with the forecast doubling of the NSW freight task by 2031. It recognises that providing a network that minimises congestion will support economic growth and productivity and encourage regional development. In this context the strategy identifies the need to develop and maintain capacity for freight on the road network.

Objectives of the *NSW Freight and Ports Strategy* relevant to the proposal include:

- delivery of a freight network that efficiently supports the projected growth of the NSW economy
- balancing freight needs with those of the broader community and the environment
- actions and tasks of the strategy and task actions relevant to the proposal include:
    - Action 2B – Develop and maintain capacity for freight on the road network
    - Task 2B-2 – Prioritise road infrastructure investments
    - Action 3B – Manage congestion, noise and emission impacts of freight transport
    - Task 3B-1 – Recognise costs of congestion.

The proposal is considered consistent with the objectives, actions and tasks referenced above. It would also help address growth in freight demand and would reduce congestion and enhance safety for all road users.

NSW Freight and Ports Plan 2018-2023

The *NSW Freight and Ports Plan* (TfNSW, 2018b) is aligned with the *NSW Future Transport Strategy 2056* and has the aim of providing a network to move goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry.

The proposal directly supports the following plan objectives:

- Objective 2 Efficiency, connectivity and access – Improving the efficiency of existing infrastructure and ensuring greater connectivity and access along key freight routes
- Objective 4 Creating a safe freight supply chain, involving safe networks, safe transport, safe speeds and safe people – Creating a safe freight supply chain, involving safe networks, safe transport, safe speeds and safe people.

The plan also includes *Goal 2: Deliver new infrastructure to increase road freight capacity and improve safety*. To address this goal several committed initiatives and initiatives for investigation are identified. This includes the following initiative for investigation:

- capacity enhancements crossing the Blue Mountains, including bypasses of Blackheath and Mount Victoria, duplication of the Great Western Highway from Katoomba to Forty Bends.

2.3 Limitations of existing infrastructure

The Great Western Highway is a key transport route across and along the Great Diving Range for all vehicles, including emergency and essential services, local and through rail customers, tourists and freight. The Great Western Highway between Katoomba and Lithgow has a higher average traffic volume than other duplicated highways. There are over 19,000 vehicle movements per day at Medlow Bath, and vehicle movements are expected to increase due to population growth, particularly in the Central West region, and increased freight, private vehicle usage and tourism in both the Blue Mountains and Central West NSW region.

The existing infrastructure is already restrained in its capacity to accommodate the existing vehicle moments, with traffic peaks and congestion a common occurrence at current merge points on the highway

through both the week and weekends. Congestion is especially restrictive during special event and the school holiday periods.

The existing arrangement of the Great Western Highway at Medlow Bath also has a number of safety issues. The results of crash data analysis associated with the Medlow Bath alignment over a five year period ending in 2019 reveal there were nine crashes recorded along the Medlow Bath corridor including one serious injury crash, five moderate injury crashes and three non-casualty towaway crashes.

There exists a safety concern at the Bellevue Crescent intersection where 44 per cent of total crashes were present at this location. In addition, one pedestrian crash was recorded near the Hydro Majestic Hotel entrance at the Medlow Bath Station during the 2009-13 period. The pedestrian refuge is also highly susceptible to near miss incidents involving pedestrians and highway traffic due to its geometry and placement. Currently there are no dedicated right turns for eastbound vehicles to turn into the Hydro Majestic Hotel or Bellevue Crescent, resulting in customers interrupting the flow of eastbound traffic while waiting for a break in westbound traffic to safely conduct a right-turn.

Emergency services access during incidents such as bushfires is also currently limited with a single lane arrangement and restricted traffic flows due to congestion, limited overtaking opportunities and steep gradients.

Pedestrian access to the Medlow Bath Station is currently limited from the western side of the Great Western Highway, with pedestrians needing to walk up Station Street to cross the Great Western Highway and Railway Parade to access the existing pathways to the station.

Additionally, the closest access point to Medlow Bath Station from the highway is via a single set of stairs off an overbridge between the Great Western Highway and Railway Parade. No lift facilities are currently provided and any customers unable to use stairs are required to walk approximately 200 metres south of the northern station entry to access the station via a railway crossing and ramp.

2.4 Proposal objectives and development criteria

The highway's topography and constrained two lane carriageway design (which in places is almost 200 years old) results in the following constraints:

- reduces freight efficiency by limiting access for safer and more sustainable high productivity vehicles
- limits access during incidents and natural disasters
- slows travel speeds with limited overtaking opportunities and steep gradients (more than double the recommended maximum level)
- causes delays of up to 80 minutes in peak times and hours if there is an incident
- has higher than state average crash rates, and
- impairs amenity for local communities with high through traffic volumes and congestion.

2.4.1 Proposal objectives

As part of a staged upgrade program, the proposal aims to deliver outcomes consistent with the Great Western Highway Upgrade Program objectives, for the Medlow Bath locality. Table 2-1 summarises how the proposal would address the overall objectives of the Great Western Highway Upgrade Program.

Table 2-1: Medlow Bath proposal response to Great Western Highway Upgrade Program objectives

Current problem	Great Western Highway Upgrade objective	Medlow Bath proposal response
1. Economic development, productivity and recovery	Improve ability to drive regional economic development and freight productivity	Provide four lanes with dedicated turn lanes to separate heavy vehicle flow from locally turning traffic
2. Resilience and future proofing	Provide a dependable and adaptable transport network that enables continuity of transport and essential services	Make network provisions for emergency services and provide safe continuous access to transport services
3. Network performance	Improve transport network efficiency	Provide suitable capacity to reduce congestion during peak periods through Medlow Bath
4. Safety	Reduce actual and perceived safety risks	Separate traffic flows and user groups, upgrade intersections and provide safer facilities. Remove trees that have reached end of life to address risk of falling trees along the highway and railway corridor
5. Movement, place and amenity	Maintain and enhance local amenity and character, and protect environmental and cultural assets	Improve active transport and local traffic connectivity along and across the corridors. Preserve local heritage assets and enhance local amenity and character through sensitive urban design.

2.4.2 Development criteria

Development criteria for the proposal have been developed to meet the above program objectives and to address current constraints at Medlow Bath. These criteria are to:

- maintain the functional operation of the highway to traffic and users at all times
- make best use of the defined road corridor between the road rail boundary and the heritage stone wall of the Hydro Majestic Hotel to maintain heritage value
- provide four lanes separated by median suitable for 60 kilometres per hour at Medlow Bath
- provide a safe all movement intersection for Bellevue Crescent that provides for U-turning traffic impacted by median separation of highway traffic
- provide a shared path for active transport users appropriately linked to the Great Blue Mountains Trail and public transport nodes
- remove the railway level crossing and pedestrian refuge in favour of a physically separated and fully accessible structure to improve rail safety and provide for accessible public transport
- turning provisions to be maintained at the Hydro Majestic Hotel. Eastbound right turn bay, left in left out plus one vehicle access closure.
- remove failing pine trees that have reached end of life to address the community safety risk of falling trees
- provide for trees in the median for as much of the length as possible to maintain the village feel

- adjust, maintain, relocate or reinstate property access to all private properties along the highway frontage
- work to enhance local amenity in developing a design that preserves or reinterprets local heritage values
- adopt water quality control measures to improve the management of stormwater out flows into the drinking catchment
- no impact to the Greater Blue Mountains World Heritage Area.

2.4.3 Urban design objectives

The urban design vision adopted for the proposal is:

> *Within the context of the rugged terrain and bushland setting of the Blue Mountains and the unique natural and cultural landscapes and precincts through which it passes, the Great Western Highway should:*
>
> - *reinforce the journey sequence of bushland and village*
> - *evoke a sense of its history and heritage*
> - *provide connectivity and permeability for pedestrians*
> - *provide views and a clear sense of orientation for users*
> - *maximise the amenity of the public domain*
> - *create a road design that integrates urban design and engineering.*

To achieve this vision, the urban design objectives for the proposal are to:

- develop an integrated design that fits with the existing high visual qualities, ecology and character of Medlow Bath and the Blue Mountains setting
- minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal
- contribute to the functionality of public spaces and enhance local and regional connectivity.

2.4.4 Transport accessibility objectives at Medlow Bath

Medlow Bath Station has been identified for an accessibility upgrade as it does not currently meet key requirements of the DSAPT or the DDA. The non-compliant level crossing and steep ramp to access the platforms do not facilitate access for people with reduced mobility, parents/carers with prams or customers with luggage.

The proposal would provide safe and equitable access to the platforms and to the pedestrian network surrounding the station. The specific objectives of the Medlow Bath Station upgrade are to:

- provide a station that is accessible to people with a disability or limited mobility, parents/carers with prams and customers with luggage
- improve customer experience through improved weather protection, interchange facilities and visual appearance
- minimise pedestrian conflict and crowding points
- improve integration with surrounding precinct
- improve customer safety
- improve wayfinding in and around the station
- improve customer amenity
- improve cross corridor access/pedestrian links to Railway Parade and the Great Western Highway.

2.5 Corridor upgrade options between Katoomba and Lithgow

An upgrade of the Great Western Highway in Medlow Bath is constrained by ridgetop terrain, private property along the Highway, and the rail line. Bypassing the township on the east was considered in the 1950s and ruled out due to impacts on the residential area. Bypassing further to the east would impact on the World Heritage listed Blue Mountains National Park and sensitive water catchment areas, and shift the alignment onto difficult and steep, undulating terrain. By keeping the Great Western Highway on the ridgeline through Medlow Bath we can reduce environmental impact while still providing opportunities to support and enhance the character of Medlow Bath village as a tourist destination.

Since the 1950s corridor options have been considered through Medlow Bath and beyond. All corridor options at Medlow Bath have focussed on using the existing corridor which was set aside for future widening. The bridge over railway was completed in 2002, confirming the four-lane highway alignment would cross the rail at Medlow Bath.

In 2013, planning and investigations for the duplication of the Great Western Highway for the entire corridor between Katoomba and Lithgow were undertaken to inform the LEP corridor reservation. All options reconfirmed the use of the existing corridor through Medlow Bath.

For options development during the 2013 phase, the highway corridor was divided into four zones (refer to Figure 2-1):

A. Katoomba to Medlow Bath

B. Medlow Bath to Blackheath bypass

C. Blackheath bypass

D. Blackheath bypass to Browntown Oval at Mount Victoria.

The proposal is located within Zone A (ie Katoomba to Medlow Bath).

Several options within the existing highway corridor were considered between Katoomba and Blackheath but all options followed the existing corridor through Medlow Bath.

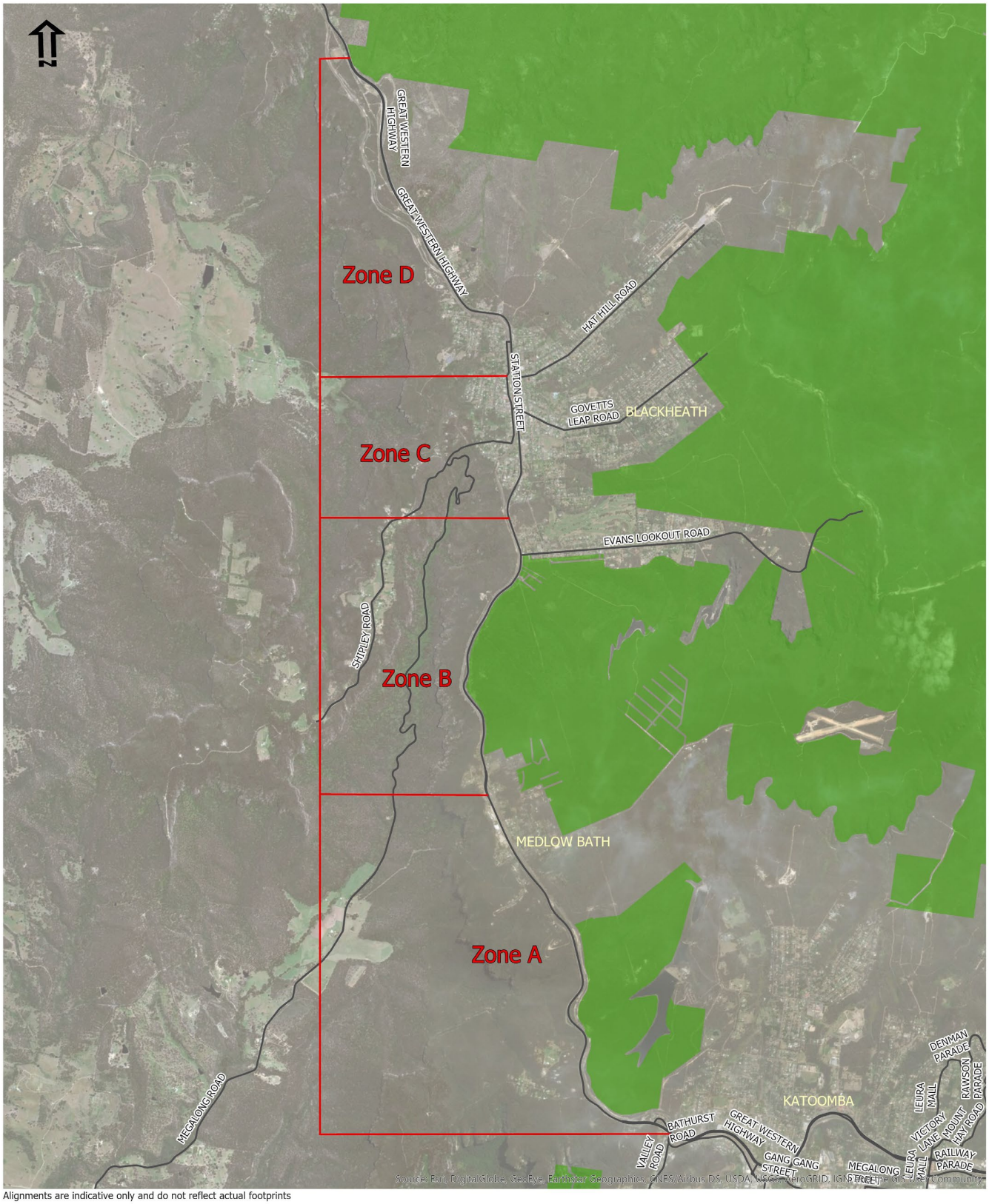

Figure 2-1: Zones of the highway corridor between Katoomba and Blackheath

2.6 Analysis of options

Options developed for the upgrade of the Great Western Highway between Katoomba and Blackheath (including Medlow Bath) adopted the following key features:

- four lane dual carriageway separated by a median
- design speed generally 90 kilometres per hour and posted speed limit 80 kilometres per hour except through Medlow Bath where design and posted speed limit are 60 kilometres per hour
- 3.5 metre travel lanes and wide 2.5 metre shoulders between Blue Mountains villages (for better road safety and provision for cyclists)
- connection with existing four lane sections built at Katoomba in the 1990s; and the bridge over rail at Medlow Bath built in in 2002
- design alignment and pavement to allow potential future improvement to freight productivity (including 26 metre and 30 metre B-doubles)
- adequate heavy vehicle rest stop facilities consistent with a finalised corridor strategy or plan when confirmed
- safe, accessible heavy vehicle enforcement infrastructure
- desired one in 20-year flood immunity
- potential active transport infrastructure (to be investigated through development of an Urban Design Framework).

A number of design, constructability, environmental and community issues influenced the selection of the preferred option through a series of workshops. These included:

- the safe and continuous operation of the highway to road user groups
- providing local access onto, along and across the highway corridor
- steep terrain and a constrained corridor
- interaction with the Main West Line
- presence of the Blue Mountains National Park and Greater Blue Mountains World Heritage Area
- presence of threatened species and ecological communities
- presence of drinking water catchments
- Aboriginal and non-Aboriginal heritage values
- community concerns about major infrastructure impacts and expectations for improved urban amenity in highway townships.

Workshops (which considered function, constructability, environment, property, community and costs issues) were used as a tool to assist in with identifying the advantages and disadvantages of options. In Medlow Bath the proposal would allow for the upgrade of the road surface road through the village with minimal property and environmental impacts, provide a clear buffer between the road and footpath, and improve safety for motorists, cyclists and pedestrians with a new shared pathway and pedestrian bridge.

2.7 Strategic design

In March 2019, the NSW Government committed $2.5 billion in funding towards the duplication of the Great Western Highway between Katoomba and Lithgow. Medlow Bath was identified as a priority section to progress to construction based on the prior preferred route identified in 2013.

Following the NSW Government announcement, a strategic design was displayed to the community for feedback in July 2020. This strategic design included:

- four 3.35 metre lanes separated by a variable width median suitable for 60 kilometres per hour
- an all movement intersection at Bellevue Crescent
- a shared path for walking and cycling linked to the Great Blue Mountains Trail and public transport modes
- removal of the railway level crossing and pedestrian refuge in favour of a pedestrian bridge with lifts and stairs to improve rail safety and provide for accessible public transport.
- turning provisions at the Hydro Majestic Hotel by providing an eastbound right turn bay, left in left out plus close one vehicle access gate. Parking removal on the highway was also adopted
- removal of failing pine trees that have reached end of life to address the community safety risk of falling trees
- provision for trees in the median for as much of the length as possible to maintain the village feel
- adjustment, relocation or reinstatement of safe property access to all private properties along the highway frontage.

As part of the development of a concept design for the preferred option (detailed in Chapter 3 the following improvements were then incorporated:

- Transport Access Program and Railway Parade improvements
- water quality management
- revisions to improve Station Street by widening the highway towards railway
- definition of property access adjustments at Delmonte Avenue and Bellevue Crescent
- U turn bay and private property acquisition.

These improvements were identified and refined following a value management process including risk assessment, and health and safety in design workshop and ongoing consultation with key stakeholder and specialists.

Where possible, TfNSW has have improved the concept design in response to feedback, including:

- traffic lights at Bellevue Crescent to make accessing the crescent safer and to slow and control traffic entering the 60 kilometre per hour zone in Medlow Bath
- a U-turn bay at Bellevue Crescent to help traffic change direction to access the service station and other properties on the eastern side of the highway
- Station Street would remain open to two-way traffic and the existing property access would remain
- retaining walls along Station Street have been removed by keeping levels close to the existing conditions
- better separation between the shared pathway and the highway with a one metre vegetated buffer in addition to the road shoulder
- improved landscaping using as many of the existing council-planted trees, along with new trees to improve the look and feel of Medlow Bath. Every tree removed including the failing radiata pines along the highway would be replaced as part of the upgrade program
- safer access for residents whose properties directly access the highway, with relocated driveways to be installed as part of the proposal.

In addition to the above, as part of the development of the detailed design of the preferred option, an alternative option for Bellevue Crescent has been identified (refer Section 3.1.2).

2.8 Upgrade options for Medlow Bath

Two options were considered for the upgrade of the Medlow Bath section of the highway (the proposal). These included:

1. Do nothing option

The 'do nothing' option would have the least environmental impacts as it would involve no construction or change to the existing Great Western Highway at Medlow Bath. It would not achieve any proposal objectives, improve safety or traffic flow with conditions worsening over time as adjoining sections are upgraded.

2. Upgrade of the Great Western Highway – Medlow Bath option

This option would involve the upgrade and duplication of the existing surface road corridor of the Great Western Highway at Medlow Bath including intersection improvements and a new pedestrian bridge (the proposal). The design meets the objectives as described in Section 2.4 and delivers on NSW Government commitments to the Great Western Highway Upgrade Program.

3. Description of the proposal

This chapter describes the concept design for the proposal and provides details of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

3.1.1 Overview

Key features of the proposal include the following:

- upgrade of the existing highway to a four-lane divided carriageway allowing for two lanes of traffic in each direction, either side of a central median with planted trees
- upgrade of the Bellevue Crescent intersection with new turning lanes, U-turn bay and traffic signals
- a new right turn lane providing access to the Hydro Majestic Hotel
- improvements on Railway Parade to formalise parking provisions, U-turns and rail customer parking
- new indented bus bays on both sides of the highway close to Medlow Bath Station
- construction of a new pedestrian bridge, stairs and lifts to provide an accessible path of travel between the bus bays, the Medlow Bath Station platforms and Railway Parade
- new shared path for pedestrians and cyclists on the western side of the highway
- ancillary works such as the replacement of road surfaces, reconstruction works associated with local roads, driveways, footpaths, kerbs, gutters and retaining walls, drainage works and relocation of services.

Key features of the proposal are shown in Figure 1-2. Further detail is provided in the general arrangement plans included in Appendix M.

3.1.2 Proposed alternative intersection at Bellevue Crescent

As part of the design for the proposal, a new alternative signalised intersection is being considered to the Great Western Highway with a new road to connect to the existing Bellevue Crescent and approximately 25 metres south of the United Petrol Station (as shown in Figure 3-1).

Figure 3-1: Aerial view of proposed alternative intersection at Bellevue Crescent

This alternative design being considered for Bellevue Crescent, which has been assessed as part of this REF, includes the following key features:

- closing the existing Bellevue Crescent and Great Western Highway intersection while still maintaining a service road/shared zone for the properties fronting the highway
- installation of a new signalised intersection built along the southern perimeter of the United Petrol Station utilising a corridor about 20 metres wide through vacant lots
- creating new access options from Bellevue Crescent to the petrol station and Hydro Majestic Hotel
- allows left and right turns out of Bellevue Crescent on to the Great Western Highway (enabling west and east bound movement) and left turn into new Bellevue Crescent from Great Western Highway westbound.

3.1.3 Accessibility improvements

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

As part of this program, an accessibility upgrade to Medlow Bath Station infrastructure is proposed by TfNSW. The following improvements may be included as part of this project at a later stage.

- replacement of the level crossing to provide a new pedestrian bridge
- upgrade of the station entrance on Railway Parade including:
    - formalising the rail customer car park along Railway Parade, and provision of new accessible parking spaces
    - provision of a new accessible kiss and ride space on Railway Parade adjacent to the new station entry

- provision of accessible paths between the footbridge entry, kiss and ride and accessible parking
- modifications to overhead wiring and HV at the station to accommodate the construction of the new pedestrian bridge

- internal station building work including:
  - minor building modifications that may be required to accommodate new or upgraded electrical equipment including a main switchboard, new or upgraded station communications equipment and other station services
  - ancillary work including adjustments to lighting, relocation or replacement of existing customer facilities (platform seating, bins, payphone, Opal card readers, fencing) and improvement to station systems including additional closed circuit television (CCTV) cameras, hearing loops and wayfinding signage.

3.2 Design

The following sections provide a description of the design criteria, major design features and engineering constraints of the proposal. These features are based on the concept design and would be further refined during detailed design.

3.2.1 Design criteria

The concept design for the proposal was prepared in accordance with the following standards:

- *T HR CI 12030 ST Overbridges and Footbridges Design Standard* (TfNSW, 2020a)
- Australian Standards: amended by Roads and Maritime Services Supplement (2012)
- *Austroads Guide to Road Design* (Austroads, 2009a) and Roads and Maritime Services supplements to the Austroads Guide
- *Austroads Road Safety Audit Manual* (Austroads, 2009b)
- *Beyond the Pavement 2020: Urban design approach and procedures for road and maritime infrastructure planning, design and construction* (TfNSW Centre for Urban Design, 2020)
- *NSW Speed Zone Guidelines* (Roads and Traffic Authority, 2011b)
- *Road Safety Audit Manual and Checklist* (Roads and Traffic Authority of NSW, 2011c)
- *Delineation Manual* (Roads and Maritime Services, 2012)
- *Services Road Design Guide* (Roads and Maritime Services, undated)
- *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2D, Main Road Construction* (Department of Environment and Climate Change, 2008).
- *Disability Standards for Accessible Public Transport 2002* (DSAPT).

Key design criteria for the road improvements are summarised in Table 3-1 (subject to detailed design).

Table 3-1: Key design criteria

Design features	Requirement
Number of lanes	Upgraded to a four-lane carriageway with a typical lane arrangement of two lanes in each direction with additional turning lanes for access to roads off Great Western Highway and to key commercial places (ie Hydro Majestic Hotel)
Lane widths	• 3.35 metres for through lanes • 3.30 metres for turning lanes (plus lane widening at curves, as required).
Design vehicle capacity for main road alignment	• 19 metre B-Double (over 50 tonnes)
Design vehicle capacity at intersections	• Bellevue Crescent (including U-turn) –prime mover and semi-trailers (up to 19 metres) • Right hand turn bay into Hydro Majestic Hotel – service vehicles (up to 8.8 metres)
Posted speed limit	• Main road alignment – 60km/h • Side roads – 50km/h
Design speed	• Main road alignment – 70km/h • Intersection (at Bellevue Crescent) – 60 km/h • Turn in to side roads – 60km/h
Median widths	• Southern portion (at Bellevue Crescent intersection) – 5.10 metres at the southern approach and 1.8 metres at the northern approach to allow for right hand turn bay at signals. • Mid portion (at Hydro Majestic Hotel) – typically 5.10 metre raised median and 1.8 metres at right hand turn bay into the hotel. • Northern portion (between Hydro Majestic Hotel and Railway Parade) – 1.8 metres
Pavement type	Pavement structure would consist of asphalt over lean mix concrete and consider acoustic requirements.
Footpaths/cycle paths and shared zones	• Southern portion (at Bellevue Crescent intersection) – includes a 6.7 metre wide shared zone for pedestrians and local traffic only (to access 100 to 104 Great Western Highway) • Mid portion (at Hydro Majestic Hotel) – includes a 2.5 metre shared path on the western side and a pedestrian path connecting the pedestrian bridge to the bus stop on the eastern side • Northern portion (between Hydro Majestic Hotel and Railway Parade) – 2.5 metre shared path on the western side of the road
Pedestrian bridge clearances	Minimum of 5.5 metres over the road and 6.6 metres over the station platform.
Flood considerations	One in 100 Average Recurrence Interval (ARI) Minor and Major Tributary flood under current climatic conditions.

3.2.2 Engineering constraints

A number of constraints and performance objectives influenced the development of the proposal design, including the following.

- **Existing utilities:** the presence of multiple existing underground and above ground public utilities need to be managed. Existing utilities have been identified, and discussions held with the service providers to either relocate utilities within the widened road corridor or protect the assets, while ensuring they can be accessed for scheduled maintenance and emergencies during construction.
- **Operational traffic:** access to the Great Western Highway needs to be maintained during construction as there are no detour options. In addition, access to side streets (Station Street, Railway Parade and Bellevue Crescent) and driveways along Great Western Highway need to be maintained to ensure access for residents and businesses. The traffic management plan should recognise the requirement for maintaining adjacent access, including emergency access and traffic flow during peak periods.
- **Urban amenity and heritage:** the Great Western Highway is one of Australia's most historic roads and the route has largely remained unchanged since its construction in the 1830s. The area has several heritage items within close proximity which notably include the locally listed Hydro Majestic Hotel (located on the western side of the highway) and the State heritage registered Medlow Bath Station Group (located east of the highway). Medlow Bath is the first built-up area east of Katoomba and needs to retain its village feel as part of an upgraded highway.
- **Water quality**: the proposal is within the Sydney Water Catchment area and engineering controls for water quality must be designed to ensure a neutral or beneficial effect to receiving waters.
- **Potential contamination**: the Phase 1 Investigation (Mott MacDonald, 2020) identified potential contamination from the United Petrol Station, the Mazda car dealership, stockpiled ballast and uncontrolled fill material. The presence/absence of these would be identified via a targeted detailed site investigation (Phase 2).

These constraints are considered in Chapter 6 of the REF, which describes measures and safeguards to be implemented to mitigate adverse impacts of the proposal.

3.2.3 Major design features

Upgrade of the Great Western Highway

The upgrade of the Great Western Highway at Medlow Bath would be carried out from 330 metres south of Bellevue Crescent extending to the existing bridge at Railway Parade and include the following features (also refer to Appendix M General Arrangement Plans):

- a four-lane divided carriageway allowing for two lanes of traffic in each direction involving
    - new road surfaces, line markings and raised medians
    - other road adjustment works such as tie ins into the existing highway and reconstruction works associated with the local roads, driveways, footpaths, kerbs and gutters
- three way signalised intersection lanes for entry/exit to Bellevue Crescent, which would include:
    - a right hand turn bay for eastbound traffic to turn from Great Western Highway into Bellevue Crescent
    - a left hand turn bay for westbound traffic to turn from Great Western Highway into Bellevue Crescent
    - U turn bay at 106 Great Western Highway
- right hand turn bay on Great Western Highway for entry into the Hydro Majestic Hotel by eastbound traffic

- a shared path for pedestrians and cyclists on the western side of Great Western Highway with new kerbs and gutters to separate road traffic from the pedestrians and cyclists
- new indented bus bays on both sides of the highway close to Medlow Bath Station
- construction of a new pedestrian bridge, stairs and lifts to provide an accessible path of travel between the bus bays, the Medlow Bath Station platforms and Railway Parade
- a new retaining wall between the railway line and the eastbound lanes of the Great Western Highway
- interchange facilities at Railway Parade adjacent to the station to include:
    - U turn bay
    - raised pedestrian crossings to allow for access to the eastern side from the new pedestrian bridge
    - formalised parking including accessible parking spaces
    - two formalised kiss and ride locations adjacent to the new pedestrian bridge
- retention of access to Station Street from westbound lane of the Great Western Highway.

An indicative cross section of the main alignment of Great Western Highway at Medlow Bath is shown in Figure 3-2 to Figure 3-7 and are subject to detailed design.

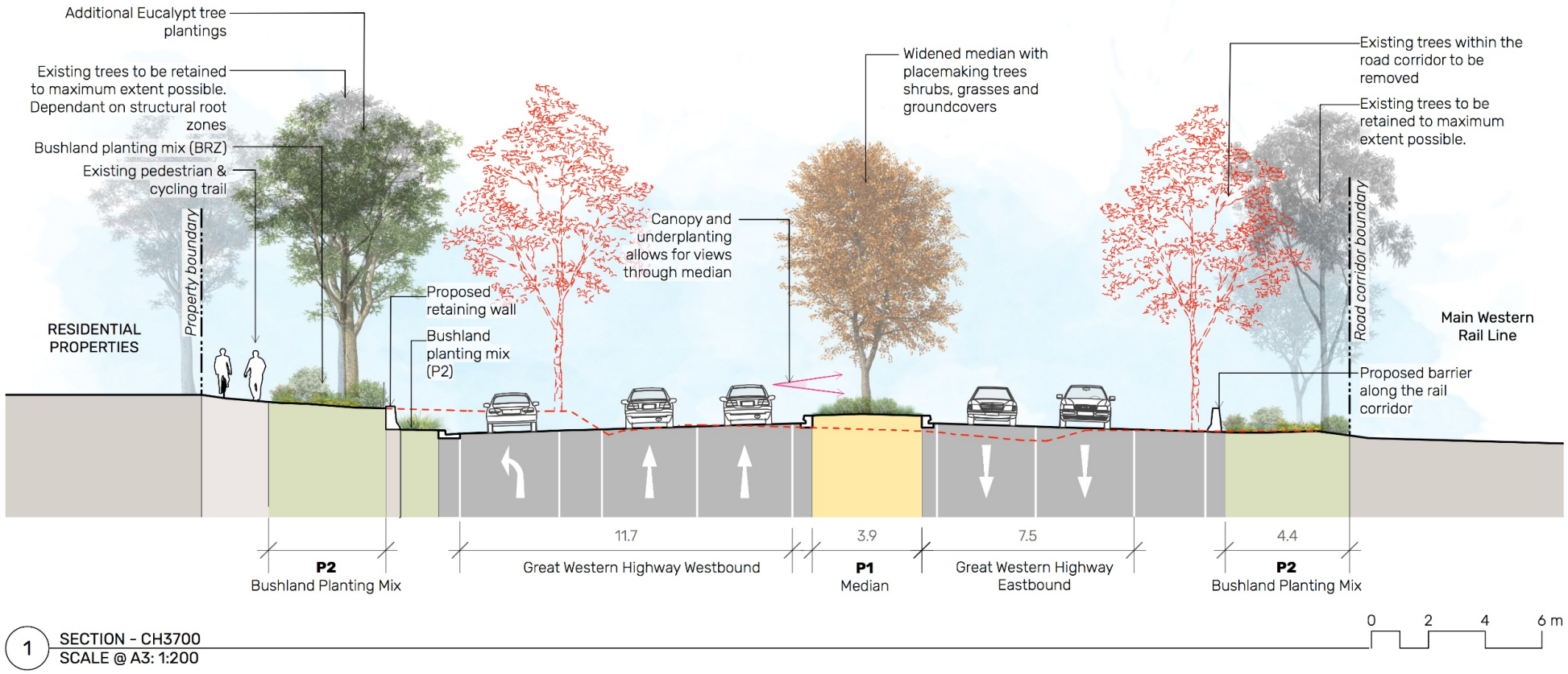

Figure 3-2: Typical cross section within southern section of proposal - south of Bellevue Crescent showing left turn lane (SMM, 2021)

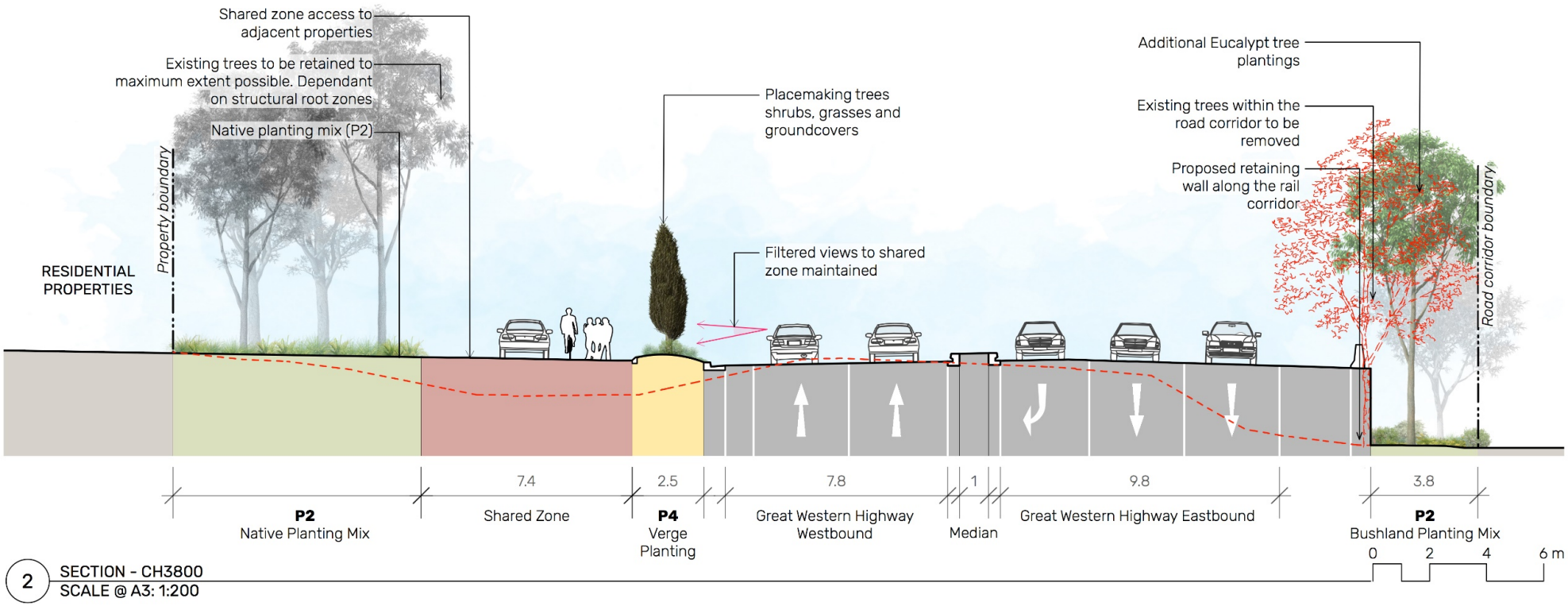

Figure 3-3: Typical cross section within southern portion of proposal – north of Bellevue Crescent showing shared zone and right hand turn lane (SMM, 2021)

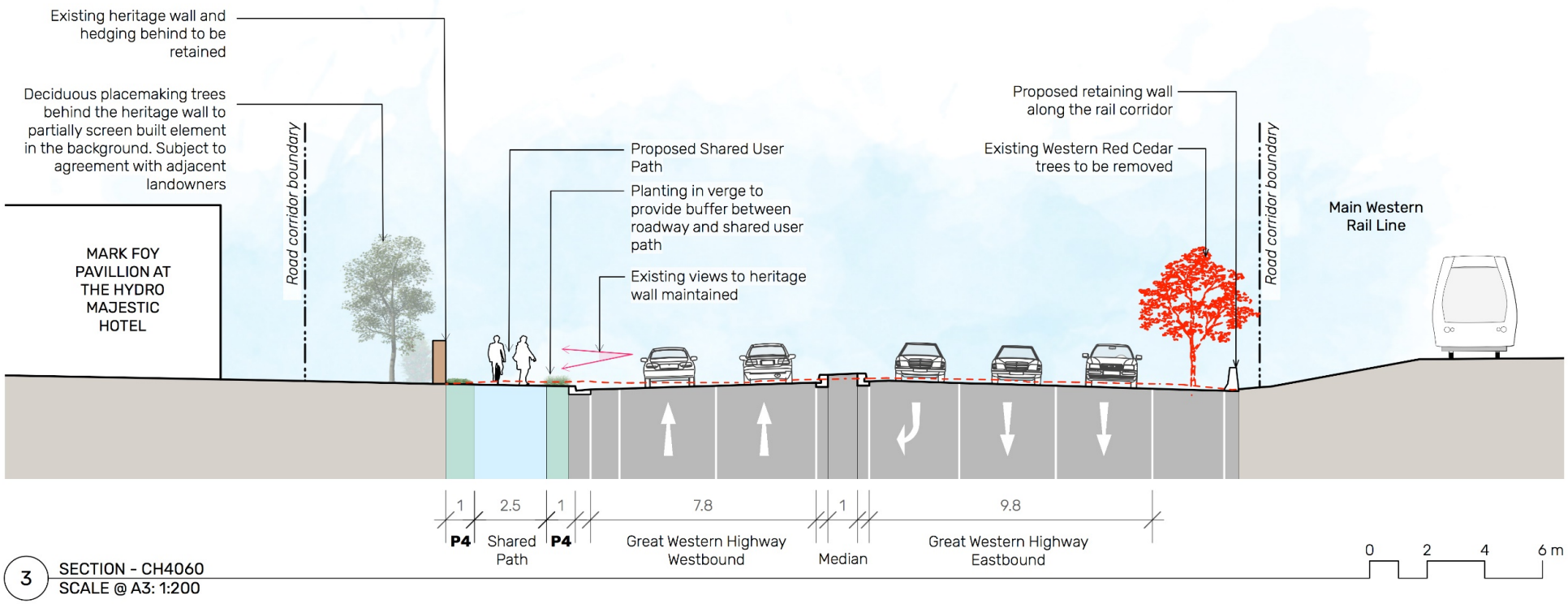

Figure 3-4: Typical cross section within midpoint of the proposal area adjacent to Hydro Majestic Hotel – with right hand turn lane (SMM, 2021)

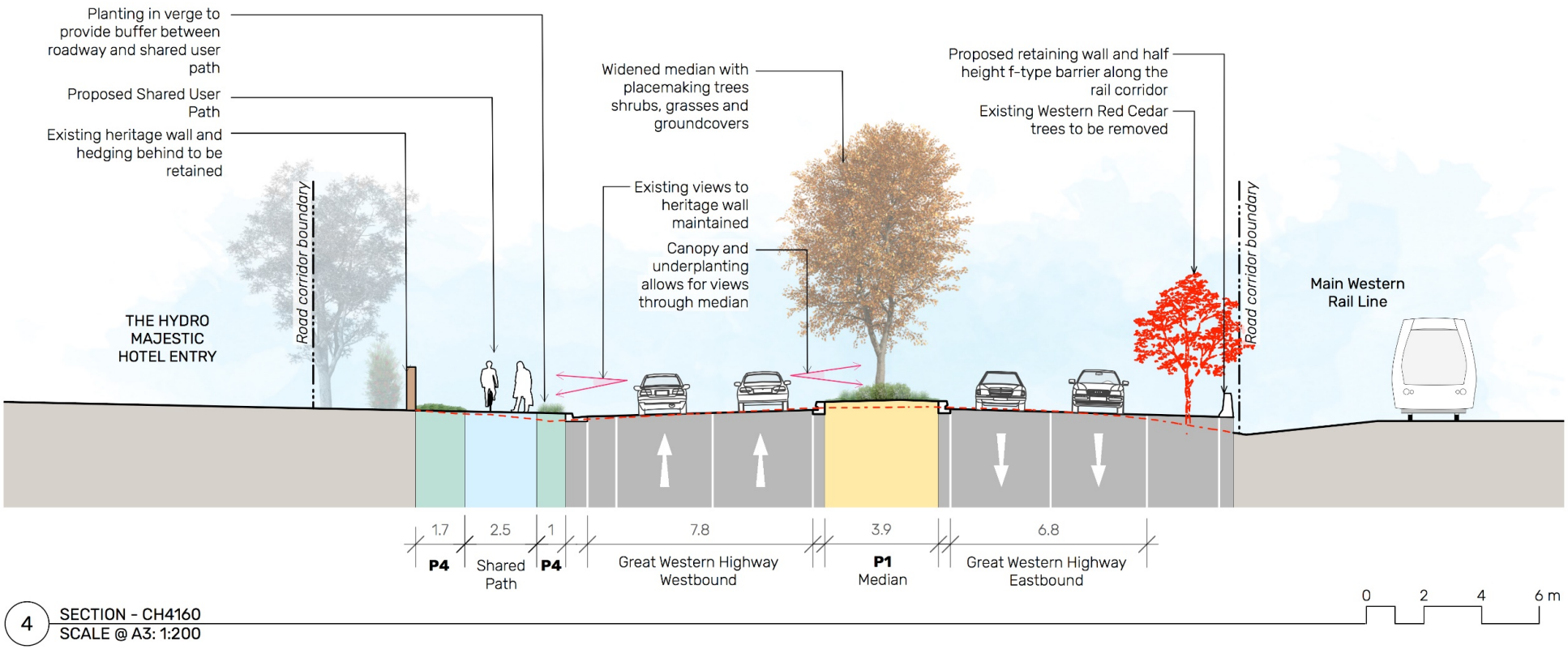

Figure 3-5: Typical cross section within midpoint of the proposal area adjacent to Hydro Majestic Hotel – with wider median and no right hand turn lane (SMM, 2021)

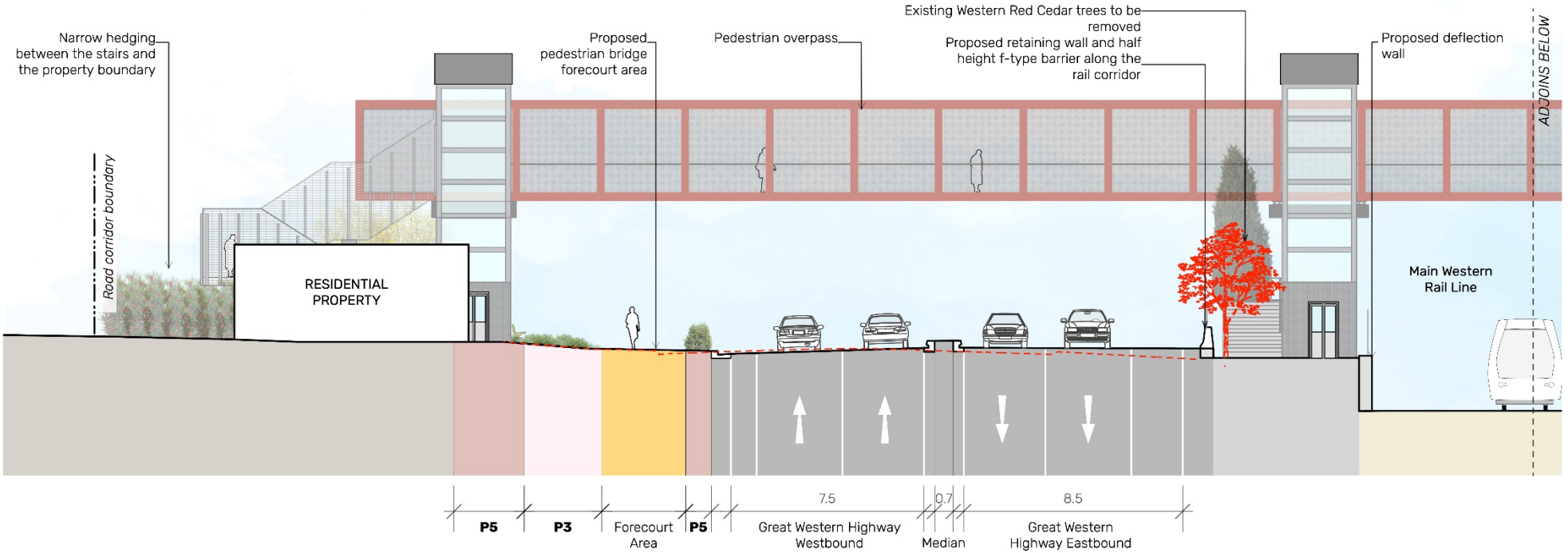

Figure 3-6: Typical cross section of proposal area adjacent to the station – showing pedestrian bridge (SMM, 2021)

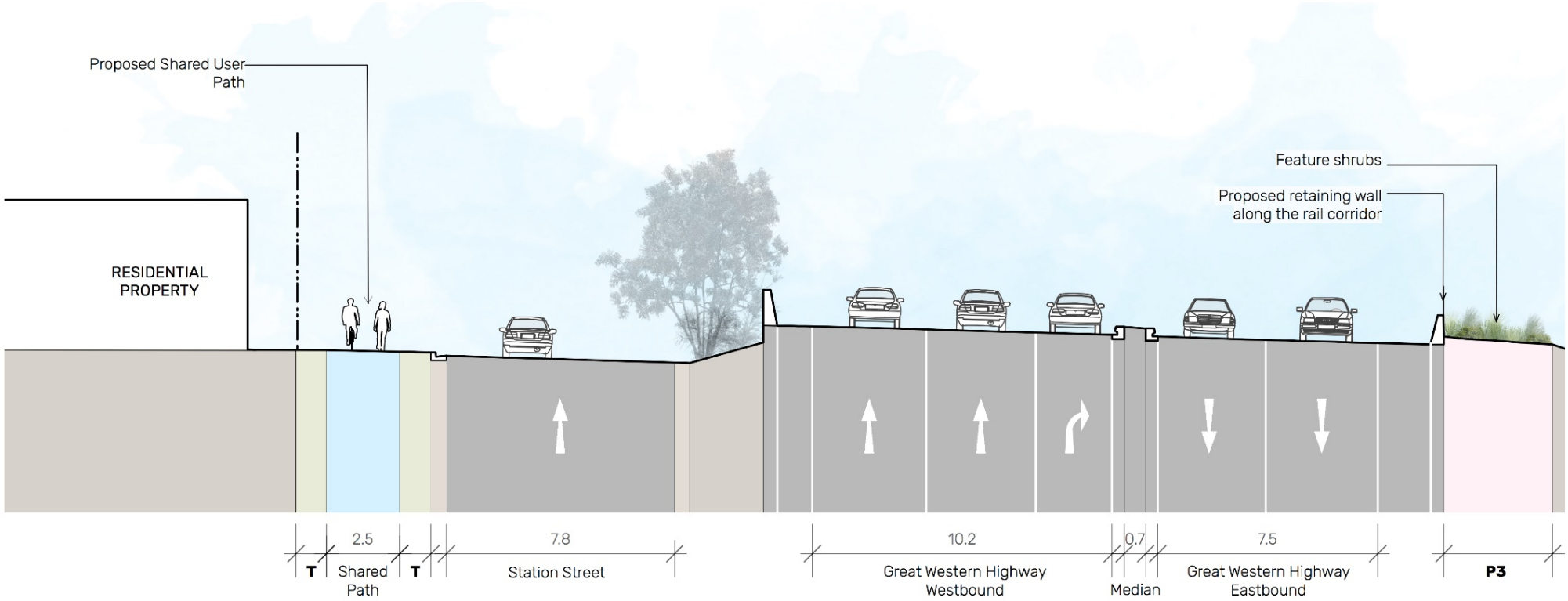

Figure 3-7: Typical cross section within northern portion of the proposal area near Station Street (SMM, 2021)

Bus bays

The proposal would include bays for local bus services to connect with the area and station. This would include one bus bay with bus shelter on the westbound carriageway and one bus bay with bus shelter on the eastbound carriageway of the highway adjacent to the new pedestrian bridge and lifts. The bus bay on the eastbound carriageway would have the design capacity for two buses. The bus bay on the westbound carriageway would have the design capacity for at least one bus. The school bus stop in Railway Parade would be removed and now use the upgraded highway bus stops.

Pedestrian bridge

The pedestrian bridge would comprise a three-span steel truss bridge extending across the full width of the widened Great Western Highway (about 60 metres), with abutments on the western side of the highway and on Railway Parade. Piers providing structural support would be located on the eastern side of the highway and on the station platform. The piers and abutments would be constructed from reinforced concrete. An indicative design of the new pedestrian bridge is shown in Figure 3-8.

To provide access for pedestrians and cyclists, new lifts and stairs would be located on both sides of the highway, the station platform and Railway Parade. The stairs would be constructed from concrete, while the 17-person lifts would comprise steel structure with glazing, and canopies at the lift lobbies to provide weather protection. The existing level crossing would be removed.

The incorporation of these lifts and stairs would significantly improve connectivity of the area for rail customers, pedestrians and tourists in line with Transport Access Program objectives. The proposal would provide an accessible path of travel across the highway and to the public transport services including the Medlow Bath Station and bus services on the Great Western Highway and Railway Parade.

The design of the bridge would be sympathetic to cultural and aesthetic characteristics of the area. For more information on design initiatives refer to Section 6.9.3.

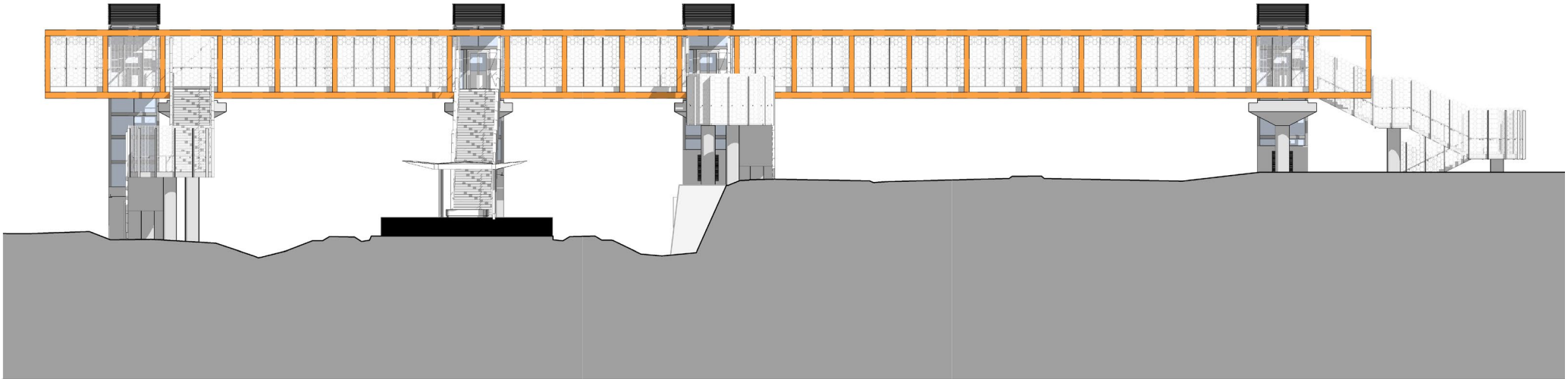

Figure 3-8: Indicative view of the new pedestrian bridge looking south (subject to detailed design) (MRB, 2021)

Urban design and landscaping features

Key urban design and landscaping features of the proposal are detailed below.

- Retaining walls to utilise materials appropriate to the Blue Mountains by having natural finishes such as sandstone (ie applied finishes like painting to be avoided).
- Where earthwork cuttings are needed, the design preference is that the embankments would be stabilised by vegetation and seek to avoid the use of shotcrete.
- Roadside furniture would be installed to support safety in operation. This would include safety screens, seating for pedestrians at bus stops and additional lighting.
- Shared user path for the entire length of the upgrade along the western side of the Great Western Highway. In combination with the new pedestrian bridge this would provide better east/west connectivity for residents, visitors and recreation users.
- Planting and revegetation of areas have been integrated into the design to mitigate potential visual and environmental impacts of the proposal. Additional opportunities for plantings have been incorporated into the design by providing a widened median. Specific examples are:
    - use of mature tree plantings along key points of the proposal for placemaking, marker moments for proposed bus stops and station entries. Deciduous tree plantings would aim to provide colour and foliage in the summer months and allow for light to permeate during the winter months. Accent tree species include Crimson Sentry, Chinese Redbud, Swanes Golden, Himalayan Cypress, Green Beech, Golden Ash, Tulip Tree and Golden Elm
    - plantings within medians aim to evoke historical aesthetic treatments (reminiscent of Medlow Bath in the 1900s). This would consist of massed colourful exotic shrubs and groundcovers, contrasting colour and texture to the existing bushland. Accent plantings of Pride of Madeira and Lavender will provide splashes of intense seasonal colour and year round textural contrast to layers of Blue Flax Lily and Shore Juniper where sight lines are needed.

The landscaping design is in accordance with the *Street Tree Masterplan* (Blue Mountains City Council, 2012).

Drainage design

Water quality management infrastructure for the proposal would include water quality controls such as detention basins and downstream biofiltration rain gardens. The proposed design of the pit and pipe network is shown in Appendix M General Arrangement Plans and includes:

- **at the southern tie in of the proposal on the Great Western Highway (south of Bellevue Crescent):** installation of a new cross drainage culvert urban runoff divert into biofiltration basins and grassed swales for primary and secondary treatment prior to discharge. The final position and shape of the basin is subject to the batter design of the upgrade works
- **at the midpoint of proposal:** installation of a new storm water pipe from west to east beneath the rail corridor (in addition and parallel to existing). This would drain into a new detention basin that incorporates bioretention. It is proposed that the basin would be located at 16 – 18 Railway Parade. The final position and shape of the basin is subject to detailed design but would be greater than 160 square metres to achieve the required Natural or Beneficial Effect (NorBE) objectives.

Other drainage features are listed below.

- Under existing conditions, the discharge of the drainage system downstream of CX3770 is to the rail culvert RD3770. A new 450 millimetre diameter connection to the existing rail drainage swale upstream of RD3770 is proposed as part of the concept design. Flows in excess of the 450 millimetre diameter connection would bypass this rail drainage outlet and continue downstream to subsequent discharge locations.

- Under existing conditions, the discharge of the drainage system downstream of CX3960 is to the rail culvert RD3960. A new 450 millimetre diameter connection to the existing rail drainage swale upstream of RD3960 is proposed as part of the concept design. Flows in excess of the 450 millimetre diameter connection would bypass this rail drainage outlet and continue downstream to subsequent discharge locations.

The provision for the capture of surface runoff represents a major upgrade to the existing conditions where minimal piped infrastructure exists. It is noted that the existing cross drainage discharge locations across the rail corridor are to be maintained to continue the connectivity of flow paths to the downstream receiving watercourses and these discharge locations are typically open drains leading to the rail corridor or existing overland flow paths in Medlow Bath Park. The general process of water quality management for the proposal is shown in Figure 3-9.

Uplift in rainfall intensities as a result of temperature increases under the latest climate projections in the Australian Rainfall and Runoff 2019 (ARR 2019) have also been incorporated into design infrastructure. The cross drainage capacity for the proposal would be upgraded to 1 per cent AEP inclusive of climate change uplift for the RCP 8.5 in line with the ARR 2019. (The RCP refers to the 'Representative Concentration Pathway that takes into account emissions of greenhouse gases, aerosols and other chemically active gases, and land use and cover. An RCP of 8.5 represents a scenario at the higher end of likely temperature increases.)

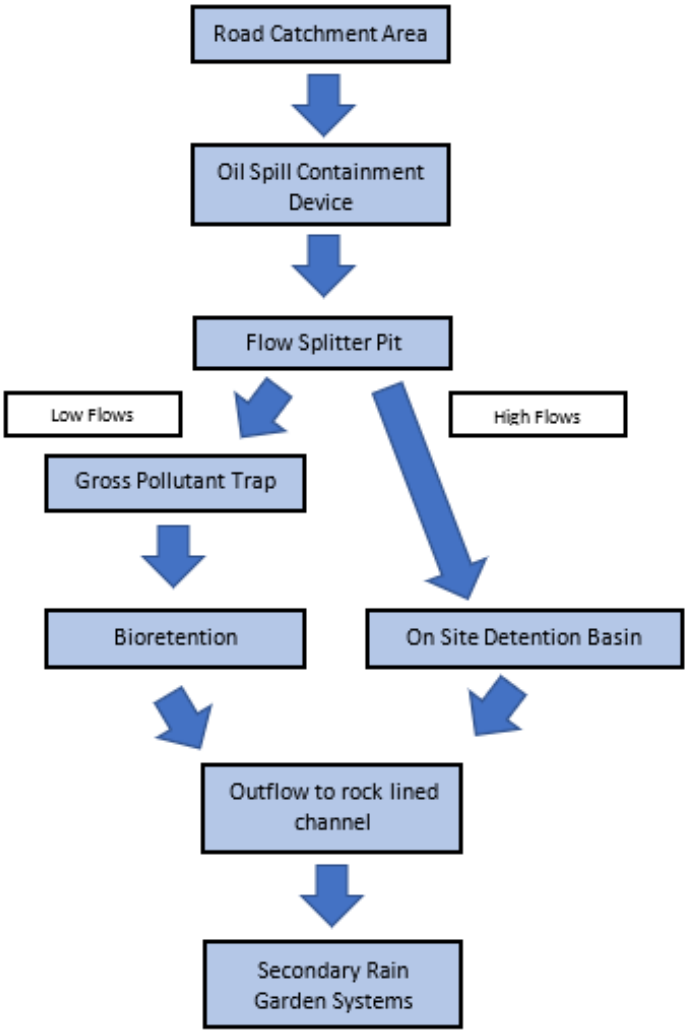

Figure 3-9: Water quality management process for the proposal

Work methodology

The next sections provide a summary of the likely construction methodology, staging, work hours, plant and equipment and associated activities that would be used to construct the proposal based on the concept design. Detailed construction staging plans and methodology would be determined by the construction contractor(s) after completion of the detailed design. The actual construction method may vary from the description in this section as a result of factors such as identification of on-site conditions during pre-construction activities, ongoing refinement of the design, consultation with property owners and availability of funding.

The environmental management framework to manage and mitigate impacts is presented in Chapter 7 (Environmental Management). Construction activities would be guided by a Construction environmental management plan (CEMP) to ensure work is carried out to TfNSW specifications (published by the former Roads and Maritime) within the specified work area. The final construction plan and methods chosen by the contractor would also be required to be consistent with this framework.

In the event that construction activities result in environmental impacts additional to those assessed in this REF, further environmental assessment would be required to be undertaken and approved by TfNSW.

3.2.4 Construction activities and staging

Construction would be staged to manage and minimise community impacts and in particular to minimise traffic impacts. Investigation and early work activities would be undertaken to facilitate efficient construction work progress. These early work activities may include activities such as:

- environmental and engineering investigations and marking of sensitive areas
- utility investigation and adjustments
- installation of temporary environmental and traffic controls such as sediment controls, basins, line marking and signposting
- property adjustment work
- establishment of ancillary facilities.

Key construction planning activities that would minimise impacts during construction are summarised below.

- Staging of works to minimise disruption by:
    - maximising large uniform areas
    - having clarity about the type of construction for an area, especially the groundworks
    - reduce access disruption
    - avoiding unnecessary excavation
    - optimising design solutions to reduce construction duration.
- Staging traffic switches and utilities works with the objective of ensuring the highway remains open in both directions during construction.
- Staging of the pedestrian bridge to fit in with planned Sydney Trains track possessions is also critical.

Impacts during the construction phase would be further minimised by the following.

- Utilising construction methods that allow the pavement to be trafficked soon after laying, such as full depth asphalt rather than lean mix concrete base.
- Construction staging and traffic switching including temporary stages to be fully modelled in Building Information Modelling (BIM) in 4D and to always allow a lane in each direction to be operational.

- Constructing the permanent sediment basin at an early stage of the proposal to capture water during construction and then be used during operation.

The indicative construction activities for the proposal are identified in Table 3-2.

Table 3-2: Indicative construction staging and activities

Stage	Activities	Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce
Site preparation	• Pre-construction identification and marking of sensitive areas as identified in this REF and the CEMP • Utility investigations • Potential removal of redundant utilities and relocation of existing ones	8	3	8
Site establishment	• Topsoil stripping • Installation of erosion and sedimentation controls • Hardstand construction • Utilities services • Material storage areas • Temporary security fencing • Temporary pedestrian fencing • Temporary access road to the compound • Temporary traffic control barriers, signage and lighting along the full length of the existing roadway in order to separate the construction site from passing traffic • Property adjustment work	6	15	35
Vegetation clearing	• Clearing trees, grubbing, mulching	2	3	5
Roadworks	Road works would be required along the entire road alignment. The works would be split into constructing the northbound lanes first and then constructing the southbound lanes. Road construction would include: • Removal and demolition of existing pavements, kerbs and gutters • Embankment foundation treatments • Construction of the new embankment • Excavation of cuttings • Construction of the larger transverse drainage structurers (box culverts) • Installation of drainage pit and pipe systems • Construction of the open drainage channels and permanent controls • Utility works typically including communications, power, gas, water and sewer (where necessary) along with Intelligent Transport System (ITS) and Traffic Control System (TCS) networks • Construction of the pavement layers including the select fill, subbase and the asphalt • Kerb and gutter construction	70	20	75

Stage	Activities	Duration (weeks)	Maximum daily deliveries (trucks)	Maximum daily workforce
	• Major and minor sign structures including piling, concrete works and installation of overhead steel structures • Tie-ins to existing pavement at the southern and northern limits			
Pedestrian bridge	• Construction of bridge footings, piers and deflection wall • Construction of lift foundations • Installation of lift shafts, upper lift landings, lift shaft services, lift cars and fit out lift cars • Installation of lighting/CCTV/PA services to lift landings • Construction of lift landing canopies • Installation of line marking and signposting	72	20	60
Station upgrade	• Site compound establishment (erect fencing, tree protection zones, site offices, amenities, plant and material storage areas, removal of platform garden beds) • Relocation of overhead wiring portal • Undergrounding of 11 kV • Platform work including, resurfacing, new tactiles, relocation of platform furniture • Upgrade of station power supply • Upgrade of station services • Removal of level crossing • Site demobilisation	72	10	25
Finishing works	• Installation of road furniture (ie lighting, safety barriers and guideposts) • Pavement marking • Installation of urban design treatments and features • Landscaping works • Removal of all remaining temporary works such as traffic control barriers and lighting	10	15	25

3.2.5 Construction hours and duration

Subject to approval, the proposal would progress to the detailed design stage. Construction of the proposal is anticipated take around 20 months to complete, weather permitting.

Construction work for the proposal would generally be carried out during standard working hours, as follows:

- Monday to Friday, 7am to 6pm
- Saturday, 8am to 1pm
- Sunday and Public Holidays, no work with the exception of during rail closures.

Out of hours work would be required to minimise disruptions to railway operations, motorists and nearby sensitive receivers. Where possible, works in or near the rail corridor would utilise already scheduled rail shutdowns.

Out of hours work would be subject to permitted road occupancy licences and construction staging. Out of hours work would be carried out in line with the procedures contained within the Environmental Protection Authority (EPA) *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009) and the *Environmental Noise Management Manual* (Roads and Traffic Authority, 2001). This would be undertaken in accordance with the conditions of the environment protection licence (EPL) for the proposal.

During scheduled night work, potentially impacted sensitive receivers would be consulted and kept informed of construction progress to minimise any impacts. In addition, management and mitigation measured detailed within the CEMP would be implemented as required to further mitigate any construction impacts. This includes the development of an out-of-hours work protocol which would govern the management of work outside standard work hours. Prior advice would be given to the community regarding work hours, and any planned construction work that is proposed to be carried out outside standard work hours.

3.2.6 Plant and equipment

A range of plant and equipment would be used during construction. An indicative list is provided below. The final equipment and plant requirements would be determined by the construction contractor.

- Bulldozers
- Backhoes
- Dump trucks
- Road trucks
- Excavators
- Backhoes
- Piling rigs
- Water trucks
- Water pumps
- Concrete saws
- Cranes
- Concrete pumps/vibrators
- Road sweepers
- Asphalt pavers
- Roller/compacters/compressors
- Line marking vehicles
- Graders
- Scrapers
- Concrete trucks
- Generators
- Chainsaws
- Jackhammers
- Mulchers

3.2.7 Earthworks

Earthworks would be required for the road upgrade works and typically involve regrading of the existing road.

However, it is anticipated that deeper excavations would be required for the following:

- abutments and piers for pedestrian bridge footings
- retaining wall adjacent to the station
- lift shaft foundations.

Any unsuitable materials would need to be removed to ensure foundation materials can provide sufficient support for the overlying work. Unsuitable materials typically include:

- highly organic material
- clay and silt of very soft, soft and firm consistency
- silt and sand of very loose relative density
- uncompacted or poorly compacted fill

- fill material containing foreign material such as waste or putrescible material
- contaminated material.

Estimated quantities of materials associated with earthwork are provided in Table 3-3. Earthwork requirements would be confirmed during detailed design.

Table 3-3: Indicative earthwork volumes

Material	Estimated volume
Excavation (cut) volume	13,250 m^3
Earthwork materials (soil)	Topsoil 1,200 m^3
Fill volume	1,600 m^3

3.2.8 Source and quantity of materials

The following materials would be required for construction:

- earthwork materials (eg sand, gravel, topsoil, general fill material) and selected material for road formation
- bitumen and aggregates (eg stone, sand, gravel) for pavement production
- binders to stabilise and treat the road formation and culvert bases
- cement and aggregates for concrete used in drainage construction, pavement construction, and miscellaneous work such as kerbs and gutters
- precast concrete elements for bridge and drainage construction and miscellaneous work.

Materials for road construction would likely need to be imported from off-site facilities (eg quarries). Sources of materials for construction would be determined during further development of the design. The indicative quantities of the main materials are listed in Table 3-4.

Table 3-4: Indicative resource volumes

Material	Estimated volume
Pavement materials (aggregate and asphalt)	Milling of asphalt surface 5,900 m^2 Select material 4,200 m^3 Lean mix concrete subbase 2,800 m^3 Base and sub-base: 890 m^3 7mm seal on subgrade: 18,800 m^2 Primer 18,800 m^2 Asphalt: 4,500 m^3
Concrete for shared paths, medians, and bridge structures	600 m^3
Steel for pedestrian bridge	63 tonnes

Surplus materials

The excavated material from the proposal would be reused onsite where possible. These materials would be stockpiled and further tested to determine suitability for reuse, however it is likely that there would be a surplus of material requiring disposal offsite.

Surplus or unsuitable material that cannot be used on-site would be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility if not possible to be stockpiled for the adjacent eastern stage of the Great Western Highway upgrade.

Water

The amount of water that would be required during construction is unknown at this stage. The amount would depend on material sources and methodologies applied by the contractor. It is proposed that water would be obtained from the local water supply network.

3.2.9 Traffic management and access

Construction would generate heavy vehicle movements associated with:

- delivery of construction materials
- spoil and waste removal
- delivery and removal of construction equipment and machinery
- movement of materials, resources and construction staff between the construction areas and compounds.

Based on the traffic assessment, truck movements during construction would be distributed throughout the day equating to less than 30 trucks per day.

Construction activities would also generate light vehicle movements associated with staff movements to and from and within the site. During normal working days it is estimated the number of truck movements to the work sites would be less than 30 per day, based on similar projects. Also refer to Table 3-2 for information on truck volumes.

Access to the construction site for trucks would be via the Great Western Highway as there are no alternative routes from local streets. Where possible, vehicles would be parked within the construction compound to minimise impact to local residents.

A temporary one hour road closure would be required to allow for the operation of a crane to lift in and install the new pedestrian bridge. Other temporary partial road or lane closures would be required at times to allow for road works (such as new pavement, kerb and gutter works) however it is proposed that alternating one-way traffic flow would be able to be maintained.

There are a number of properties with direct access to the road network within the proposal area. Access to affected properties would be maintained throughout by providing temporary property access where required.

Bus stops on Great Western Highway servicing the local bus network would be temporarily relocated during construction. Proposed relocations would be confirmed during construction planning.

Section 6.5 provides a more detailed assessment of traffic and transport impacts.

3.3 Ancillary facilities

Ancillary facilities would be required to support construction of the proposal including the following:

- site compounds
- laydown areas
- stockpile sites
- hardstands for the construction plant (including cranes)
- temporary sediment basins.

Table 3-5 summarises the potential locations of each ancillary facility, and how they would generally be used subject to arrangement with property owners. These are shown in Figure 3-10.

Table 3-5: Indicative location of ancillary facilities

Location	Size (m^2)	Indicative site use
181 – 183 Great Western Highway, Medlow Bath	2,053	Potential site compound, site office location and construction parking
90-98 Great Western Highway, Medlow Bath	2,750	Site compound and equipment laydown site
52-88 Great Western Highway, Medlow Bath (area behind Petrol Station)	6,902	Potential site compound, site office location and construction parking

Figure 3-10: Indicative locations of anciliary facilities site

Potential impacts of these proposed site compounds and ancillary facilities have been assessed in this REF. Impacts have been minimised by selecting sites with consideration to the following criteria:

- proximity to the proposal
- vacant site with exiting hardstand area, with existing vehicle access and egress
- relatively flat ground that does not require substantial reshaping
- in plain view of the public to deter theft and illegal dumping.

Stockpile locations would be refined during the detailed design phase using the criteria set out in the *Stockpile Management Guideline* (Roads and Maritime Services, 2015b). Where possible, the stockpile areas would be located on sites:

- not prone to flash flooding
- more than 40 metres from a watercourse
- more than 50 metres from the nearest dwelling
- in previously disturbed areas that do not require the clearing of native vegetation
- in plain view of the public to deter theft and illegal dumping
- outside the drip line of trees and on level ground wherever possible.

Bridge laydown areas for large precast structures would need to be in proximity to the bridge construction area.

Ancillary sites would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of construction, the temporary site compound, work areas and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated.

Where amendments or additional ancillary facilities are identified during construction, the contractor would consult with TfNSW to confirm the suitability of the proposed amendment or additional facility, and whether any additional environmental assessment is required.

3.3.1 Ancillary facilities for Transport Access Program works

Potential locations of site compounds and laydown areas for the management of the Transport Access Upgrade works at Medlow Bath Station are identified below. It is anticipated that the compounds would be required for the duration of construction.

The proposed location of the site compound (adjacent to the rural fire service land on Railway Parade) is indicated in Figure 3-11. The proposed location of laydown area within the rail corridor is indicated in Figure 3-12.

Figure 3-11: Proposed site compound for Transport Access Program works

Figure 3-12: Proposed laydown area for Transport Access Program works

3.3.2 Construction sedimentation basins

Construction works have the potential to affect water quality through erosion of exposed or disturbed areas and subsequent sedimentation of watercourses. To mitigate these effects, sediment basins would be installed within the proposal area to trap sediments and other pollutants from disturbed areas.

Sediment basins shown in the general arrangement plans included in Appendix M would collect a high proportion of sediment-laden runoff from disturbed areas. The ideal location for the sediment basins is on the downstream side of the proposal area. These proposed locations for sediment basins also consider site constraints such as heritage, environmental, accessibility for maintenance or other constraints such as utilities.

The design criteria for the sediment basins are defined in *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D Main Road Construction* (Department of Environment and Climate Change, 2008) and the former Roads and Maritime General Specifications G36 and G38. The sediment basins would need to provide sufficient volume for settling and storage of sediments. The settling zone volume are estimated using the appropriate design rainfall depth and catchment areas. The storage zone is estimated using the Revised Universal Soil Loss Equation.

The final size and location of the basins would be confirmed during detailed design. Additional soil and water management measures would also be developed during detailed design and included in the CEMP.

3.4 Public utility adjustment

TfNSW has consulted with public utility authorities during the design process to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments.

Preliminary investigations indicate that the following existing utilities are within the proposal area:

- overhead (majority of local network) and underground electricity – Endeavour Energy and RailCorp
- water reticulation – Sydney Water Corporation
- sewer reticulation – Sydney Water Corporation
- natural gas – Jemena Gas
- telecommunications – Telstra, Optus, NBN Co, etc.

Most of the affected utilities are located on the western side of the Great Western Highway. Some utilities located on the western verge cross the rail corridor to Railway Parade, the Endeavour Energy 11 kilovolt supply via overhead infrastructure and Jemena Gas via a conduit.

As part of the proposal these services would be relocated to a new configuration outside the new road pavement but still on the western side of the highway, with the final location of any relocated utilities subject to consultation with the relevant utility providers. The eastern side of the highway has little opportunity to accommodate services due to the widening of the road and inclusion of a retaining wall on the rail corridor boundary.

As part of the proposal an upgrade to the station power supply would be required to provide adequate power for the new pedestrian bridge and lifts. This would include a new kiosk substation to be located east of the Medlow Bath station platform adjacent to Railway Parade within the railway corridor.

Utilities that would be impacted by the proposal are identified in Table 3-6. Generally, utilities that would require relocation as part of the proposal would be relocated underground within the new road alignment.

Table 3-6: Utility impact assessment

Service	Location	Requirement	Service type	Service provider
Power (Great Western Highway side)	Distribution Overhead / Underground on western verge of the Great Western Highway between Bellevue Crescent and Hydro Majestic Hotel. Streetlighting and Low Voltage Overhead on western and eastern verges of the Great Western Highway. 11kV overhead supply crosses the rail corridor near the middle of the project boundary.	Relocation required	11 kV high voltage, 415 V and street lighting	Endeavour Energy
Power (Railway Parade side)	11 kV overhead between the rail corridor and Railway Parade	Section requires relocating underground at the pedestrian bridge	11kV high voltage	RailCorp

Service	Location	Requirement	Service type	Service provider
Gas	Mainly present on the western verge of the Great Western Highway. Crosses to Railway Parade on the eastern side of the rail corridor	Relocation required	300 kPa 160 mm diameter pipe, 300 kPA 32 mm diameter pipe	Jemena Gas
Tele-communications (including NBN)	Telstra network present on the western and eastern verges of the Great Western Highway and at Railway Parade. Optus fibre within the rail corridor.	Relocation and/or protection required	Fibre optic and copper. DA and CC network. Underground network mainly within Telstra network. Optus Inter Office Fibre.	Telstra Optus NBN
Water – potable and sewer	Mainly present on the western verge of the Great Western Highway and section at Railway Parade turning bay	Relocation and/or protection required	150 mm potable main and 110 mm sewer main on westbound verge of the Great Western Highway. 100 mm potable main and 450 mm sewer main on Railway Parade.	Sydney Water Corporation

3.5 Property acquisition

The proposal is mainly located within the existing road corridor, however, some property acquisition may be necessary. Based on the concept design, the property acquisitions outlined in Table 3-7 would be required however details of property acquisition would be determined during the detailed design phase. Table 3-7 identifies potentially affected lots to provide an indication of the acquisition that may be necessary.

Table 3-7: Proposed property acquisitions

Address	Current use	Purpose
Part of 46 Great Western Highway, Medlow Bath (Lot C/DP413431)	Car park	Western footing of pedestrian bridge
16 - 18 Railway Parade, Medlow Bath (Lot 1/1/DP2590)	Vacant	Permanent drainage basin
106 Great Western Highway Medlow Bath (Lot 9/DP701200)	Residential	Space for U-turn bay on Bellevue Crescent
128W Great Western Highway Medlow Bath (Lots 219 and 220/DP1211208)	Vacant	Provide additional space for road corridor
Part of 52-88 Great Western Highway, Medlow Bath (Lot 20/DP25570) – at rear of petrol station	Temporary car park	Alternative Bellevue Crescent alignment option
90-98 Great Western Highway, Medlow Bath (Lots 3 and 4/DP25570 and Part of 5/DP25570)	Vacant	Alternative Bellevue Crescent alignment option

4. Statutory and planning framework

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

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act* (EP&A Act) establishes the system of environmental planning and assessment in NSW. This proposal is subject to the environmental impact assessment and planning approval requirements of Division 5.1 of the EP&A Act. Division 5.1 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which do not require development consent under Part 4 of the Act.

In accordance with Section 5.5 of the EP&A Act, TfNSW, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposal.

Clause 228 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) defines the factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has or is likely to have a significant impact on the environment. Chapter 6 of the REF provides an environmental impact assessment of the proposal in accordance with clause 228 and Appendix A specifically responds to the factors for consideration under clause 228.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. ISEPP is the key environmental planning instrument which determines the permissibility of a proposal and under which part of the EP&A Act an activity or development may be assessed.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is for road and road infrastructure facilities and is to be carried out on behalf of TfNSW, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under *State Environmental Planning Policy (Coastal Management) 2018, State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (State Significant Precincts) 2005.*

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Section 5.4 of this REF.

The ISEPP prevails over all other environmental planning instruments except where there is an inconsistency with *State Environmental Planning Policy (State Significant Precincts) 2005* or certain provisions of *State Environmental Planning Policy (Coastal Management) 2018*. The proposal does not require consideration under these SEPPs and therefore do not require further consideration as part of this REF.

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* relates to the use of land within the Sydney drinking water catchment. Clause 12 of this SEPP requires consideration of whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity. A neutral or beneficial effect (NorBE) assessment is included in Appendix C. The assessment concluded that the proposal would have a beneficial effect on water quality.

State Environmental Planning Policy (Koala Habitat Protection) 2020

The *State Environmental Planning Policy (Koala Habitat Protection) 2020* aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range. The SEPP identifies the areas of core koala habitat, encourages the inclusion of core koala habitat into environmental protection zones and requires management plans to be prepared prior to the granting of development consent within an area of core koala habitat.

The Blue Mountains LGA is listed in Schedule 1 of the SEPP as land on which this SEPP is applicable. However, the proposal does not require development consent from council as it would be assessed under Division 5.1 of the EP&A Act.

State Environmental Planning Policy No. 55 – Remediation of Land

The *State Environmental Planning Policy No.55 — Remediation of Land* (SEPP 55) provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. While development consent for the proposal is not required, the provisions of SEPP 55 have still been considered in the preparation of this REF.

Section 6.4 of this REF contains an assessment of the potential contamination impacts of the proposal. While some contaminants have been observed within or adjacent to the proposal area, it is not expected that any large-scale remediation (Category 1) work would be required as part of the proposal. The proposed land use would not differ to the existing use and, therefore, would be unlikely to be affected by any potential contaminants that exist within the road corridor. Excavation of the ground would be required for the foundations of the proposed new pedestrian bridge, however any contaminated materials found within these areas would be dealt with as per the relevant procedures and safeguards outlined in the CEMP.

4.1.2 Local Environmental Plans

Blue Mountains Local Environmental Plan 2015

The *Blue Mountains Local Environmental Plan 2015* (Blue Mountains LEP) is the governing plan for the Blue Mountains LGA, including Medlow Bath. Table 4-1 summarises the relevant aspects of the Blue Mountains LEP applicable to the proposal.

Table 4-1 Relevant provisions of Blue Mountains LEP

Provision description	Relevance to the proposal
Clause 2.3 Zone Objectives and Land Use Table	The relevant land zones described in Table 4-2 indicate that the proposal would be permitted with consent in all zones. However, as outlined in Section 4.1.1, under ISEPP the proposal is permitted without consent of council. Therefore, the consent requirements of the LEP do not apply and the proposal may be determined under Division 5.1 of the EP&A Act. The land zoning within and around the proposal area is shown in Figure 4-1: Land zoning
Clause 5.10 Heritage conservation	Clause 5.10 of the Blue Mountains LEP aims to conserve the environmental heritage of the Blue Mountains, heritage significance of heritage items, archaeological sites, Aboriginal objects and Aboriginal places within the LGA. There are a number of heritage items listed on the Blue Mountains LEP that are located in the immediate vicinity of the proposal including the Hydro Majestic Hotel, Medlow Bath Railway Station, Avenue of Trees, Melbourne House, Cosy Cot and Sheleagh Cottage, St Luke's Anglican Church and Medlow House located along the Great Western Highway. A discussion of potential impacts to local heritage is provided in Section 6.8.
Clause 6.12 Protected area – escarpment	Clause 6.12 of the Blue Mountains LEP aims to preserve and enhance the visual, cultural, natural and ecological features and values of the escarpment systems in the Blue Mountains, to limit the proportion of hard surfaces in close proximity to escarpment systems and ensure that development is designed and sited appropriately, and to encourage the retention, restoration and maintenance of areas of disturbed native vegetation. Land along the eastern side of the Great Western Highway within the proposal area is marked as 'Protected area – Escarpment' and any development within this area must not adversely impact the visual, cultural and ecological values of the area or introduce visually disruptive materials. The proposal involves work within the existing disturbed road corridor, which is consistent with the existing nature of the area. However, the proposal would introduce a new pedestrian footbridge over the Great Western Highway, though only a portion of the new pedestrian footbridge would be located within land marked as 'Protected area – Escarpment'. As outlined in Section 4.1.1, under ISEPP the proposal is permitted without consent of council. Therefore, the consent requirements of the LEP do not apply and the proposal may be determined under Division 5.1 of the EP&A Act. A discussion of potential impacts to landscape character and visual amenity is provided in Section 6.9.
Clause 6.14 Earthworks	Clause 6.14 of the Blue Mountains LEP aims to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land. By virtue of clause 5(3) and 94 of the ISEPP, the proposal is permissible without development consent. Consideration of the potential impacts and mitigation measures for earthworks for the proposal is outlined in Section 6.4.
Clause 7.9 Medlow Bath Precinct	Clause 7.9 of the Blue Mountains LEP aims to encourage development within the Medlow Bath Precinct that complements and is sympathetic to the heritage significance of the Hydro Majestic Hotel, while also minimising the impact of development on escarpment areas and on land in the Zone E2 Environmental Conservation. The clause also aims to enhance the traditional streetscape character and gardens of the precinct. The proposal aims to reduce congestion and provide more efficient and reliable journeys for those travelling in, around and through the Blue Mountains. The proposal would also address known safety and accessibility concerns within the Medlow Bath local area, benefiting local traffic and pedestrians while also benefiting those passing through Medlow Bath. Additionally, the proposal has been designed to be contained within the existing road corridor as much as possible to result in minimal property, environmental and heritage impacts.

Figure 4-1 shows the relevant section of the zoning map from the Blue Mountains LEP, with the indicative location of the proposal. The land use objectives for these zones under the LEP, and the proposal's consistency with those objectives, is detailed in Table 4-2.

Table 4-2 Relevant zone objectives

Zone	Objectives	Consistency of the proposal with the zone objective
SP2 Infrastructure Classified Road	To provide for infrastructure and related uses To prevent development that is not compatible with or that may detract from the provision of infrastructure.	The proposal would provide an upgrade to the Great Western Highway to improve capacity, travel times and safety.
SP3 Tourist	To provide for a variety of tourist-oriented development and related uses. To provide tourist development that is compatible with the environmental, scenic and landscape qualities of the area. To enable other uses that complement tourist development without eroding the retail hierarchy of the local centres and villages. To promote a high standard of urban design and amenity in a high-quality landscape setting. To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.	The Great Western Highway is the main route between Greater Sydney and Central West NSW for general, freight and tourism traffic. The proposal would duplicate the existing capacity of the Great Western Highway for a safer and more efficient link for traffic utilising the road, including tourism traffic. By enhancing the transport infrastructure within the existing road corridor, the proposal aims to support tourism-related industries through greater and safer access while protecting areas of high ecological, scientific, cultural and aesthetic values.
E4 Environmental Living	To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values. To ensure that residential development does not have an adverse effect on those values. To preserve and re-establish native bushland in those areas that exhibit a predominantly bushland character, where consistent with the protection of assets from bush fire. To ensure that the form and siting of buildings are appropriate for, and harmonise with, the bushland character of the locality.	The proposal would involve an upgrade to the Great Western Highway within the existing road corridor and does not include residential development. It is not expected that the proposal would negatively impact on the objectives of the E4 zone.

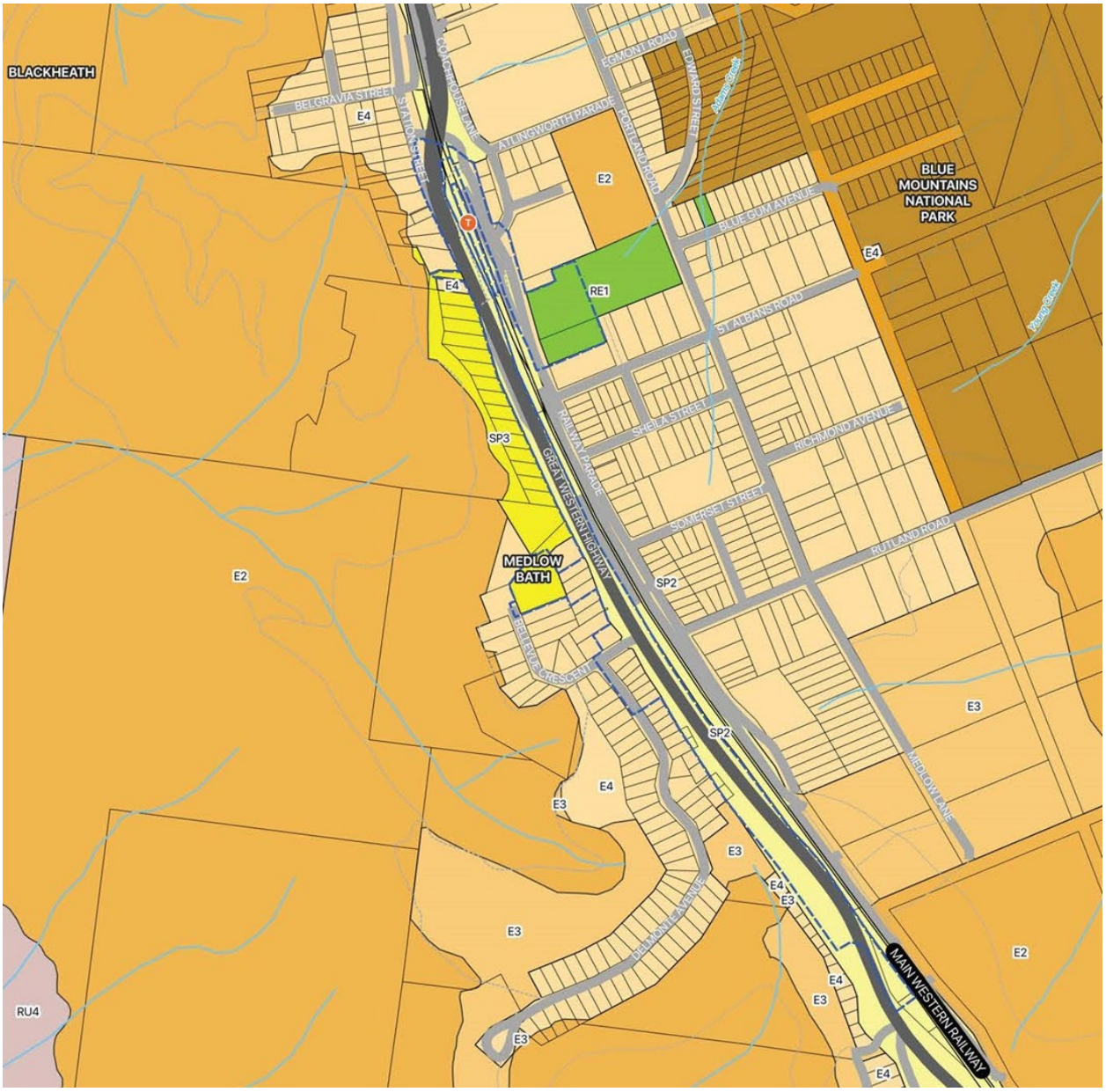

Figure 4-1: Land zoning

4.2 Other relevant NSW legislation

4.2.1 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and the declaration of public authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.

Under Section 138(1) of the Roads Act, consent from the road authority is required for carrying out various activities in, on and over public roads. The Great Western Highway is a classified road and requires consent from the road authority to proceed. Approval would be sought for a road occupancy licence for the temporary closure of traffic lanes and, if required, the movement of over-sized vehicles during construction. Consent to carry out work on classified roads is not required as per Schedule 2 clause 5(1) of the Roads Act.

However, a road occupancy licence would need to be obtained as necessary prior to construction commencing.

4.2.2 Crown Lands Management Act 2016

The *Crown Lands Management Act 2016* provides the legislative framework for the administration of land that is vested in the Crown in NSW. Ministerial approval is required to grant a 'lease, licence, permit, easement or right of way over a Crown Reserve'. Consultation with the Department of Industry (Crown lands division) and a community engagement strategy is required under the *Crown Land Management Act 2016* for any action affecting Crown Land use including licences and leases.

Acquisition of Crown land would not be required for the proposal, as described in Section 3.5.

4.2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) sets out the assessment framework for threatened species and ecological communities for activities subject to assessment under Part 5 of the EP&A Act (amongst other types of development).

Under Part 7 of the BC Act, a species impact statement (or biodiversity assessment report) in relation to an activity that is likely to significantly affect threatened species (which is defined to include ecological communities, or their habitats) and the concurrence of the Environment Agency Head may be required. A biodiversity assessment has been undertaken for the proposal (refer Section 6.1) which concluded that the proposal was unlikely to have a significant impact and further assessment through the preparation of a Biodiversity Development Assessment Report is not required.

4.2.4 Heritage Act 1977

An excavation permit is required to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation would or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Section 139(4) of the *Heritage Act 1977* makes provision for the issuing of an exception in certain prescribed circumstances.

A major works (or standard) Section 60 approval is required for activities and works that have (or would have the potential to have) a moderate or greater impact on the heritage significance of a State heritage item. A Section 60 application would be required for proposed works within the State Heritage Register (SHR) curtilage of Medlow Bath Railway Station (refer Section 6.8). The approval would be obtained prior to works commencing.

4.2.5 National Parks and Wildlife Act 1979

The harming or desecrating of Aboriginal objects or places is an offence under Section 86 of the *National Parks and Wildlife Act 1979* (NPW Act). Under Section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

The NSW Department of Planning, Industry and the Environment has published the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (Department of Environment, Climate Change and Water, 2010).

The due diligence process and the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Services, 2011) has been undertaken as part of this REF and confirmed that an Aboriginal heritage impact permit (AHIP) is not required for the proposal (refer to Section 6.7).

4.2.6 Land Acquisition (Just Terms Compensation) Act 1991

Based on the concept design, it is anticipated that properties at six addresses may need to be partially or fully acquired as part of the proposal (refer to Table 3-7). All property acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, which aims to guarantee just

compensation terms for land that is acquired by an authority of the State. TfNSW would continue to consult with affected landowners during the development of the proposal.

4.2.7 Contaminated Land Management Act 1997

Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) imposes a duty on landowners to notify the Department of Planning, Industry and Environment, and potentially investigate and remediate land if contamination is above EPA guideline levels.

A search of the EPA list of contaminated sites in NSW on 11 February 2020 found the location of the proposal has not been declared under the CLM Act as being significantly contaminated, nor are there any contaminated sites within close proximity to the proposal area (refer Section 6.4).

Further sampling and assessment would be required during construction to determine final waste classification. Subsequent to this, any materials classified as Hazardous Waste may require treatment or an immobilisation approval in accordance with Part 10 of the Protection of the Environment Operations (Waste) Regulation 2014 prior to off-site disposal.

4.2.8 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legal framework for the management of air, noise, water and waste pollution. Under Section 48 of the POEO Act, scheduled activities (as defined in Schedule 1 of the Act) require an environment protection licence (EPL).

Part 3.2 of the POEO Act requires an environment protection licence for scheduled development work and the carrying out of scheduled activities (as set out in Schedule 1 of the POEO Act). Clause 35 of Schedule 1 of the POEO Act applies to road construction, meaning the construction, widening or rerouting of roads. The proposal is declared to be a scheduled activity as it results in the existence of four or more traffic lanes for at least one kilometre, where the road is in a metropolitan area and is classified, or proposed to be classified, as a main road (but not a freeway or tollway) under the *Roads Act 1993*.

In addition, the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005 are the key pieces of legislation that regulate waste in NSW. They contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste. Applying waste to land in NSW (such as temporary storage and reusing materials back into the construction of a road) may trigger various regulatory requirements such as the need to hold an EPL or pay the waste and environment levy. However, a ‘resource recovery exemption’ may be applicable for the land application if it is a genuine, fit for purpose, reuse of the waste rather than another path to waste disposal.

An exemption facilitates the use of specific waste materials outside of certain requirements of the waste regulatory framework. For each exemption, there is a corresponding ‘resource recovery order’ that specifies the requirements that must be met by suppliers of the material. The EPA has issued general resource recovery orders and exemptions for many materials including:

- excavated natural material
- excavated public road material
- raw mulch
- reclaimed asphalt pavement
- recovered aggregate.

These orders and exemptions may be used for the proposal without seeking approval from the EPA.

4.2.9 Waste Avoidance and Resource Recovery Act 2001

The purpose of the *Waste Avoidance and Resource Recovery Act 2001* is to develop and support the implementation of regional and local programs to meet the outcomes of a State-wide strategy for waste avoidance and resource recovery. It also aims to 'minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste'.

Waste generation and disposal reporting would be carried out during the construction and operation of the proposal. Procedures would be implemented during construction to promote the objectives of this Act (refer to Section 6.12).

4.3 Commonwealth legislation

4.3.1 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 Appendix A and Chapter 6 of this REF.

A referral is not required for proposed activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted for TfNSW (former Roads and Maritime) under the EPBC Act by the Australian Government in September 2015. Potential impacts to these biodiversity matters are also considered as part of Chapter 6 of this REF.

Findings – matters of national environmental significance

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

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

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

4.3.2 Native Title Act 1993

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

A search of the Native Title Tribunal Native Title Vision website was undertaken on 14 February 2020, with no Native Title holders/claimants identified.

TfNSW would provide a notice of the proposal to NTSCORP under Section 24KA of the Act and would be invited comment on the proposal.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

TfNSW is the determining authority for the proposal. This REF fulfils TfNSW's obligation under Section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and further consultation proposed.

5.1 Consultation strategy

The communication objectives for the Great Western Highway Upgrade Program (including the Medlow Bath section) as set out in the *Medlow Bath Consultation Summary Report* (TfNSW, 2020b) are to:

- provide clear, consistent and timely information to communities, stakeholders and customers on the program
- build relationships and a database of contacts of interested and concerned community members with who TfNSW will continue to engage with throughout the development and delivery of the Great Western Highway Upgrade Program
- provide meaningful opportunities for the community to provide feedback
- listen to community and stakeholder views to help shape the design of the program
- raise awareness of the program and its benefits and impacts throughout all phases including planning and construction
- establish relationships and build trust with the local community, particularly local stakeholder groups, business and any directly impacted residents/landowners
- provide clarity to the local community on the strategic design for Medlow Bath
- actively accept and respond to feedback and input from the local community on the elements of the strategic design, including within the period of consultation
- ensure that members of the local community have sufficient opportunity to provide feedback, in light of fluid COVID-19 advice and restrictions on community consultation.

The consultation strategy has been developed to engage with a broad cross section of the community. Consultation has been open to all interested stakeholders within the Blue Mountains but has focused on the residents and business owners of Medlow Bath.

Consultation that has been undertaken to date for Medlow Bath is outlined in the sections below. For further information on community consultation undertaken as part of the wider program refer to **nswroads.work/gwhd**.

5.2 Community involvement

The strategic corridor for the proposed upgrade between Katoomba and Lithgow was released to the community for feedback in November 2019.

Public consultation was carried out between 29 June 2020 and 31 August 2020 to gather feedback and insights from stakeholders on the proposed draft Medlow Bath strategic design.

Face-to-face consultation with residents and the community was initially scheduled to take place between Monday 29 June 2020 and Saturday 15 August 2020. Due to the COVID-19 health guidelines set by NSW Health, interested parties were asked to register for these sessions to ensure a limit of 20 attendees per session. Prior to the face-to-face consultation NSW Health updated the guidelines which resulted in all consultation being moved online. TfNSW welcomed feedback through an interactive online portal, email, mail, phone and online consultation sessions.

Stakeholders and the community were encouraged to provide feedback on the following proposal elements:

- improving intersections and providing turning lanes
- connectivity across the highway
- how to ensure resilience and emergency access is maintained
- maintaining the speed limit through Medlow Bath
- how to minimise impacts on the village
- landscaping opportunities

Stakeholder and community feedback on the strategic design was used to help refine and inform the design to concept design stage, which has been used for the environmental assessment stage.

Consultation tools and communications materials used during consultation period included the following:

- consultation postcard – a double sided postcard containing consultation session details was delivered to all Medlow Bath residences
- community update and FAQ – a six-page community update including a map of the Medlow Bath strategic design was delivered to Medlow Bath residents and made available on the project website
- bespoke meeting letter – two consultation sessions were planned to address issues for specific areas and streets, including residents in the vicinity of the Great Western Highway/Bellevue Crescent/Delmonte Avenue, and one for residents of Coachhouse Lane
- doorknocking – the project team doorknocked residents of Bellevue Crescent, Delmonte Avenue, and the Great Western Highway on 29 June 2020.

Community consultation sessions and briefings are detailed in Table 5-1.

Table 5-1: Community consultation sessions

Engagement	Details and dates
General community sessions	• Wednesday 22 July 2020: 7–8pm • Thursday 23 July 2020: 1–2pm • Tuesday 28 July 2020: 12–1pm • Wednesday 29 July 2020: 7–8pm • Thursday 30 July 2020: 1–2pm
Bespoke community sessions	• Thursday 23 July 2020: 7–8pm Bellevue Crescent and Delmonte Avenue residents • Thursday 30 July 2020: 7–8pm Coachhouse Lane residents • Monday 17 August 2020: 6–7pm Coachhouse Lane residents
Stakeholder group meetings	• 29 June 2020, Medlow Bath Highway Action Group • 22 July 2020, Medlow Bath Residents' Association • 5 August 2020, Medlow Bath Rural Fire Service
Local businesses meetings	• 29 and 30 June 2020 with the Hydro Majestic Hotel, United Petrol Station and Mazda Medlow Bath

In addition, meetings were held on 29 June 2020 with numerous Medlow Bath residents and phone conversations with seven individual residents.

The Medlow Bath consultation period was advertised in local newspapers including the Blue Mountains Gazette (1 July, 12 August, and 19 August 2020) and the Lithgow Mercury (20 June 2020). Two media releases were distributed via the project website and through local media. Information about the consultation period was also distributed via Facebook.

A total of 850 pieces of feedback was received from members of the community, businesses and stakeholders, including the following:

- 70 online feedback forms
- 30 email submissions
- 223 pinned comments on the online map
- 94 reactions, 128 comments and 48 shares were received on two social media posts
- over 400 questions asked and answered at the online consultation sessions.

Seven online community information sessions were held and were attended by 70 people. The online sessions comprised a half hour presentation by the Project Development Manager explaining the proposed design, followed by a half hour question and answer session. Phone consultations were offered to those who were unable to attend the online sessions.

Key themes raised by the community during the consultation period included questions about the following:

- urban design
- property
- traffic
- business case
- heavy vehicles
- road safety
- walking and cycling
- local businesses
- environment
- public transport
- safety upgrades
- resilience
- consultation
- design.

A summary of issues raised is provided in *Medlow Bath Consultation Summary Report (*TfNSW, 2020b) provided in Appendix N.

5.3 Aboriginal community involvement

As part of the overall Great Western Highway Upgrade investigations, the *Great Western Highway Duplication - Katoomba to Lithgow Archaeological Survey Report* was completed (Jacobs, 2020) to assess Aboriginal cultural heritage. This report included a Stage 2 Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). This PACHCI included the consultation actions outlined in Table 5-2.

Table 5-2: Summary of actions undertaken following the PACHCI

Action	Description	Details/outcome
Action 1	Identify key Aboriginal stakeholders	A search of the National Native Title Register to identify and registered native title claimants or native title holders for the options assessment area was completed on 14 February 2020. For the Medlow Bath proposal area, this search confirmed that there were no native title claimants or native title holders for Medlow Bath. There was a Land Use Agreement (NI2014/001 - Gundungurra Area Agreement) with the boundary located on the eastern side of the Great Western Highway, meaning the road corridor is within its agreement area. The search also identified Local Aboriginal Land Council (LALC) relevant to Medlow Bath is Deerubbin LALC.
Action 2	Engage Aboriginal stakeholders to undertake an archaeological survey	Nominated representatives for the relevant LALCs, Native Title and Traditional Owner groups were engaged to participate in the archaeological survey where the proposed route corridor traversed their boundaries.
Actions 3 & 4	Undertake the archaeological survey	Consultation was conducted with nominated representatives for the LALCs and Traditional Owner groups during the field surveys. Field surveys were undertaken through 2019 and 2020. Consultation conducted during survey provided an opportunity for the Aboriginal stakeholder representatives to provide: • comment on the potential for Aboriginal cultural material to be present within the proposed route corridor • comment on the cultural significance of any Aboriginal cultural heritage sites identified during the survey • comment on proposed management recommendations, including recommendations for further assessment.
Action 5	Aboriginal stakeholder(s) prepare cultural heritage survey report	In accordance with PACHCI, the Deerubbin LALC was requested to provide a cultural heritage survey report to TfNSW advising on Aboriginal cultural heritage issues that may arise as a result of the proposal.

In relation to the table above, specific considerations for the Medlow Bath section of the project are as follows:

- Action 1: No native title claims were identified to be present within the Medlow Bath project corridor and therefore no further actions are required.
- Actions 2, 3 and 4: As detailed within the PACHI, no archaeological survey was completed of the Medlow Bath area as no AHIMS sites were identified within or near the project corridor.
- Action 5: The Deerubbin LALC provided a cultural heritage survey report to TfNSW and this was included in the PACHCI Stage 2 report prepared by Artefact (2015a). The report found that most of the study area was highly disturbed, and no Aboriginal cultural materials were identified. No objection was raised to the proposed development.

Further consultation and an Aboriginal Cultural Heritage Assessment report is recommended for surrounding projects within the wider Great Western Highway Program, however as no impacts to known Aboriginal heritage are proposed as part of the Medlow Bath proposal, further specific consultation with the Registered Aboriginal Parties (ie Deerubbin LALC), is not considered necessary unless impacts beyond those assessed in this REF are identified. Any further impacts beyond the boundary of the assessed areas would be subject to further assessment and consultation with Deerubbin LALC consistent with the requirements of the TfNSW PACHCI.

5.4 ISEPP consultation

Blue Mountains City Council has been consulted on the proposal as per the requirements of clauses 13 and 14 of ISEPP. Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered. Issues raised during consultation are outlined in Table 5-3.

Table 5-3: Issues raised through ISEPP consultation with Blue Mountains City Council

Issue raised	Response / where addressed in REF
That the Statement of Heritage Impact (SoHI) is limited but the stage of detailed design for relevant items that interact with heritage.	Section 6.8 and Appendix J
Relocation of the bus shelter with original paintings is strongly supported. The relocation position, and the details of where and how it will be removed, stored and relocated, should be provided to Council and be included in the documentation.	Section 6.8 and Appendix J
Detailed design phase should consider the following in order to mitigate potential visual impacts: • minimise bulk, with new built forms clearly separate from existing heritage fabric • respond to existing and significant architectural detail, such as the architectural detailing of the station building, or the footbridge.	Section 6.8, Section 6.9 and Appendix J
Construction of the highway and installation of pedestrian bridge would physically impact Avenue of trees [formerly Avenue of Radiata Pines"] through the reduction of its heritage curtilage. Critical root zones of the trees would also be impacted, while some trees would require removal. An Arboricultural Impact Assessment would determine the full impact of the proposal and could recommend appropriate management and mitigation measures to potentially reduce this impact.	Section 6.8 and Appendix J
The advertising sign near Bellevue Crescent should be salvaged and relocated. The relocation position, and the details of where and how it will be removed, stored and relocated, should be provided to Council and be included in the documentation.	Section 6.8 and Appendix J
The trees within the Hydro site should also be subject to the above requirements on behalf of the property owner.	Section 6.8 and Appendix J
More details on the pedestrian bridge are required to understand and review impacts.	Section 6.8 and Appendix J
Mitigation measures and protections for the stone wall of the Hydro must be in place to protect the wall from vibration impacts. This should be spelled out in the documentation and provided to Council.	Section 6.8 and Appendix J
Details of the new retaining walls within the proposal should be subject to detailed design in consultation with the Council and local community to ensure to adverse visual impacts.	Section 6.8, Section 6.9 and Appendix J

5.5 Government agency and stakeholder involvement

Various government agencies and stakeholders have been consulted about the proposal, including Blue Mountains City Council, Sydney Trains, NSW TrainLink, WaterNSW, Sydney Water and utility providers (Jemena Gas, Optus/Telstra/NBN, and Endeavour Energy).

Issues that have been raised through consultation with these agencies and stakeholders are outlined in Table 5-4.

Table 5-4: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
Blue Mountains City Council	Water quality control design, traffic, active transport, heritage, landscaping & parks/recreation	Section 6.2 Section 6.3
Sydney Trains	Railway property interfaces, drainage, electrical, heritage and transport accessibility	Section 6.8 Section 6.9
NSW TrainLink	Railway station operation, transport accessibility and customer feedback	Section 6.10
WaterNSW	Water quality control design, erosion/sediment control and downstream requirements to Special Catchment Area	Section 6.2 Section 6.3
Sydney Water	Water main & sewer main adjustments and planning	Section 3.4 Section 6.2 Section 6.3
Jemena Gas	Gas main adjustments and planning	Section 3.4
Optus/Telstra/NBN	Communication mains adjustment and planning	Section 3.4
Endeavour Energy	Electrical supply to Medlow Bath, local main adjustments and network planning.	Section 3.4

5.6 Ongoing or future consultation

A community update will be distributed to local residents, government agencies and councils, and other relevant stakeholders before the REF goes on public display. Advertisements would also be placed in local newspapers to announce the REF display, online consultation sessions, and face-to-face consultation sessions where permissible (considering COVID-19 restrictions).

Public display of the REF

The REF will be on public display from 26 July 2021 and 25 August 2021 via an online portal on the proposal webpage.

During the public display period of the REF the community will be able to provide feedback on the proposal via email, phone, mail, an online portal or in person at the planned consultation sessions.

Following the REF public display period, a consultation summary report will be prepared addressing matters raised by the community and to identify any further assessment and/or design changes made to the proposal. The consultation summary report would be made publicly available on the proposal website. The community would be kept informed of any further changes to the proposal and any future consultation.

Community information sessions

This REF is on display for comment between 26 July 2021 and 25 August 2021. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the TfNSW website at **nswroads.work/gwhdconsult**

A virtual engagement room, virtual information and the opportunity to register for updates is available at the online portal **nswroads.work/gwhdconsult**

Printed copies

Due to COVID-19 restrictions, hard copies will not be available.

You can view the Medlow Bath Upgrade REF and Concept Design at our virtual consultation room at **nswroads.work/gwhdconsult**

Public display

The project team will be delivering the following information sessions (all online via Microsoft Teams live-stream):

- Wednesday 28 July 2021, 1:00pm – 2:30pm
- Saturday 31 July 2021, 12:30pm – 2:00pm
- Tuesday 3 August 2021, 6:30pm – 8:00pm
- Thursday 5 August 2021, 6:30pm – 8:00pm

Register for our live-stream at **nswroads.work/gwhdconsult**

Currently face-to-face sessions will not be held due to COVID-19 restrictions.

Proposal webpage

The proposal webpage contains key proposal information including news updates, links to the online portal, contact information and project documentation. The proposal webpage is **nswroads.work/gwhdconsult.**

TfNSW will continue to consult with the community and relevant stakeholders in the lead up to and during construction of the proposal. Future community consultation would include community updates, information provided on the TfNSW website, and direct consultation in the form of meetings, phone calls and correspondence.

Continual consultation

Ongoing consultation with the community, relevant agencies and other stakeholders will be undertaken following the public display of the REF and in preparation of the physical works on site to begin in mid-2022. TfNSW will continue to work closely with the community during

- consultation with community stakeholders to assist in managing impacts during construction
- follow-up meetings to discuss access arrangements with directly affected landholders
- ongoing updates throughout the planning phase and construction period to the immediately affected community as well as travelling public
- ongoing meetings with Blue Mountains City Council, government agencies, utility providers, adjacent landowners and community stakeholders as required
- ongoing updates as required on the proposal website.

Contact details

The project team can be contacted with feedback or enquiries by the following contact details:

Phone: 1800 953 777

Email: **gwhd@transport.nsw.gov.au**

Post: Great Western Highway Upgrade Program - PO Box 2332, Orange NSW 2800.

6. Environmental assessment

6.1 Biodiversity

A detailed impact assessment of the proposal, as described in Chapter 3. The assessment report details the methods, biodiversity field survey results and assessment used to identify the extent and magnitude of potential ecological impacts associated with the proposal for the study area as defined in *the Medlow Bath Upgrade Great Western Highway Biodiversity Assessment* (RPS, 2021a), which is provided in Appendix D. A summary of this assessment is provided below.

6.1.1 Methodology

Background research of mapping, datasets and database searches was undertaken to collect and review publicly available information on the presence or likelihood of occurrence (within a 10 kilometre radius) of:

- threatened and protected terrestrial and aquatic flora and fauna species and their habitat
- threatened ecological communities
- important habitat for migratory species
- declared areas of outstanding biodiversity value.

The list of threatened species and ecological communities (threatened biodiversity) identified by database searches were subject to a habitat assessment. A field inspection of the main proposal area was undertaken by an ecologist on 10 December 2020 (as well as an additional visit on 14 May 2021 for the proposed Bellevue Crescent option). This field work aimed at ground-truthing the results of the background research and habitat assessment.

Five ‘likelihood of occurrence’ categories were applied to the threatened biodiversity listed in Table 6-1 with regard to:

- habitat descriptions as provided in the Threatened Species Profile Database and whether habitat features or components associated with the species occur within the proposal area
- geographic distribution of the species is known or predicted
- the recency of threatened species observations (ie recent being less than five years) and proximity to the proposal area (ie landscape factors such as patch size and connectivity)
- habitat value and condition as determined through the site inspection
- the results of targeted surveys (where performed)
- the likely effect of existing key threatening process (KTPs).

Table 6-1: Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area. It may be an occasional visitor (fauna) and is not dependent on available habitat (ie for breeding or important life cycle periods such as winter flowering resources) or for plants the site is sufficiently disturbed such that plant propagules are not likely to be present in the soil seed bank. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

6.1.2 Existing environment

The proposal area is located in the Wollemi subregion of the Sydney Basin bioregion. Soil and water catchment details are described in Section 6.3 and Section 6.4.

The proposal area typically comprises vegetation that is in a moderate to highly modified state, ranging from areas of bushland with edge effects apparent to fully cleared and managed roadside verges land and parklands. The best condition native vegetation is located along the western margin of the proposal area south of Bellevue Crescent, with higher condition vegetation and habitat occurring in this location.

Plant community types

The native vegetation observed within the proposal area is comprised of one vegetation community, which has been assigned a plant community type (PCT). The PCT identified within the proposal area is listed in Table 6-2 and shown in Figure 6-1.

Table 6-2: Native vegetation community types within the proposal area

Plant community type (PCT)	Condition class	Threatened ecological community	Area (ha) in proposal area	Area (ha) in study area
PCT 1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion	Moderate	None	0.34	1.87
	Poor	None	0.02	0.02
Total			**0.36**	**1.89**

The identified PCT has been classified according to condition class (ie moderate or poor) and does not correlate to a threatened ecological community (TEC).

Other forms of vegetation cover not consistent with a naturally occurring PCT that were observed in the proposal area are listed below:

- 0.08 ha of native (landscaped)
- 1.06 ha of exotic (tree cover)
- 1.49 ha of exotic (groundcover).

Threatened ecological communities

No TECs were identified within the proposal area. The only State and Commonwealth listed TEC occurs outside and northeast of the study area in the Temperate Highland Peat Swamp on Sandstone (THPSS) endangered ecological community (EEC).

The location of this TEC relative to the proposal area is shown in Figure 6-2. This community provides unique habitat conditions for species such as the Blue Mountains Water Skink (*Eulamprus leuraensis*), Giant Dragonfly (*Petaleura gigantea*) and *Carex klaphakei*.

Groundwater dependent ecosystems

No groundwater dependent ecosystems were observed within the proposal area as the identified vegetation does not have high potential for groundwater dependency.

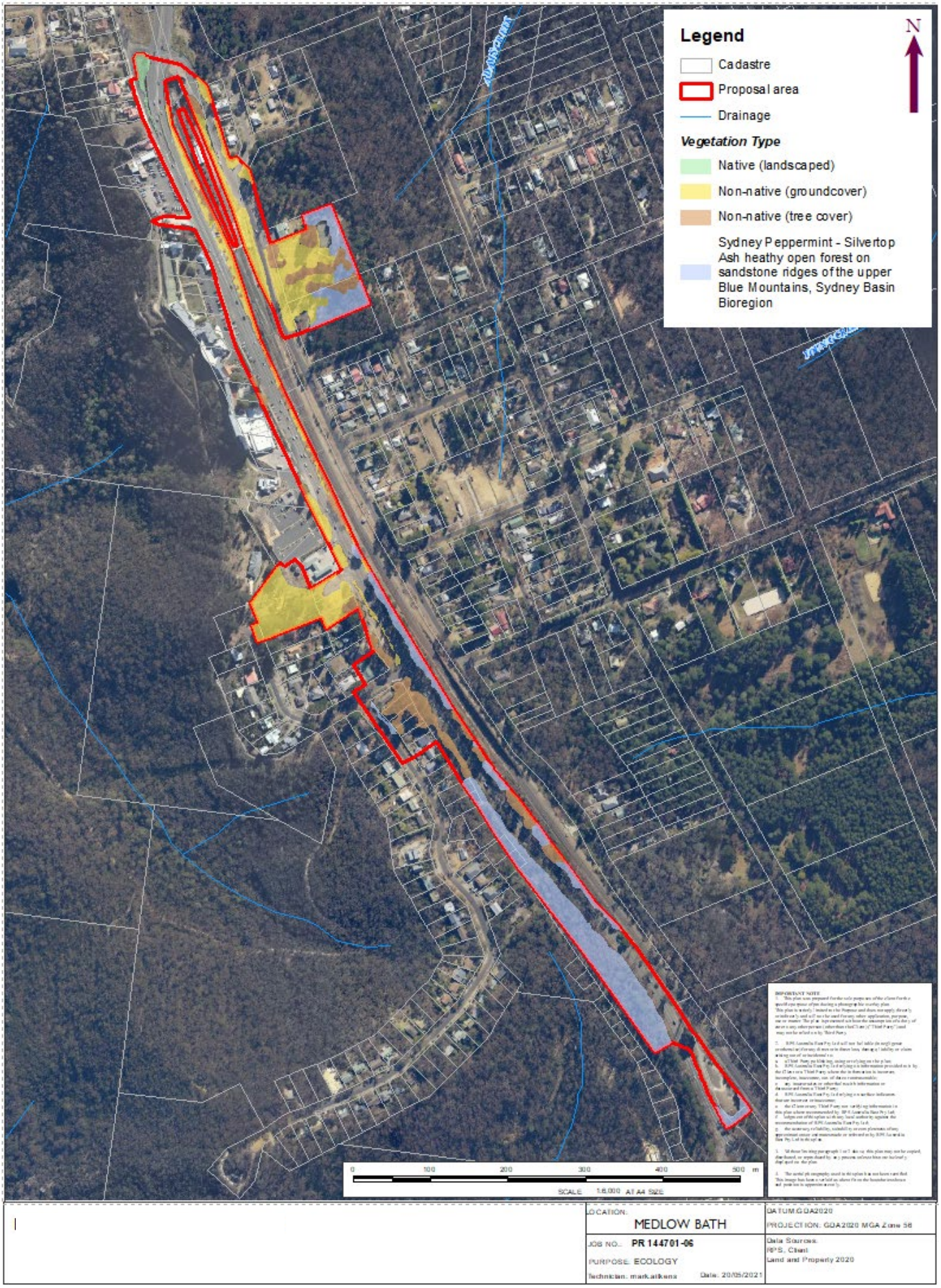

Figure 6-1: Vegetation cover within the proposal area (RPS, 2021a)

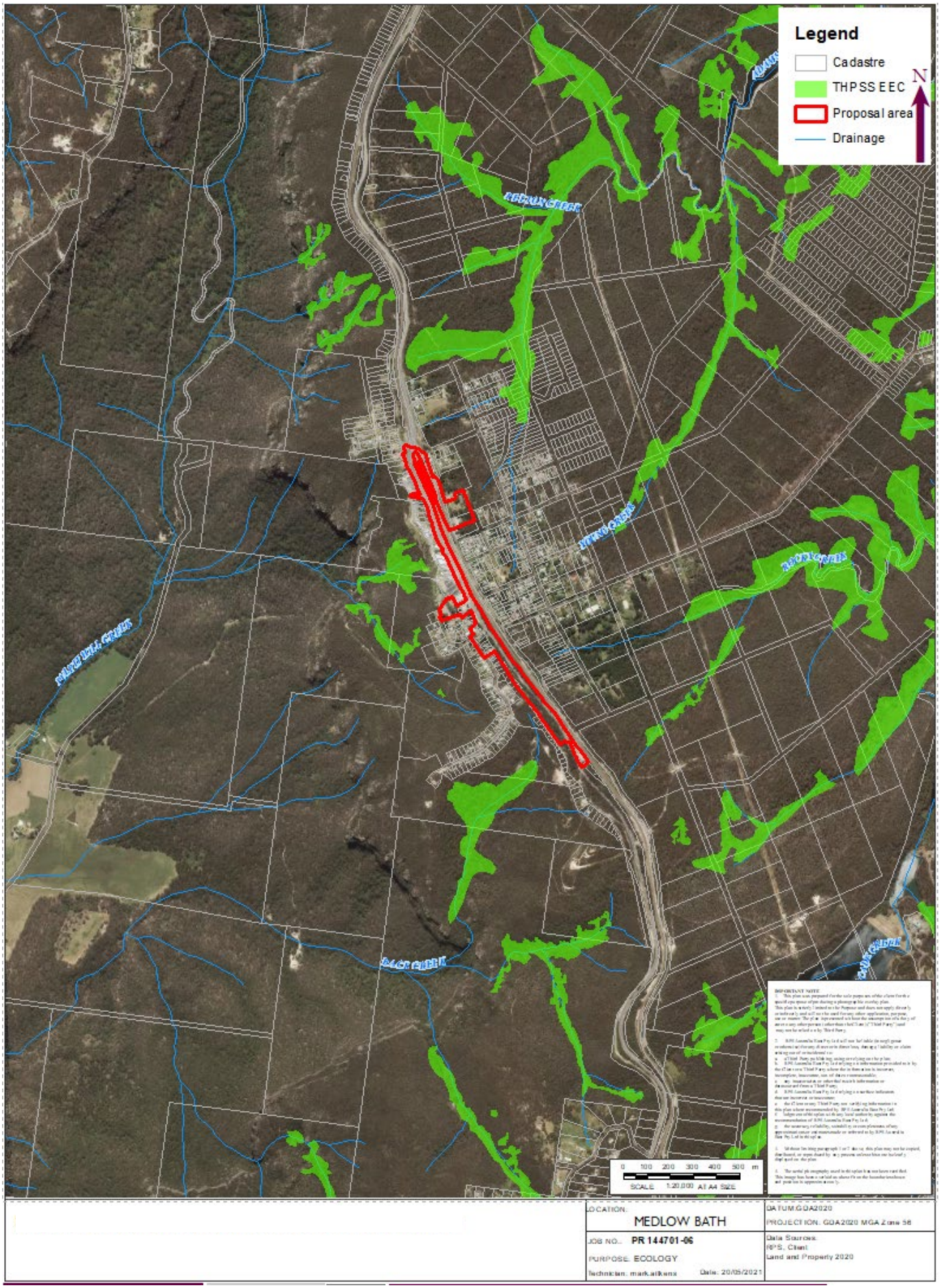

Figure 6-2: Threatened ecological communities within proximity to the proposal area (RPS, 2021a)

Threatened species and populations

Four threatened species were found to have a high likelihood of occurring on site and eighteen threatened species have a moderate likelihood. A summary of the likelihood of occurrence analysis is provided in Table 6-3. None of these species listed were observed during the field investigations.

Table 6-3: Likelihood occurrence analysis for threatened species within proposal area

Scientific name	Common name	Status – BC Act	Status – EPBC Act	Likelihood of occurrence
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Moderate
Heleioporus australiacus	Giant Burrowing Frog	V	V	Moderate
Pseudophryne australis	Red-crowned Toadlet	V	-	Moderate
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Moderate
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	High
Daphoenositta chrysoptera	Varied Sittella	V	-	Moderate
Petroica boodang	Scarlet Robin	V	-	High
Petroica phoenicea	Flame Robin	V	-	Moderate
Glossopsitta pusilla	Little Lorikeet	V	-	High
Ninox connivens	Barking Owl	V		Moderate
Ninox strenua	Powerful Owl	V	-	Moderate
Cercartetus nanus	Eastern Pygmy-possum	V	-	High
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Moderate
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	Moderate
Phascolarctos cinereus	Koala	V	V	Moderate
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Moderate
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Moderate
Miniopterus australis	Little Bentwing-bat	V	-	Moderate
Miniopterus schreibersii oceanensis	Large Bent-winged Bat	V	-	Moderate
Persoonia hirsuta	Hairy Geebung	E	E	Moderate
Persoonia marginata	Clandulla Geebung	V	-	Moderate
Zieria murphyi	Velvet zieria	V	-	Moderate

V = vulnerable
E = endangered

Aquatic environment

The proposal area does not contain defined drainages that would classify as waterway habitat.

Areas of outstanding biodiversity value

No areas of outstanding biodiversity value (AOBV) occur within or in the vicinity of the proposal area and AOBV would not be impacted by the proposal.

Wildlife connectivity corridors

The well vegetated upper Blue Mountains provides for relatively unconstrainted wildlife connectivity in within the local area with local barriers to movement being limited to the developed parts of Medlow Bath and the Great Western Highway/railway line corridors. These barriers are considered minor and of no regional consequence.

Matters of National Environmental Significance

Commonwealth listed threatened and migratory species with a likelihood of occurrence of 'moderate' or 'greater' within the proposal area are outlined in Table 6-4. None of the species listed below were observed during the field investigation.

No EPBC listed wetlands of importance or threatened ecological communities were identified within the proposal area. One Commonwealth listed TEC is located 250 to 500 metres downstream of the study area.

Table 6-4: Likelihood of occurrence analysis for Commonwealth-listed threatened species within proposal area

Scientific name	Common name	Status – BC Act	Status – EPBC Act	Likelihood of occurrence
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Moderate
Heleioporus australiacus	Giant Burrowing Frog	V	V	Moderate
Apus pacificus	Fork-tailed Swift	-	M	Moderate
Hirundapus caudacutus	White-throated Needletail	-	M	Moderate
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Moderate
Pseudomys novaehollandiae	New Holland Mouse	-	V	Moderate
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	Moderate
Petauroides volans	Greater Glider	-	V	Moderate
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Moderate
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Moderate

V = vulnerable
E = endangered

6.1.3 Potential impacts

Construction

The construction of the proposal is likely to result in the following impacts:

- removal of native vegetation
- removal of threatened fauna habitat
- removal of threatened flora
- aquatic impacts
- fauna injury or mortality
- impacts from construction noise, light and vibration.

Removal of native vegetation

The proposal is estimated to result in the clearing of 0.36 hectares of native vegetation consistent with a PCT classification. An additional 0.08 hectares of native (landscaped) vegetation would also be removed. A summary of the native vegetation loss by PCT classification is shown in Table 6-5. No TECs would be removed by the proposal.

Table 6-5: Impacts on native vegetation

Plant community type (PCT)	BC Act status	EPBC Act status	Percent cleared[1]	Proposal area[2] (hectares)
1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion (moderate)	-	-	20	0.34
1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion (poor)	-	-	20	0.02
Total				**0.36**

1- Based on the Vegetation Information System classification database.
2- Area to be cleared based on ground-truthed vegetation mapping within the study area.

Removal of threatened fauna habitat

The potential habitat of threatened fauna species with a moderate or greater likelihood of occurrence to be removed by the proposal is outlined in Table 6-6.

Table 6-6: Impacts on threatened fauna and potential habitat

Threatened species	Ecosystem or species credit species	BC Act status	EPBC Act status	Likelihood of occurrence	Potential Habitat to be impacted (ha)
Littlejohn's Tree Frog	Species	V	V	Moderate	0.32
Giant Burrowing Frog	Species	V	V	Moderate	0.32
Red-crowned Toadlet	Species	V	-	Moderate	0.32
Fork-tailed Swift	Ecosystem	-	M	Moderate	0.32
White-throated Needletail	Ecosystem	-	M	Moderate	0.32
Dusky Woodswallow	Ecosystem	V	-	Moderate	0.32
Gang-gang Cockatoo	Species	V	-	High	0.32
Varied Sittella	Ecosystem	V	-	Moderate	0.32
Scarlet Robin	Ecosystem	V	-	High	0.32
Flame Robin	Ecosystem	V	-	Moderate	0.32
Little Lorikeet	Species	V	-	High	0.32
Barking Owl	Species	V	-	Moderate	0.32
Powerful Owl	Ecosystem	V	-	Moderate	0.32
Eastern Pygmy-possum	Species	V	-	High	0.32
Spotted-tailed Quoll	Ecosystem	V	E	Moderate	0.32
New Holland Mouse	Ecosystem	-	V	Moderate	0.32
Southern Brown Bandicoot (eastern)	Ecosystem	E	-	Moderate	0.32
Koala	Species	V	V	Moderate	0.32
Greater Glider	Ecosystem	-	V	Moderate	0.32
Grey-headed Flying-fox	Ecosystem	V	V	Moderate	0.32
Large-eared Pied Bat	Species	V	V	Moderate	0.32
Little Bentwing-bat	Ecosystem/ Species	V		Moderate	0.32
Large Bent-winged Bat	Ecosystem/ Species	V		Moderate	0.32

V = vulnerable
E = endangered

Removal of threatened flora

The potential habitat of threatened flora species with a moderate or greater likelihood of occurrence to be removed by the proposal is outlined in Table 6-7.

Table 6-7: Impacts on threatened flora and potential habitat

Threatened species	Ecosystem or species credit species	BC Act status	EPBC Act status	Likelihood of occurrence	Potential Habitat to be impacted (ha)
Hairy Geebung	Species	E	E	Moderate	0.32
Persoonia marginata	Species	V	V	Moderate	0.32
Zieria murphyi	Species	V	V	Moderate	0.32

Removal of migratory species habitat

The potential habitat of migratory species with a moderate or greater likelihood of occurrence to be removed by the proposal is outlined in Table 6-8.

Table 6-8: Impacts on migratory species and potential habitat

Threatened species	Ecosystem or species credit species	BC Act status	EPBC Act status	Likelihood of occurrence	Potential Habitat to be impacted (ha)
Fork-tailed Swift	-	-	M	Moderate	0.32
White-throated Needletail	-	-	M	Moderate	0.32

Aquatic impacts

Impacts to waterways and aquatic habitats may include:

- temporary displacement of fauna
- loss of riparian and aquatic habitat, including removal or relocation of snags
- changes to flooding regimes, hydrology, turbidity and sedimentation
- changed hydrology including excessive flow velocities, modified depths of waterways, increase water turbulence, in stream structures, realignment of creeks, alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands, and channelization, piping, concrete lining or scour protection of waterways
- changes in shading regime and temperature.

No direct impact on aquatic habitat is expected. Changes to water quality and quantity may emerge in Adams Creek following redirection of overland flows into that drainage. Provided these flows are appropriately mitigated and managed measures it is considered that downstream impacts will be minor and inconsequential.

Injury and mortality

Fauna injury or death has the greatest potential to occur during construction when vegetation clearing would occur. The extent of this impact would be proportionate to the extent of vegetation that is cleared. Less mobile species (eg ground dwelling reptiles), or those that are nocturnal and nest or roost in trees during the day (eg arboreal mammals and microchiropteran bat species), may find it difficult to rapidly move away from the clearing when disturbed. The study area is known to contain several arboreal species such as birds that may be injured or killed during vegetation removal. Reptiles and frogs may also be injured or killed during construction as habitat is cleared.

Noise, light and vibration

The proposal may result in impacts to fauna from noise and vibration during construction, which may result in fauna temporarily avoiding habitats adjacent to the construction. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Lighting would be used at night to enable work to be completed that may result in impacts to nocturnal fauna. Nocturnal species such as possums and microbats may avoid the habitat in the proposal area during construction as temporary 'daylight' conditions would be created by the mobile lighting system. This impact is considered temporary and would not have long lasting effects on the biodiversity of the proposal area. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Operation

The proposal is likely to result in the following operational/indirect impacts:

- reduced wildlife connectivity and habitat fragmentation
- edge effects on adjacent native vegetation
- invasion and spread of weeds, pests, pathogens and disease
- changes to hydrology
- impacts to groundwater dependent ecosystems
- cumulative biodiversity impacts.

Wildlife connectivity and habitat fragmentation

Potential impacts to wildlife connectivity may occur where roads affect the movement of plants and animals between habitats. Wildlife connectivity issues include blocking fish passage, preventing migration of a species, decreasing the opportunity for dispersal or increasing roadkill. The proposal has been identified as having the following impacts on wildlife connectivity and habitat fragmentation:

- loss of overhanging/ adjacent tree canopy and widening of existing tree canopy gaps
- barrier effects due to construction of new road and road widening
- edge effects
- genetic isolation
- life cycle requirements of species potentially impacted by the proposal
- changes to culverts and bridges resulting in wildlife connectivity impacts
- the scale, frequency, intensity and duration of potential wildlife connectivity impacts including direct and indirect impacts and the difference between construction (temporary) and operational (long-term) impacts
- cumulative impacts on corridors and movement.

The proposal is mostly restricted to the existing urban parts of Medlow Bath and consequently would have no discernible impact on wildlife connectivity within the local area. Additional contributions to habitat fragmentation are minor and inconsequential. No adverse impacts on wildlife populations, key habitat resources, genetic interchange, and population viability for some species is expected.

Edge effects on adjacent native vegetation and habitat

The development of linear infrastructure is known to cause disturbance in terms of reducing habitat quality in adjacent areas. This is due to the greater potential for edge effects and habitat fragmentation and barrier effects due to the high perimeter to area ratio of linear developments. Edge effects typically take the form of weed invasion, increased light levels, increased wind speeds, and greater temperature fluctuations.

The proposal would be built in an area that is subject to a high level of edge effects from the existing roadways and other development. The vegetation patches within the study area affected by high weed

invasion and other edge effects along existing edges, typically extending five to seven metres from the existing road formation and other clearings. There are likely to be additional edge effects resulting from the proposal as the new edges would typically be in areas only currently experiencing low to moderate weed invasion and other edge effects.

Invasion and spread of weeds and pests

Proliferation of weed and pest species would be an indirect impact (ie not a direct result of proposal activities). The most likely causes of weed dispersal and importation associated with the proposal include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases. The proposal area contains significant weed growth, in all areas, particularly on agricultural land and along minor roads and tracks. As such, the spread and proliferation of weeds would need to be managed during construction.

Proposal activities also have the potential to disperse pest species out of the proposal area across the surrounding landscape. Machinery entering the site would need to be cleaned to remove plant propagules so as to limit the likelihood of importation into the proposal area. The magnitude of this impact is likely to be low and mitigation measures are likely to be effective.

Invasion and spread of pathogens and disease

Several pathogens known from NSW have potential to impact on biodiversity as a result their movement and infection during construction. Of these, three are listed as a key threatening process under either the EPBC Act and/or BC Act including:

- dieback caused by Phytophthora (Root Rot; EPBC Act and BC Act)
- infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis (EPBC Act and BC Act)
- introduction and establishment of exotic Rust Fungi of the order Pucciniales on plants of the family Myrtaceae (BC Act).

While these pathogens were not observed in the proposal area, the potential for pathogens to occur should be treated as a risk during construction. The most likely causes of pathogen dispersal and importation associated with the proposal include earthworks, movement of soil, and attachment of plant matter to vehicles and machinery during all phases (construction and operation). Pathogens would need to be managed within the proposal area according to the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).

Changes to hydrology

The proposal would involve the redirection of waters into Adams Creek thereby increasing water quantity and possible changes to water quality along this drainage. The proposal is likely to cause changes to affect the volume and peak runoff rates into waterways from the upstream catchments. The following recommendations have been made to minimise these impacts:

- provide all runoff discharge locations with level spreaders for limits on the scour potential of runoff entering the existing watercourses
- runoff discharge locations are proposed to have attenuation basins for mitigation of the discharge peak flows to no greater than under the existing conditions. Bioretention is proposed to be integrated into the basin floor to provide stormwater quality filtration and treatment.

Minor and inconsequential impacts on the THPSS EEC located 250 to 500 metres downstream of the proposal are predicted because of these works. No changes in ecosystem functionality and composition are expected.

Operational noise, light and vibration

The existing levels of noise and vibration from the existing Medlow Bath area and other roads by vehicles are substantial, with the proposal unlikely to significantly increase noise and vibration during operation of the road that would result in any increased impacts to biodiversity within the proposal area.

Impacts to groundwater dependent ecosystems

The proposal is not likely to have any direct impacts on groundwater dependent ecosystems. However, alteration to the hydrology of Adams Creek through the direction of increased flows into the watercourse may have an impact on THPSS EEC, which is a groundwater dependent ecosystem. Impacts to this TEC are likely to be minor and inconsequential.

Cumulative impacts

The potential biodiversity impacts of the proposal must be considered as a consequence of the construction and operation of the proposal within the existing environment. The proposal would not act alone in causing impacts to biodiversity. The incremental effects of multiple sources of impact (past, present and future) are referred to as cumulative impacts and provide an opportunity to consider the proposal within a strategic context.

Conclusion on significance of impacts

Even though some clearance of vegetation is required, the proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act or FM Act and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

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

Biodiversity offsets

The proposal is not likely to have a significant impact on threatened species, ecological communities and their habitats. Residual impacts are to be minimised and mitigated. A Biodiversity Offset Strategy is not required for this proposal.

6.1.4 Safeguards and management measures

Table 6-9: Safeguards and management measures – Biodiversity

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with TfNSW's *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the *Landscape Design Guideline* (Roads and Maritime Services, 2018a) • pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (Department of Primary Industries Fisheries, 2013) • protocols to manage weeds and pathogens.	Contractor	Detailed design / Pre-construction	Section 4.8 of *QA G36 Environment Protection*
Removal of native vegetation	Areas for native vegetation and habitat removal will be minimised through detailed design.	Contractor	Detailed design	Appendix D
Removal of native vegetation	Pre-clearing surveys and habitat removal will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a). Where possible, hollow bearing trees should be retained or relocated.	Contractor	Pre-construction	Appendix D
Removal of native vegetation	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the	Contractor	Construction	Appendix D

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects (Roads and Traffic Authority, 2011a).			
Removal of native vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	TfNSW	Post construction	Appendix D
Removal of native vegetation	The unexpected species find procedure will be followed under the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal area.	Construction contractor	Construction	Appendix D
Aquatic habitat	Aquatic habitats will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) and Section 3.3.2 Standard precautions and mitigation measures of the *Policy and guidelines for fish habitat conservation and management Update 2013* (Department of Primary Industries Fisheries, 2013).	Contractor	Construction	Appendix D
Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D
Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D
Invasion and spread of pests	Pest species will be managed within the proposal area.	Contractor	Construction	Appendix D
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D

6.2 Hydrology and flooding

Hydrological and hydraulic studies were completed to identify design requirements to mitigate the changes in potential flooding risks and to address the requirements of the proposal. Refer to the *Great Western Highway Upgrade – Medlow Bath Hydrology and Hydraulic Impact Assessments* (Mott MacDonald, 2021a) in Appendix E.

6.2.1 Methodology

The hydrological performance of key features of the stormwater drainage system comprising pipes, culverts, open channels and head walls has been assessed through DRAINS model. The assessment approach included:

- hydrologic and hydraulic analysis of existing cross drainage structures
- hydraulic analysis to identify culvert upgrades required for the works
- development of a high-level strategy for discharging runoff from the new pavement drainage system
- impact assessment of the proposed works during construction and operation
- design for mitigation to reduce the impacts of the proposal in terms of water quality and quality of run off.

Data sources

The assessment was completed based on draft masterplans for Medlow Bath Park, digital survey, utility and environmental GIS data, and road design information as detailed in Appendix E.

Existing cross drainage structures

A schedule of the existing cross drainage structures along the Great Western Highway that provide capture and conveyance of upstream runoff are listed below, with information on these culverts obtained through a detailed survey.

- CX3480 - CH3480, 1no. 375 millimetre diameter pipe
- CX3770 - CH3770, 1no. 450 millimetre diameter pipe
- CX3960 - CH3960, 1no. 450 millimetre diameter pipe
- CX4200 - CH4200, 1no. 450 millimetre diameter pipe
- CX4220 - CH4220, 1no. 375 millimetre diameter pipe.

Performance for existing structures:

Due to the small and urban nature of the upstream catchments, the flow regime reflecting the critical storm conditions are consistently short and flashy events with high intensity rainfall. Assumptions were made on the size of cross drainage structures downstream of CX3770, CX3960, CX4200 in the rail corridor as this information is not embedded into the Digital Sending Software digital utility information on the drainage features within the corridor.

The identified drainage standards of existing drainage structures were:

- CX3480 at 2 per cent Annual Exceedance Probability (AEP), discharges freely
- CX3770 at 1 per cent AEP, assumes unblocked rail cross drainage downstream. Rail hydraulic standard less than 1 per cent AEP
- CX3960 at 10 per cent AEP, assumes unblocked rail cross drainage downstream. Rail hydraulic standard less than 1 per cent AEP
- CX4200 at 20 per cent AEP, constrained by downstream rail cross drainage

- CX4220 at 20 per cent AEP, Constrained by downstream rail cross drainage.

A range of rainfall intensities were then selected to assess the existing cross drainage performance, including 1 per cent, 2 per cent, 5 per cent, 10 per cent and 20 per cent AEP storm events and the details are summarised below.

- At 1 per cent AEP, the existing cross drainage structures CX3480, CX3960, CX4200, CX4220 showed overflow results
- At 2 per cent AEP, the existing cross drainage structures CX3960, CX4200, CX4220 showed overflow results
- At 5 per cent AEP, the existing cross drainage structures CX3960, CX4200, CX4220 showed overflow results
- At 10 per cent AEP, the existing cross drainage structures CX4200 and CX4220 showed overflow results
- At 20 per cent AEP, the existing cross drainage structures showed no overflow results.

Design assumptions

The study recognises future upgrade considerations due to the potential impact on peak flows of future development and climate change. TfNSW design criteria for blockage of cross drainage structures has not been considered in the capacity assessment below but would form part of the design criteria for the cross drainage structures in detailed design.

Uplift in rainfall intensities as a result of temperature increases under the latest climate projections in the Australian Rainfall and Runoff 2019 (ARR 2019) have also been incorporated into design infrastructure. The cross drainage capacity for the proposal would be upgraded to 1 per cent AEP inclusive of climate change uplift for the RCP 8.5 in line with the ARR 2019. (The RCP refers to the ‘Representative Concentration Pathway that takes into account emissions of greenhouse gases, aerosols and other chemically active gases, and land use and cover. An RCP of 8.5 represents a scenario at the higher end of likely temperature increases.)

6.2.2 Existing environment

Regional context

The proposal is in the vicinity of multiple tributaries comprising ephemeral streams that feed into the larger river systems of the Coxs River and Grose River. These catchments predominantly comprise of native vegetation with small portions of urban development located adjacent the transport corridor of the Great Western Highway and adjacent rail corridor.

The study area for the hydrology assessment covers 10.58 hectares including Medlow Bath Station and interchange, as well as Medlow Bath Park to the east and downstream of the major sag location and cross drainage structures for the transport corridor. This major sag just south of the existing railway station collects runoff from the majority of the study area and directs the flow to the receiving Adams Creek to the west. Smaller portions of the study area drain to the remaining watercourses.

Climate

Average monthly rainfall for the nearest rainfall station at Katoomba (063039, Murri Street) indicates the area experiences larger summer rainfalls than during the winter months. This is indicated in the Figure 6-3 average monthly plot, with the annual average rainfall at 1,400 millimetres across the 134 year record.

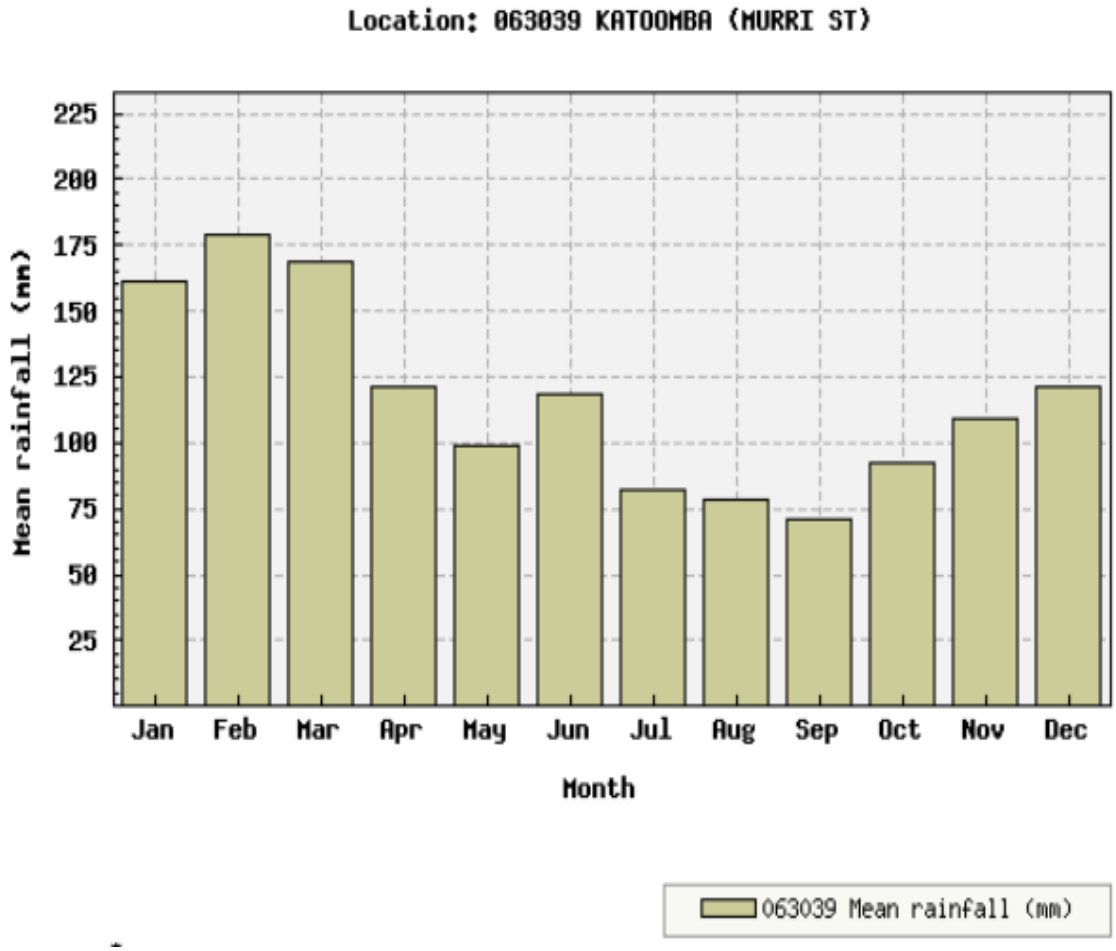

Figure 6-3: Average monthly rainfall data (Source: Bureau of Meteorology)

6.2.3 Potential impacts

The following impacts have been identified based on the concept design and would be reviewed once detailed design is available. During the detailed design phase any additional impact would be identified and added to the project risk assessment for documentation of potential risks and mitigation measures.

Construction

Construction activities would involve earthworks and other ground disturbing activities that would increase the risk of sediment movement off site either through vehicle movements, or wind and water runoff. Impacts from sediment movement are expected to be managed through the implementation of standard erosion and sediment controls and management plans implemented by the contractor.

There is a risk of potential blockages to waterways and drainage lines due to earthworks and other construction activities, which may result in localised flooding upstream and change the ultimate discharge location of overland flows into receiving watercourses. Diversion of drainage lines may also create localised areas of flooding and scour. These impacts are expected to be minor and would be managed through the implementation of standard water management and scour measures.

Operation

Flooding changes

The proposed upgrade includes changes in the road geometry and widening which would create an increase in the paved area, and improve the drainage capacity of the formal drainage infrastructure to current standards. This can change the existing flood behaviour and alter the flood risk to existing sensitive receivers.

The proposal would affect the peak runoff rates from upstream catchments contributing flows to cross drainage structures. The increase in paved areas would result in an estimated 20 per cent increase in the 1 per cent AEP peak flows at the Medlow Bath Park and new cross drainage CD3770 discharge locations. The increased cross drainage capacity removes flood storage from upstream of the rail corridor by allowing higher peak flow rates through the upgraded culverts. These locations are proposed to have attenuation basins for mitigation of the discharge peak flows to no greater than under the existing conditions and to relocate flood storage to within the formal basin structure.

Upstream flooding impacts are caused by increased runoff volumes by the increase in impervious portions of catchments, the increase in catchment size through regrading of the area to create the design pavement profiles, or the redistribution of flows as a result of a change in the formal drainage infrastructure. All three components were found to be influencing the post construction flood impacts in the modelling, however the impacts are generally considered minor given the limitation of vertical alignment changes, maintenance of flow discharge splits to downstream receivers, and general increase in available stormwater storage within the drainage system.

Downstream flooding impacts would be limited through the use of flow control structures including:

- a new detention basin downstream south of the existing cross drainage location (CX3480) where a major flow culvert upgrade across the transport corridor is proposed
- a new detention basin downstream of the existing sag rail cross drainage location (CX4200 and CX4220) where a major flow culvert upgrade across the transport corridor is proposed
- existing intermediate rail cross drainage locations (CX3770 & CX3960) where the highway stormwater system discharges flow to the existing rail cross drainage structures without major flow culvert upgrades.

Scour impacts

Scour potential would be increased with higher velocities and larger flow rates than experienced under existing conditions. With the increase in impervious areas as the road widening is constructed, runoff volumes would increase having the potential for scour events in receiving watercourses. Culvert/channel scour protection to Australian and TfNSW design standards to ensure suitable velocity and peak flow protection would be undertaken during detailed design.

6.2.4 Safeguards and management measures

Table 6-10: Safeguards and management measures – Hydrology and flooding

Impact	Environmental safeguards	Responsibility	Timing	Reference
Blockage causing increased flooding potential	Develop a blockage assessment of the pavement and cross drainage strategy.	Contractor	Detailed design /Pre-construction	Best practice
Overland flows causing localised flooding	Flow diversion bunds and sediment fencing are to be used for redirection of overland flows to dedicated management areas including sediment basins and ultimately to discharge locations.	Contractor	Construction	Best practice

6.3 Surface water and groundwater

The *Great Western Highway Upgrade Medlow Bath Surface and Ground Water Impact Assessments* (Mott MacDonald, 2021b) is included in Appendix F and summarised in this section. The hydrological catchment areas (study area) for the assessment are shown in Figure 6-4.

Figure 6-4: Hydrological catchment areas for the proposal (Mott MacDonald, 2021b)

6.3.1 Methodology

The proposed upgrade includes changes in the road geometry and widening which potentially creates changes to the groundwater table and an overall increased paved area. This can change the existing groundwater infiltration and alter the flow paths of surface water as it becomes runoff and is discharged to existing receivers. To assess potential water quality risks and to address the requirements of the proposal the assessment included:

- collation, analysis and interpretation of the available sensitive ecosystem and groundwater bore data including registered users
- an assessment of the existing soil and potential contamination conditions, including a review of exiting subsurface strata from geological records and geotechnical data
- review of contribution pollutants from the existing catchment
- preparation of a high-level water quality strategy accounting for both increases and changes in the surface and groundwater transportation

- assessment of potential impacts to water quality through the neutral or beneficial effect on water quality (NorBE) assessment tool published by WaterNSW, as a result of the proposal being located within the Sydney Drinking Water Catchment. The NorBE assessment is provided in Appendix C.

The assessment was completed based on draft masterplans for Medlow Bath Park, digital survey, utility and environmental GIS data, contaminated land information, and road design information as detailed in Appendix F.

6.3.2 Existing environment

Regional context

The regional context is described in Section 6.2.2.

Groundwater dependent ecosystems

Refer to the Section 6.1 for a discussion on groundwater dependent ecosystems.

Groundwater

The study area does not have any recorded hydrological landscape data according to the NSW Department of Planning, Industry and Environment; however, it lies adjacent to the Megalong Valley Hydrological Landscape, which provides data that is useful to determine the likely nature of groundwater in this landscape. Characteristics of this adjacent landscape were obtained through the NSW Department of Planning, Industry and Environment eSPADE website.

The key hydrogeological landscape characteristic of the Megalong Valley Hydrological Landscape is a long sandstone escarpment with moderately to steeply inclined colluvial slopes and drainage lines. This characteristic is positively associated with the soil and geology landscape seen within the Medlow Bath Landscape. This landscape is of low salinity, with a low salt load (export) and a relatively high quality of fresh water. In correlation with the acid sulphate data for the area, pyrites are not present. It is an area of moderate rainfall.

As the Medlow Bath Landscape is that of shallow soil, and with a topography leading to a rapid cliff-like drop, it is highly likely that the groundwater flow from the Medlow Bank Landscape discharges into the lithosols/siliceous sands below the sandstone escarpment, flowing then on the surface of the granite bedrock.

Figure 6-5 shows the conceptual cross-section for Megalong Valley Hydrological Landscape showing the distribution of regolith landforms, salt sites and flow paths of water infiltrating the system.

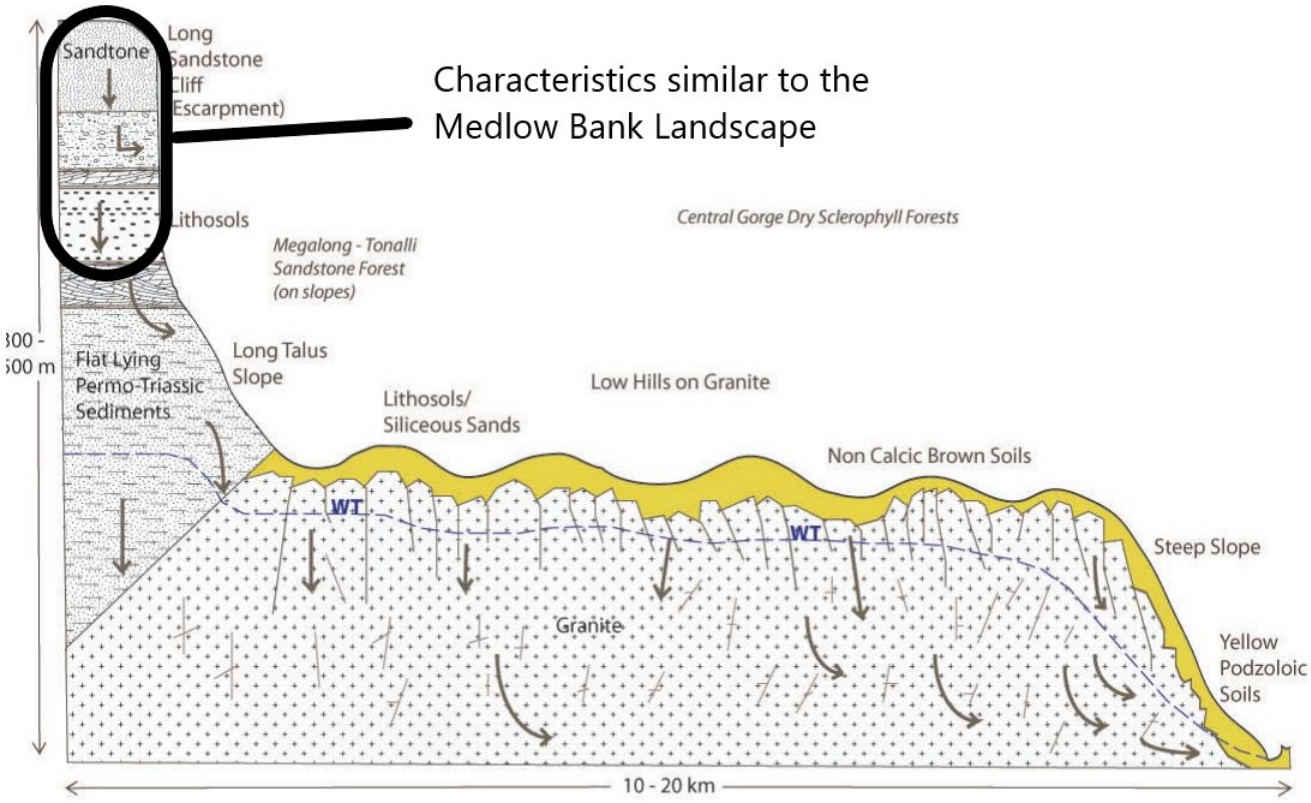

Figure 6-5: Conceptual cross-section for Megalong Valley (Source: Department of Planning, Industry and Environment)

Water quality

Water draining from the study area flows towards the Grose River and Coxs river catchments which are subject to controls under the Sydney Drinking Water Catchment. In the current condition, minimal existing treatment measures are installed in the cross drainage structures to treat the urban runoff from the area flowing into the system prior to discharge to the natural receiving watercourses.

Surface water features

A schedule of existing cross drainage structures for providing capture and conveyance of upstream runoff are listed in Section 6.3.2. The existing cross drainage discharge locations across the rail corridor are to be maintained to continue the connectivity of flow paths to the downstream receiving watercourses. These discharge locations are typically open drains leading to the rail corridor or existing overland flow paths in Medlow Bath Park.

6.3.3 Potential impacts

Construction

In addition to sedimentation and scour impacts which are described in Section 6.2.3 which can contribute to poor water quality there is also a risk of releasing potentially harmful chemicals and other substances in the environment due to spills. This could occur as a result of equipment malfunction and maintenance or refuelling, inappropriate storage, handling and use of contaminated sediment and via treatment and curing processes for concrete. Potential contaminants could include acids and chemicals from washing down of vehicles, construction fuels, oils, lubricants, hydraulic fluids and other chemicals.

Groundwater impacts during construction include risks to groundwater quality as a result of spills or poor management of groundwater encountered during earthworks. Drawdown of groundwater levels may also impact surrounding land uses including affects to groundwater use and settlement of adjacent structures.

Operation

Increases in impervious surface areas have the potential to result in increased runoff due to changes in the hydrological regime. This could lead to water quality impacts associated with increased erosion and sedimentation and increased concentrations or the introduction contain pollutants such as sediments, nutrients, oils and greases, petrochemicals and heavy metals, which could potentially impact on water quality when discharged into receiving waterways.

The operation of the proposal is likely to impact on water quality due to discharge of drainage at new locations or increased discharge at existing locations where road and drainage upgrades have occurred. Increased flow rates can impact on the bed and bank stability of the existing watercourses making them highly susceptible to erosion. Stream erosion increases sediment and nutrient loads leading to decreased water quality which would potentially affect the protection of the nominated environmental values and scour potential is also increased with higher velocities and larger flow rates.

Surface water impacts during operation of the proposal would be minimised by:

- providing level spreaders to limit scour potential at runoff discharge locations entering the existing watercourses
- implementing attenuation/detention basins for mitigation of the discharge peak flows to no greater than under the existing conditions
- integrated bioretention into the basin floor to provide stormwater quality filtration and treatment.

The NorBE assessment carried out for the proposal (included at Appendix C), included MUSIC modelling and is the quantitative approach to assess the potential impacts and provide a basis of pollutant generation that is used in determination of the mitigation measures. The assessment found that assuming the mitigation recommendations are adopted, the proposal would achieve a beneficial outcome with regard to surface water quality. The new treatment measures would remove gross pollutants and further reduce residual pollutants through biofiltration prior to discharge, contributing to a lower level of pollutants than before construction.

With respect to groundwater, all the construction stage risks are also relevant in the operational phase. In addition, the potential long term effects of the changes in impervious surfaces with road widening could alter the groundwater recharge rates in the immediate vicinity and continue the impacts to sensitive receivers such as groundwater dependent ecosystems.

Installation of stormwater detention basin

A key strategy to manage surface water run off during operation is the installation of a new sedimentation basin located adjacent to Medlow Bath (refer Figure 6-6 which shows the proposed location). It is intended that this sedimentation basin would be installed at an early phase of the construction works to be utilised for managing surface water run off during works (including additional pipes below the rail line). The basin would then be used during the operational phase to ensure an acceptable level of water quality is discharged into the existing overland flow paths in Medlow Bath Park.

During both phases, the water would be pre-treated via spill containment (to capture oils from road surfaces) and a gross pollutant trap (to capture sediment, rubbish and vegetation debris). The water would enter the detention basin in order to retard or slow down the flow of water so it is released at a steady state, and this would also enable some water to infiltrate into the ground and potentially allow for storage for use in watering the park. Post treatment, the treated water would discharge into the existing rock lined channel in Medlow Bath Park. Figure 6-7 shows the water quality process that has been incorporated into the design.

Figure 6-6: Proposed location of new sedimentation basin - in yellow (Image source: Mecone Mosaic)

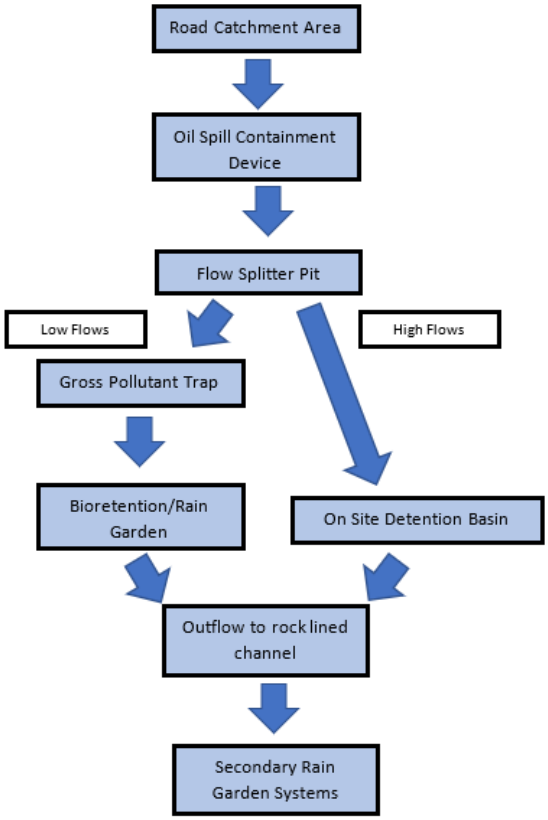

Figure 6-7: Water quality management process for the proposal

6.3.4 Safeguards and management measures

Table 6-11: Safeguards and management measures – Surface water and groundwater impacts

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil degradation and water pollution	A Soil and Water Management Plan will be prepared and implemented as part of the CEMP. The plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. The Soil and Water Management Plan will be reviewed by a soil conservationist on the TfNSW list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The Plan will then be revised to address the outcomes of the review.	Contractor	Detailed design / Pre-construction	Section 2.1 of *QA G38 Soil and Water Management*
Soil degradation and water pollution	Site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan. The Plan/s will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. The site specific Erosion and Sediment Control Plan/s will be developed in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (DECCW, 2008), commonly referred to as the 'Blue Book'.	Contractor	Detailed design / Pre-construction	Section 2.2 of *QA G38 Soil and Water Management*
Run-off velocity (scour protection)	Level spreaders will be installed at all discharge locations to the natural surface used to reduce velocity and depth of the flows reaching the natural watercourses /s. New discharge outlets will be designed with appropriate energy dissipation and scour protection measures as required to minimise the potential for sediment disturbance and resuspension in the receiving waters. Outlet design and energy	Contractor	Detailed design / Pre-construction	Best practice

Impact	Environmental safeguards	Responsibility	Timing	Reference
	dissipation/scour protection measures will be informed by drainage modelling. Check dams or velocity managing devices are installed into flow paths particularly in areas with steep gradients.			
Water quality	Maintenance requirements for all stormwater treatment systems and devices installed as part of the proposal will be identified and included in relevant operational maintenance schedules/systems.	TfNSW	Post construction	Best practice
Spill containment	Dedicated diversion equipment will be implemented for the storage of spills to avoid direct discharge to receiving watercourses.	Contractor	Detailed design / Pre-construction	Best practice
Sediment run-off from construction site	Sediment basins will be designed and constructed for the collection of sediment runoffs through reduction of flow velocity.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*
Sediment run-off from construction site	The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*
Sediment run-off from construction site	Disturbed ground and exposed soils will be permanently stabilised and proposed landscaped areas will be suitably profiled and vegetated as soon as possible following disturbance to minimise the potential erosion.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*

6.4 Soils and contamination

This section summarises the results of a desktop investigation of the soils and geology underlying the proposal area and the *Great Western Highway Upgrade Medlow Bath Phase 1 Preliminary Site Investigation and Report* (Mott MacDonald, 2020), provided in Appendix G.

6.4.1 Existing environment

Geology

The geology of the proposed area is identified by the NSW Department of Planning, Industry and Environment's data as comprising:

- **Narrabeen Group**: Quartz-lithic to quartzose sandstone, conglomerate, mudstone, siltstone, rare coal
- **Early Triassic to Middle Triassic**: predominately sedimentary rocks; including sedimentary rocks of low metamorphic grade and diapiric breccias.

Soil landscape

The *1:100,000 Geology of Penrith Map* (Geological Survey of NSW, 1991), identifies the regional geology of the proposal area as a combination of the following landscape, as shown in Figure 6-8.

- **Medlow Bath (residual):** predominately a combination of Leptic Rudosols and Orthic Tenosols which are rapid to well-draining, achieving an approximate depth of 100 centimetres before bedrock.

Adjacent soil landscapes include:

- **Warragamba (erosional):** compromised of a combination between rapidly and well-drained soils to a maximum depth of 150 centimetres before bedrock appears
- **Wollangambe (erosional):** compromised of a variety of rapidly draining soils to a maximum depth of 150 centimetres before bedrock appears.

Acid sulphate soils

Acid sulphate soils include those where the sulfides in the soils have been exposed to air and acid is being generated (actual acid sulphate soil) and those which may form actual acid sulphate soil when drained or exposed to oxidisation processes (ie the exposure of iron sulphate minerals such as pyrite to oxygen).

A search of the NSW Department of Planning, Industry and Environment's database on Eastern Australian Acid Sulphate Soils on 26 November 2020 indicates that there are no known or risk of acid sulphate soils occurring within or in the vicinity of the proposal.

Salinity

Salinity is the accumulation of salts in soil and water to levels that impact on human and natural assets. Salinity occurs where salt in the landscape is mobilised and redistributed closer to the soil surface and / or into waterways by rising groundwater.

A search of the NSW Department of Planning, Industry and Environment's database on Eastern Australian Soil Salinity on 3 March 2021 did not include salinity data for the proposal area. However, records for the adjacent area states "no salting evident".

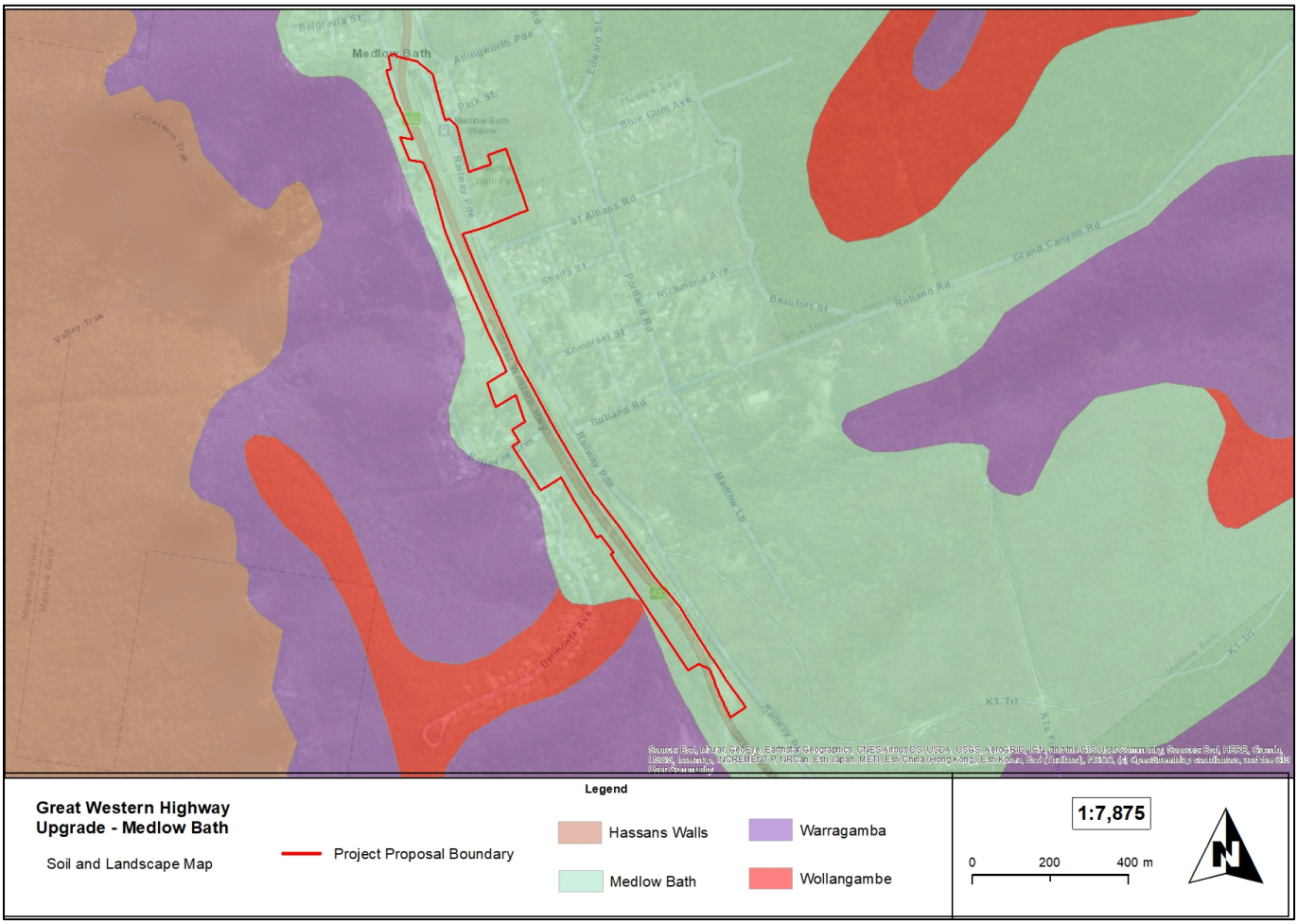

Figure 6-8: Soil landscape map for the proposal area (Source: Department of Planning, Industry and Environment)

Topography

The topography of the landscapes associated with the proposal have the following characteristics:

- **Medlow Bath:** rolling rises to rolling low hills on Hawkesbury Sandstone and Narrabeen Group Sandstone in the south west of the Hunter Region. Slopes 10 per cent to 20 per cent, local relief 20 metres to 50 metres, elevation 464 metres to 1,184 metres. Partially cleared open forest and open woodland
- **Warragamba:** steep, narrow, gorges on Narrabeen Group sandstone in the Hawkesbury Nepean and Hunter Central Rivers catchments. Slopes greater than 35 per cent, local relief 90 metres to greater than 300 metres, elevation 30 metres to 1,179 metres. Partially cleared tall open-forest and rainforest in sheltered gullies
- **Wollongambe:** rolling low hills to steep hills on Narrabeen Group Sandstone mainly in the north-west of the Hawkesbury Nepean Catchment but also the rugged south-west of the Hunter Region. Slopes 20 per cent to 40 per cent, local relief less than 220 metres, elevation 200 metres to 600 metres.

Contamination

The information presented in this section is based on a review of readily available government information sources and information, a site inspection carried out 19 November 2020, and the findings of the *Phase 1 Preliminary Site Investigation and Report* (Mott MacDonald, 2020) provided in Appendix G.

Historical aerial photographs and land use changes

- **1958:** the Great Western Highway and railway line are present, having previously been developed. The proposal area also comprises a combination of cleared/grazed paddocks with sparse residential occupation. Of the disturbed land, the United Petrol Station located opposite Somerset Avenue appears to have had its petrol tanks directly in-line with the Proposal area.
- **1966:** relatively unchanged land use from that of 1958.
- **1994:** parcels of residential land have now had property developed on most lots. With a majority of these houses constructed between 1970s-1980s, it is likely that they contain asbestos. The vegetation that lines the Great Western Highway remains the same, however the canopy cover is larger. The Hydro Majestic Hotel has been significantly upgraded.
- **2006:** vegetation lining the Great Western Highway has not increased in number but has increased in canopy cover. The Hydro Majestic Hotel has undergone further restoration/upgrade.

Desktop review

An online search of the NSW EPA contaminated land record of notices database and the POEO Act public register database was carried out on 25 November 2020 and displayed no records to suggest the presence of contamination within the proposal area.

Site inspection

The site inspection noted the following potential areas of environmental concern within and adjacent to the proposal area:

- a petrol station at 90-92 Great Western Highway has existed in excess of 20 years and as such there is the potential of hydrocarbon contamination from uncontrolled spills, surface water run-off and leakage from underground petroleum storage systems (previous and existing). Groundwater monitoring wells were noted onsite during the site inspection
- evidence of unknown fill material and unregulated waste dumping, particularly between the Great Western Highway and the rail corridor
- an operational car dealership that includes a maintenance workshop is located at 42 Great Western Highway which presents a potential historic risk of soil and groundwater contamination due to the likelihood of hydrocarbon spills, chemical storage and battery storage
- utility conduits presumed to contain asbestos were found between the Great Western Highway and Medlow Bath Station and could occur in additional locations.
- fill material from an unknown source associated with historical road construction was identified within several locations (notably between the Great Western Highway and rail corridor)
- stockpiled ballast was observed at the proposed compound site located at 181-183 Great Western Highway.

6.4.2 Potential impacts

Surface and groundwater quality impacts which are linked to soils and contamination are discussed in Section 6.3.

Construction

Erosion and sedimentation

Ground disturbing activities such as vegetation clearance, earthworks, stockpiling etc increase erosion potential which can lead to sedimentation from increased soil exposure, and which in turn can affect local surface water quality. The risks are increased where there are uncompacted or unconsolidated materials (such as excavated and stockpiled soils) or works being undertaken in steep or unstable soil areas.

During construction, soil erosion risks would be managed in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008), commonly referred to as the 'Blue Book'.

Contamination

Potential contaminants of concern relating to the activities observed during the site inspection (or identified during the desk top review of aerial maps or recorded on the EPA and POEO Act public register) included material suspected of containing asbestos (including fill and conduits), total coverable hydrocarbons, benzene, toluene, ethylbenzene and xylene, polycyclic aromatic hydrocarbons, organochlorine pesticides, organophosphate pesticides, polychlorinated biphenyls, phenols, volatile organic compounds and asbestos containing materials. During construction there is a risk of disturbance to soil layers that potentially contain these contaminants.

Operation

Erosion and sedimentation

There is potential for recently disturbed soils to be susceptible to erosion, which could occur during initial periods of landscaping and re-establishment of vegetation. This may occur in areas where soft landscaping is proposed for the proposal, including open space areas at Medlow Bath Station, adjacent to disturbed areas, along embankments and in the reinstatement of temporary ancillary facilities where topsoil is settling and vegetation is establishing. Landscaping at Medlow Bath Station also presents the greatest risk of sediment loads entering waterways through the stormwater system, due to the extent of landscaping proposed and the proximity to waterways. In terms of soil stability, retaining walls are proposed along the highway alignment to provide support and ensure long term erosion or collapse risks are eliminated.

Contamination

During operation, the likely sources of contamination would be from exhaust particles and discharges from vehicle engines, litter and other waste, materials from vehicle incidents and wear from vehicle parts such as tyres. This would be managed through the installation of dedicated diversion equipment for the storage of spills to avoid direct discharge to receiving watercourses.

6.4.3 Safeguards and management measures

Table 6-12: Safeguards and management measures – Soils and contamination

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	A targeted Phase 2 investigation providing general coverage of the proposed alignment and areas of potential contamination sources (including areas where fill would be encountered during construction and hydrocarbon migration from the United Petrol Station) will be undertaken. The investigation will address the potential risk that fill material may pose to construction workers and future users of the site. Assessments will be carried out in accordance with guidance made or endorsed by the NSW EPA. The contaminated land investigations will be carried out and the report verified by a suitably qualified and experienced environmental consultant.	TfNSW	Detailed design / Pre-construction	Appendix G
Contaminated land	A Contaminated Land Management Plan will be prepared in accordance with the *Guideline for the Management of Contamination* (TfNSW, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: • capture and management of any surface runoff contaminated by exposure to the contaminated land • any further investigations required to determine the extent, concentration and type of contamination. • management of the remediation and subsequent validation of the contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction. If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any	Contractor	Detailed design / Pre-construction	Section 4.2 of *QA G36 Environment Protection* Appendix G

Impact	Environmental safeguards	Responsibility	Timing	Reference
	necessary site-specific controls or further actions identified in consultation with the TfNSW Environment Manager and/or EPA.			
Pollution from run-off	The following measures will be included to limit sediment and other contaminations entering receiving waterways: • chemicals will be stored within a sealed or bunded area • appropriate controls will be in place where plant is stored • run-off from ancillary facilities will be controlled and treated before discharging into downstream waterways • vehicle movements will be restricted to designated pathways where feasible. Areas that will be exposed for extended periods, such as car parks will be stabilised where feasible.	Contractor	Construction	Additional safeguard
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the TfNSW *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including TfNSW and EPA officers).	Contractor	Detailed design / Pre-construction	Section 4.3 of *QA G36 Environment Protection*

6.5 Traffic and transport

This section describes the traffic and transport impacts associated with the proposal and is based on the supporting *Traffic and Transport Report – Great Western Highway Upgrade Program Medlow Bath* (Mott MacDonald, 2021c) included at Appendix H.

6.5.1 Methodology

Construction assessment

The traffic and transport assessment considers how the proposed activities, work methods, program, expected vehicle movements and required management controls would temporarily impact the following within the study area:

- traffic network performance on the Great Western Highway between the intersections Bellevue Crescent and Station Street
- all modes of public, private and active transport
- public road and private property access.

Operation assessment

Potential traffic impacts of the proposal were assessed by comparing the performance of the road network with and without the proposal. Future traffic on the Great Western Highway was derived from the Strategic Traffic Forecast Model. Future traffic volumes were then put into the intersection modelling software 'SIDRA' (Signalised Intersection Design Research Aid) to evaluate the performance of the road network.

The key intersection performance indicators extracted from the SIDRA Network analysis for this study include:

- Level of Service (LOS) – this is the standard measure used to assess the operational performance of an intersection. It is a measure of the delay at an intersection. There are six levels of service from 'A' (excellent with delays of less than 15 seconds) to 'F' (unacceptable with delays of more than 70 seconds)
- Degree of Saturation (DOS) – this is the ratio of traffic using an intersection to its capacity. A DOS value greater than 1.0 indicates that the intersection is over capacity.

6.5.2 Existing environment

Road corridor

The Medlow Bath road corridor for the proposal extends 1.2 kilometres east-west between the existing rail overbridge at Railway Parade and a location around 330 metres south of the intersection with Bellevue Crescent. It is a state highway managed by TfNSW and is situated in the Blue Mountains LGA.

This section of the Great Western Highway is currently a two-lane single carriageway with a posted speed limit of 60 kilometres per hour for most of its length. The posted speed limit on the eastbound carriageway changes from 60 to 70 kilometres per hour around 75 metres south of the intersection with Bellevue Crescent. The corridor is accessed via an intersection at Bellevue Crescent and another at Railway Parade. Westbound, the Great Western Highway splits into Railway Parade and Station Street. The corridor provides access to a service station, Hydro Majestic Hotel, a Mazda dealership and Medlow Bath Station.

Freight and heavy vehicles

The Medlow Bath corridor forms part of the freight and heavy vehicles network connecting adjacent suburbs along the Great Western Highway. It accommodates freight and heavy vehicles up to 19 metre B-Doubles over 50 tonnes.

Observed traffic volumes

Traffic volumes were identified in December 2020 through a combination of link counts (seven day count and a 10 day count) and video turning movement surveys during AM and PM peak periods at various locations along the Great Western Highway. It is noted that these traffic volumes may have been affected by COVID-19, yielding lower volumes than expected in a normal year.

Below is a summary of observations from daily traffic volumes travelling westbound and eastbound on the Great Western Highway at a location just south of the intersection at Bellevue Crescent.

- Average weekday traffic volumes are around 20,000 vehicles in total with daily westbound flows slightly higher than daily eastbound flows.
- Average weekend traffic volumes are around 21,000 vehicles in total with daily eastbound flows slightly higher than daily westbound flows.
- Heavy vehicles make up around 20 per cent of total traffic on an average weekday. On a weekend, they make up around 10 per cent of total traffic.

Further, observed average weekday and weekend traffic volumes showed that:

- on an average weekday, eastbound flows are higher than westbound flows during the AM period (6-9am) while westbound flows are higher than eastbound flows during the PM period (4-7pm)
- on an average weekday, two-way traffic volumes are highest in the afternoon between 3-4pm. During this time, 793 vehicles were observed travelling westbound and 789 vehicles eastbound
- on an average weekend, westbound flows are higher than eastbound flows during the AM (6-9am) while eastbound flows are higher than westbound flows during the PM period (4-7pm)
- on an average weekend, two-way traffic volumes are highest in the afternoon between 12-1pm. During this time, 878 vehicles were observed travelling westbound and 942 vehicles eastbound.

Existing road network performance

Existing intersection performances were assessed following the calibration and verification of SIDRA models. Analysis results are summarised in Table 6-13 and indicates a LOS A for the Railway Parade intersection, and LOS B/C at Bellevue Crescent.

Table 6-13: Existing 2020 intersection performance (SIDRA 2020)

Intersection	Existing control	Peak hour	Traffic volume (veh/h)	Average vehicle delay (seconds)	Level of Service (LoS)	Degree of Saturation (DoS)	95 percentile queue lengths (m)
Great Western Highway and Railway Parade	Signalised	AM	1441	6	A	0.3	54 (west approach)
		PM	1482	6	A	0.3	54 (west approach)
Great Western Highway and Bellevue Crescent	Stop (unsignalised)	AM	1434	26	B	0.49	2 (north approach)
		PM	1476	31	C	0.48	2 (north approach)

Crash data

The results of crash data analysis associated with the Medlow Bath section of the highway over a five-year period ending in 2019 revealed nine crashes recorded along the Medlow Bath corridor, comprising:

- nil fatality crashes
- one serious injury crash at the dividing road westbound
- five moderate injury crashes
- three non-casualty towaway crashes.

The spatial grouping of crashes suggests that there exists a safety concern at the Bellevue Crescent intersection as 44 per cent of the total crashes occurred at this location. Despite the lack of formal footpaths and cycling routes, no pedestrian or cyclist crashes occurred during the five-year survey period. However, one pedestrian crash was recorded near the Hydro Majestic Hotel entrance at Medlow Bath Station during the 2009-13 period. The pedestrian refuge is highly susceptible to near miss incidents involving pedestrians and highway traffic due to its geometry and placement.

Parking provisions

Various parking arrangements are available within the proposal area as shown in Figure 6-9. Perpendicular parking for around 40 vehicles is available along the western side of the highway for around 300 metres adjacent to the Hydro Majestic Hotel. Parking bays in this area are unmarked and untimed. This on-road parking area has been identified for relocation into the 90-space car park to the south as part of the separate Hydro Majestic Hotel redevelopment approval.

There are currently no kiss and ride spaces available within the proposal area. There are four accessible parking spaces within the proposal area. Two accessible parking spaces are available within the Hydro Majestic Hotel car park.

Public and hotel guest car parks are located within the Hydro Majestic Hotel complex at the northern and southern ends with capacities of around 35 and 90 car spaces respectively. An informal rail customer car park exists on Railway Parade with a capacity for around eight parking spaces, identified to service railway customers.

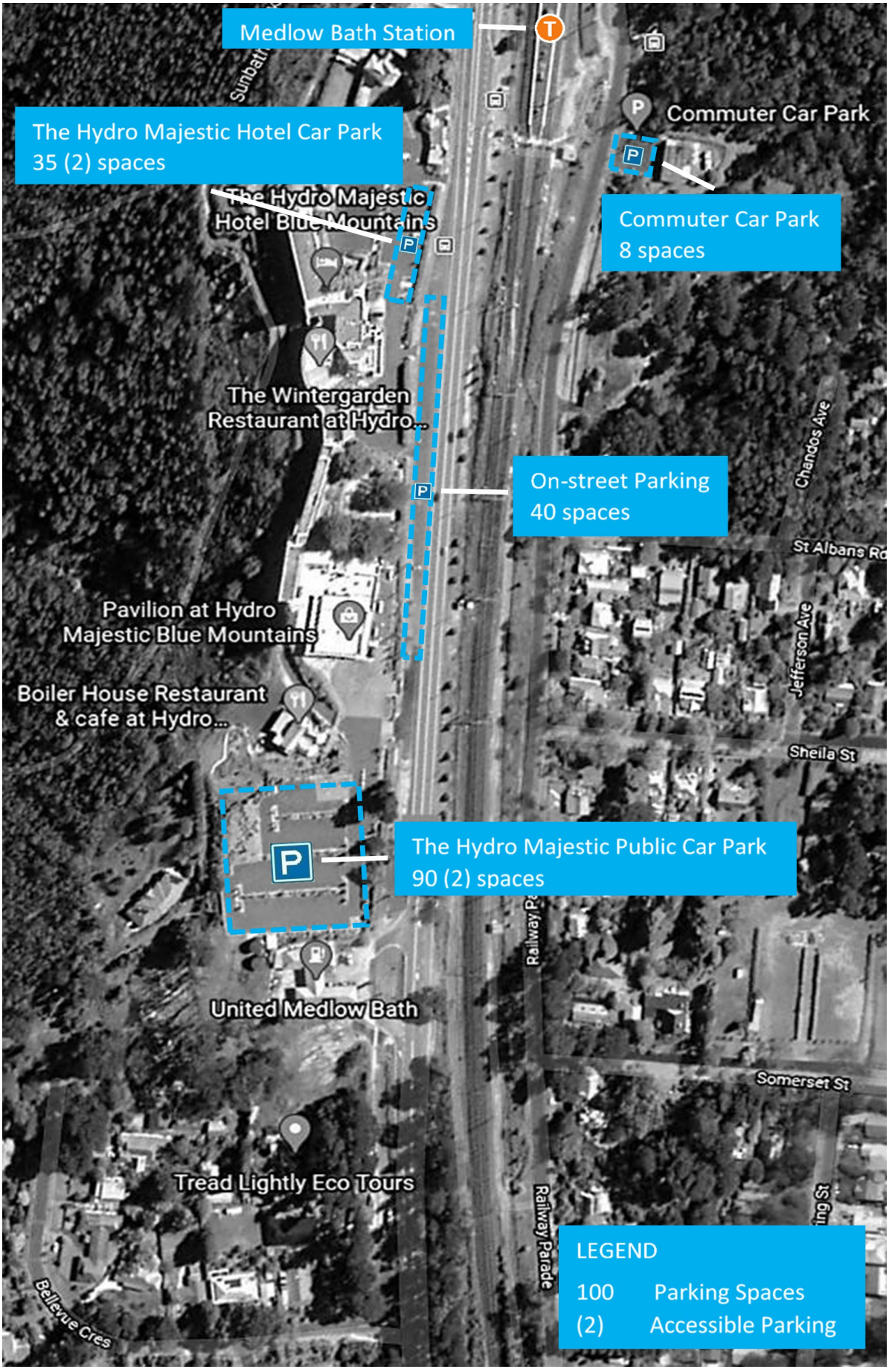

Figure 6-9: Medlow Bath existing corridor parking provisions (Mott MacDonald, 2021c)

Walking and cycling

Walking and cycling facilities on and around the Great Western Highway are shown in Figure 6-10. There is a lack of an accessible path of travel to the station from surrounds. Relevant details for these facilities are as follows.

- There are no dedicated cycling facilities within the proposal area. However, the Great Western Highway, Railway Parade and Rutland Road are marked as on-road cycling routes. This forms a regional on-road cycle route along the Medlow Bath alignment in which little protection for cyclists is provided along the narrow road shoulders. Shared pedestrian and bicycle paths begin along Bellevue Crescent and Station Street.
- No bicycle parking exists within the proposal area.
- A push button activated pedestrian crossing on the westbound approach of the Great Western Highway and Railway Parade intersection.
- A zebra crossing across the left turn slip lane from Railway Parade to the highway. This zebra crossing connects to a footpath that provides access to a pedestrian overbridge.
- A pedestrian overbridge north of the station platform. Pedestrian access to this overbridge is possible from:
    - west of the railway line via a footpath that runs along the eastern side of the Great Western Highway
    - east of the railway line via footpath that connects to Railway Parade.
- Pedestrians can access Medlow Bath Station and bus stops through two access points:
    - access from the north is via the rail overbridge and pedestrian crossing connecting the Great Western Highway and Railway Parade
    - a pedestrian/railway level crossing south of the station platform. This crossing is accessed from the western side of the highway via a refuge crossing. This refuge island can accommodate around three people at a time. Access to the level crossing from east of the railway line is via a footpath that connects to Railway Parade.
- A paved pedestrian footpath around 560 metres exists along the west side of the Great Western Highway while no formal footpath exists along the eastern side.
- A paved pedestrian footpath along the eastern side of the highway extending for around 195 metres between the level crossing and the overbridge. There are also various sealed and unsealed bush walking tracks in the area.

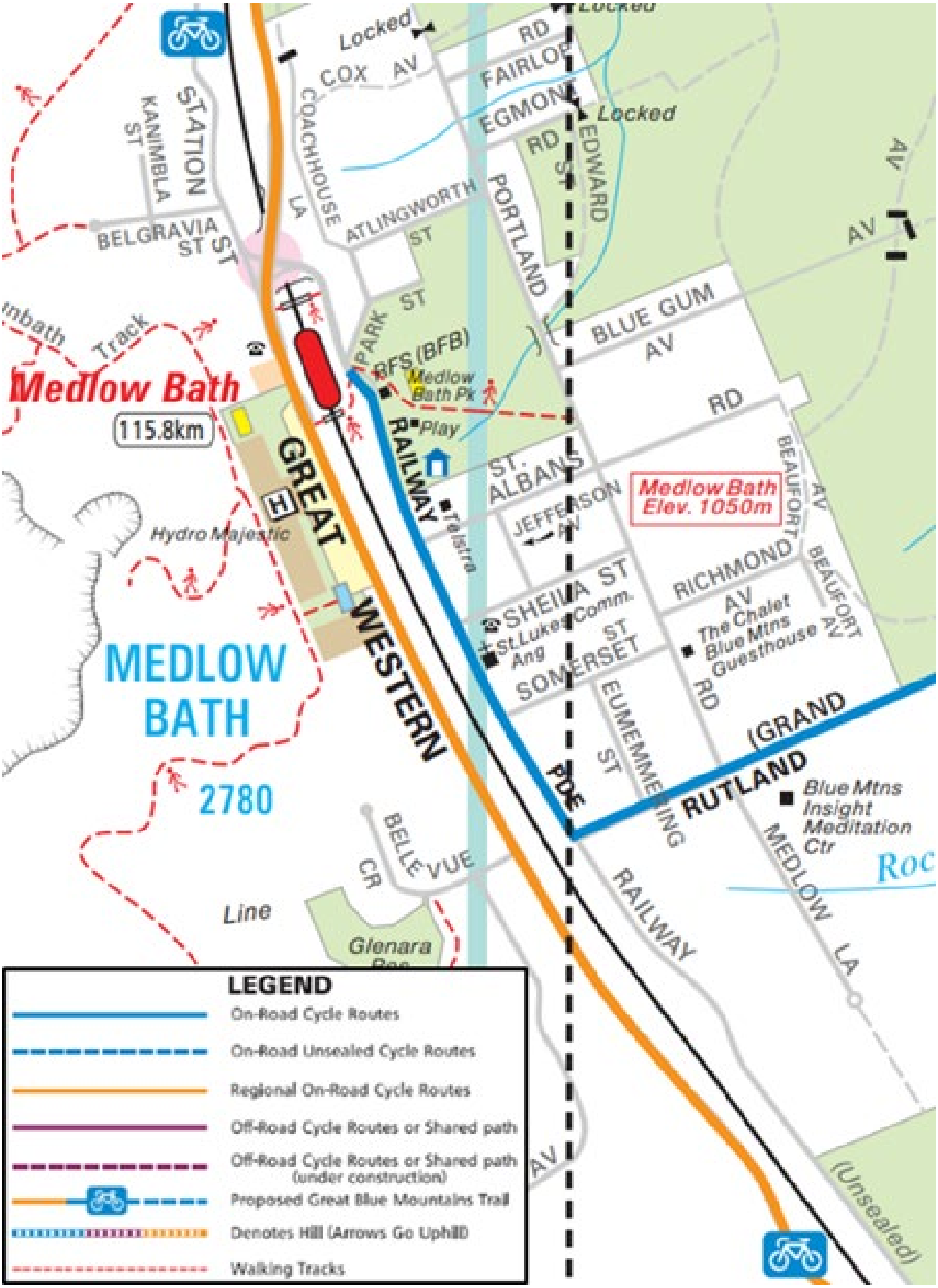

Figure 6-10: Cycle routes along the Medlow Bath corridor (Source: Blue Mountains City Council)

Public transport

Train services

Medlow Bath Station is serviced by the Blue Mountains Line, providing services between Central and Bathurst. Train frequencies are on average one service per hour.

Bus services

Bus stops within the proposal area are located on both sides of the highway at the Medlow Bath Station pedestrian level crossing. The Proposal area is serviced by the following bus routes:

- 698 – Katoomba to Blackheath (loop service) which extends across the entire length of the Proposal with four bus stops
- 698V – Katoomba to Mt Victoria (loop service) which extends across the entire length of the Proposal with three bus stops
- 8718 – Blue Mountains Christian School to Hazelbrook Station. This is a school bus that runs eastbound and stops at the eastern-side bus stop only.

The 698 service has an average of one service per hour between 7.30am to 6.30pm for both the eastbound and westbound directions. The 698V service has two services running westbound at 11.25am and 2.31pm and four services running eastbound at 8.16am, 8.44am, 12.19pm and 4.50pm. The Railway Parade Bus Stop is provided for 3.30pm exchange of students between bus routes on the local street to prevent the need to cross the highway.

Figure 6-11 illustrates the bus stops and their routes.

Figure 6-11: Medlow Bath Corridor Bus Stops and Bus Routes (Source: TfNSW)

Taxi

There are no existing taxi ranks located within Medlow Bath. Taxi services are located within the neighbouring Blue Mountains villages including Wentworth Falls, Lawson, Springwood, Winmalee, Harrington Park, Wetherill Park, Hinchinbrook and Prospect. Members of the community are able to book a taxi by phone call, online booking on agency's webpage or by hailing down a taxi.

6.5.3 Potential impacts

Construction

During construction, traffic and transport impacts and risks include:

- potential increases in vehicle movements and changes to traffic flows which may lead to short traffic delays, for example:
    - a temporary road closure of one hour would be required to allow for the operation of a crane to lift in and install the new pedestrian bridge
    - other temporary partial road or lane closures would be required at times to allow for road works (such as new pavement, kerb and gutter works) however it is proposed that alternating one-way traffic flow would be able to be maintained
- changes for pedestrians and cyclists accessing the station and surrounding footpath/road network which could mean detours and longer walking/cycling distances. There may also be an increased risk to safety as a result of changed conditions
- delays to buses on the Great Western Highway and temporary reduction in accessibility to bus stops as some bus stops would need to be relocated particularly where work activities being undertaken within the highway corridor
- removal of 40 perpendicular parking spaces to allow for construction works to establish the widened highway along the western side but which have already been compensated for by the Hydro Majestic Hotel southern car park works.

Theses impacts would be temporary and would only occur during construction work. The duration of construction is expected to be about 20 months, weather depending (refer to Section 3.2.4) for construction staging and timing of activities).

The number of truck movements to the work sites is unknown at this stage, however based on similar projects is likely to be less than 200 per day. Trucks movements would be distributed throughout the day equating to less than 30 movements per hour based on an eight-hour workday, which is estimated to be around a ten per cent increase in the hourly heavy vehicle movements. This additional traffic is unlikely to have a significant impact on the road network. However, if required, the movements of trucks would be scheduled to avoid peaks such as during local school zone hours.

Access to the construction site for trucks would be via the Great Western Highway, Bellevue Crescent and Railway Parade. Light vehicles to the site would be permitted to use all existing roads. Staff parking is likely to be provided within each construction site.

Light vehicle traffic to the site would be associated with the movements of construction personnel. The peak construction workforce is currently unknown but is likely to be a maximum of 200 at any one time based on similar projects. Assuming that five per cent of personnel travel to the site by public transport and 95 per cent travel by private car and an average car occupancy factor of 1.05, this equates to 362 light vehicle movements per day (181 in the morning and 181 in the afternoon). Assuming that 80 per cent of these light vehicles arrive and depart in the same peak hour, an additional 145 vehicles would be generated during each of the AM and PM peak hours. Given that two-way peak hours flow on the Great Western Highway are about 1500 vehicles per hour, there is sufficient capacity to accommodate this additional traffic.

There are a number of properties with direct access to the road network within the proposal area. Access to affected properties would be maintained throughout, and temporary property access would be provided where required.

Operation

Traffic and network impacts

A comparison of future (2036) intersection performance with and without the proposal for the AM and PM peak hours is presented in Table 6-14.

The SIDRA modelling indicates that the Great Western Highway/Railway Parade intersection would perform at an excellent LOS both with and without the proposal. Queue lengths and the DOS in the 'with proposal' scenario are slightly higher, but this is due to the overall increase in traffic volumes resulting from an assumption in the model that all Great Western Highway Upgrade Program improvements are operational by 2036 (ie improved travel speeds would attract traffic from alternative routes). It is noted that the intersection still performs with an excellent LOS and the impact of the slightly longer queues on intersection performance would be negligible.

The SIDRA modelling comparison of the 2036 intersection performance at the Great Western Highway/Bellevue Crescent intersection without and with the proposal (assumed to be a signalised intersection from the existing (stop) intersection) revealed that:

- there would be a reduction in average delays and DOS upon signalisation of the intersection
- the conversion of this intersection from a stop sign control system to signalisation would result in increased queuing on the highway. However, the proposed turning bay lengths of 100 metres for westbound left turning vehicles and 80 metres eastbound right turning vehicles would be sufficient to accommodate the modelled queueing.

Overall, the proposal would improve the existing performance of the highway including accommodating future increases to traffic volumes in 2036. Alterations to the existing alignment, particularly the signalised control system and U-turn bay at Bellevue Crescent and the addition of right turn bays eastbound into key amenities would improve the safety of vehicles and the community. The 5-year crash data reveal a 44 per cent of total crashes within Medlow Bath at Bellevue Crescent and so the modification to provide dedicated turning movement provisions at this location would improve vehicle safety.

Table 6-14: 2036 Scenario SIDRA outputs

Intersection	With proposal					Without proposal				
	Intersection type	Peak Hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation	Intersection type	Peak Hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation
Great Western Highway and Railway Parade	Signalised	AM	12	A	0.38	Signalised	AM	12	A	0.35
		PM	13	A	0.45		PM	12	A	0.39
Great Western Highway and Bellevue Crescent	Signalised	AM	6	A	0.35	Stop (unsignalised)	AM	38	C	0.56
		PM	5	A	0.35		PM	39	C	0.55

Modelling of the alternate Bellevue Crescent option (shown in Table 6-15) indicated an excellent LOS and that:

- turning lanes on both the west and east approaches of the highway would not block through movements
- queues at the new Bellevue Crescent at the approach to the highway would not block the new entry/exits of the United Petrol Station or Hydro Majestic Hotel.

Table 6-15: 2036 Scenario SIDRA outputs for alternative Bellevue Crescent option (with proposal)

Intersection	Intersection type	Peak hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation
Great Western Highway and Railway Parade	Signalised	AM	12	A	0.36
		PM	12	A	0.43
Great Western Highway and Alternate Bellevue Option	Signalised	AM	6	A	0.33
		PM	6	A	0.34

When compared to the concept design. the alternate Bellevue Crescent option would lead to fewer vehicles making a U-turn at the Station Street/Railway Parade intersection. This is because the alternative design allows for traffic exiting the United Petrol Station and Hydro Majestic Hotel to turn right at the proposed new Bellevue Crescent intersection and travel eastbound (towards Sydney). The preferred design does not provide an opportunity for traffic exiting the United Petrol Station and Hydro Majestic Hotel to make this right turn movement requiring vehicles intending to travel eastbound to make a U-turn at the Station Street/Railway parade intersection.

Road and station user impacts

The proposal would result in the following positive impacts or changes to road and station users.

- The highway would be able to support longer, heavier vehicles that are able to transport more freight per vehicle. This would provide improvements to safety and sustainability as well as improvements in productivity. This is expected to increase the volume of freight, but reduce the number of vehicles required to transport the freight along the highway.
- The existing pedestrian refuge and level pedestrian/railway crossing would be removed and replaced with a new raised pedestrian crossing on Railway Parade and pedestrian bridge with stairs/lifts at Railway Parade, Medlow Bath Station and on both sides of the highway. The incorporation of lifts and stairs would significantly improve connectivity of the area for customers and tourists and provide an accessible path of travel to the station and across the highway/rail corridor. It would also improve safety by removing pedestrian/vehicle interactions.
- Enhanced pedestrian safety and connectivity through the provision of dedicated cycling and pedestrian facilities along the length of the Great Western Highway in respect to the proposal, where currently there are limited facilities.
- The relocation of existing bus stops and shelters on both sides of the highway is proposed to provide a safe interchange area that is close to the station. The relocated bus stop on the western side would be relocated as close as possible to the proposed lift at the pedestrian bridge and would allow for one bus. The relocated bus stop with bus shelter on the eastern side would also be located as close as possible to the proposed lift.

- Two new kiss and ride bays would be provided at Railway Parade providing a safe environment for customers to drop off and pick up.
- Parking changes, including:
    - the rail customer car park at Railway Parade would be formalised and expanded to include nine parking bays and include one accessible parking space
    - the loss of around 40 perpendicular car parking spaces along the western side of the highway but which have already been compensated for by the Hydro Majestic Hotel southern car park works.

6.5.4 Safeguards and management measures

Table 6-16: Safeguards and management measures – Traffic and transport

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan will be prepared and implemented as part of the CEMP. The plan will be prepared in accordance with the *Traffic Control at Work Sites Manual* (TfNSW, 2020c) and *QA Specification G10 Control of Traffic.* The plan will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction	*QA Specification G10*
Traffic and transport	• The local bus operators will be consulted to confirm alternative temporary bus stop and operations during construction. • The local community will be notified about the agreed local temporary bus stop location, as coordinated and managed under the consultation strategy.	Contractor	Construction	
Property access	• Property access will be maintained where feasible and reasonable and property owners will be consulted	Contractor	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
	before starting any work that may temporarily restrict or control access. • (Side) road and lane closures will be minimised where feasible and reasonable.			

6.6 Noise and vibration

Potential noise and vibration impacts have been assessed in *Noise and Vibration Technical Paper Great Western Highway Upgrade Medlow Bath* (Mott MacDonald, 2021d) (refer Appendix I). A summary of the potential construction and operational noise and vibration impacts is presented in this section, together with management measures to mitigate any negative impacts.

6.6.1 Methodology

Construction noise

The *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009) details a process for the assessment and management of construction noise. The primary purpose of the construction noise assessment is to identify the potential for construction noise levels to exceed the acceptable noise management levels (NML) or highly affected level for sensitive receivers. NML are elevated from existing noise levels (and the levels vary, depending on if it is daytime, evening or night-time) but represent an increase in the noise level that is likely to be acceptable during construction.

In order to inform the NML for the proposal, long term noise monitoring was completed at four locations throughout Medlow Bath from Thursday 3 December to Monday 14 December 2020. The purpose of the monitoring was to measure the existing levels of traffic noise to assist in establishing criteria (refer Section 6.6.3), validating the noise model and to identify the rating background levels (RBLs) in support of the construction noise assessment.

Typical construction scenarios which assumed the number and type of equipment to be used were then modelled using SoundPLAN v8 software to compare the predicted noise levels during construction against the NML and highly affected noise level. It is noted that construction noise levels at sensitive receivers will depend upon the distance of the receiver to the works, the amount of shielding, if any, by topography or nearby structures, and the amount of noise generated by the construction activities. Construction traffic noise was also assessed.

Operational noise

Noise generated by road traffic operating on the proposed road upgrade has been modelled and assessed in accordance with the *NSW Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011), the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015c) and the *Noise Criteria Guideline* (Roads and Maritime Services, 2015a). To assess the potential impacts of the operational phase of the proposal on noise-sensitive receivers, the following steps were completed for both daytime and night-time scenarios:

- modelling of the existing environment as part of the validation process
- modelling of a ‘do minimum (the year of opening 2026)’ and a ‘do something (the design operational year 2036)’ scenarios for the purpose of establishing criteria
- modelling of road traffic noise levels for 10 years after opening (2036). These predictions were undertaken prior to optimisation of any noise barriers and aim to determine all receivers that qualify for consideration of noise mitigation.

The following factors were considered in assessing traffic noise impacts:

- traffic volume and proportions of heavy vehicles: measured traffic counts were used to validate the existing noise model and future traffic counts were sourced from modelling scenarios (refer Section 6.5)
- vehicle speed: the existing posted speed limit throughout the proposal area is 60 kilometres per hour and would remain at this speed in the future

- topographical information along and surrounding the proposal area
- road pavement surface types
- road gradient
- noise emission levels and source heights for different vehicle types
- building structures
- location of potentially affected receivers.

Road noise was modelled using UK Department of Transport, Calculation of Road Traffic Noise (CORTN) algorithm with noise source heights of 0.5 metres, 1.5 metres, and 3.6 metres above ground level. These heights represent the noise from light vehicles, combined engine/tyre noise from heavy vehicle and the exhaust noise from heavy vehicle.

6.6.2 Existing environment

Medlow Bath predominantly comprises residential properties, with the local noise environment controlled by traffic on the existing Great Western Highway and the Blue Mountains Line rail services. Both the road and rail line are freight routes, resulting in an appreciable noise contribution from trucks and diesel locomotives. Adjacent to Medlow Bath Station there is a pedestrian crossing. Trains are required to sound their horn at this location to warn pedestrians of their approach, which contributes to the local noise environment. The proposal would remove this pedestrian crossing and provide an alternate means of access (a pedestrian bridge elevated above the railway and highway), also removing the crossing noise events.

Existing background levels

Table 6-17 presents the rating background levels (RBLs) which are a measure of the existing noise level for each monitoring location, and which have been calculated in accordance with the *Noise Policy for Industry* (EPA, 2017).

Table 6-17: Rating background level

Noise logging location (NL)	Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night-time (10pm – 7am)
NL1 25 Delmonte Avenue, Medlow Bath	40	37	27
NL2 104 Great Western Highway, Medlow Bath	50	42	29
NL3 40 Railway Parade, Medlow Bath	49	41	29
NL4 5 Railway Parade, Medlow Bath	46	41	24

Noise sensitive receivers

Noise sensitive receivers were identified through aerial photography and visual inspection. Locations and occupancy of all receivers have been identified to classify each building as either residential, commercial, industrial, educational, and other non-sensitive uses. Noise catchment areas (NCA) are used to group receivers within a similar noise environment and define appropriate construction NML.

The assessment identified 320 buildings around the proposal area as receivers and these receivers and which were divided into two NCA (refer Table 6-18).

Table 6-18: Noise Catchment Areas (NCAs)

NCA	Location	Description
NCA01	East of Great Western Highway	To the east of the Great Western Highway, the receivers are generally residential, with a small number of guest houses dotted throughout the area. There is a single commercial building (a café) towards the northern end of Railway Parade. The remainder of the receivers are residential.
NCA02	West of Great Western Highway	On the western side, the Hydro Majestic Hotel is a prominent feature of Medlow Bath with other commercial premises to the south including a restaurant and store. There is also a car dealership to the north of the Hydro Majestic Hotel. The remainder of the receivers are residential.

Vibration sensitive receivers

The following vibration sensitive receivers (heritage items) have been identified in and around the proposal area:

- Medlow Bath Station
- Hydro Majestic Hotel
- Former Post and Telegraph Store, 1 Railway Parade
- Urunga, 1 Park Street
- Melbourne House, 2 Station Street
- Cosy Cot, 4 Station Street
- Shelaugh Cottage, 6 Station Street.

6.6.3 Potential impacts

Construction

Assessment criteria

Table 6-19 presents information from the ICNG on NML for residential receivers, including how to calculate and apply for construction noise assessments.

Construction noise

Table 6-19: Noise Management Levels (NML) for residential receivers

Time of day	Noise Management Level $L_{Aeq,15min}$	How to apply
Recommended standard hours: **Monday to Friday: 7am to 6pm** **Saturday: 8am to 1pm**	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq,15min 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.
No work on Sundays or Public Holidays	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. 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: • 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.
Outside recommended standard hours	Noise affected RBL + 5 dBA	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.

Based on the RBLs for the proposal and the ICNG recommendations, NMLs for residential and non-residential receivers is established in Table 6-20 and Table 6-21, respectively.

Table 6-20: Construction noise management levels –residential land uses

Site	Noise management level, $L_{Aeq,15min}$ dBA		
NCA	Daytime	Evening	Night-time
01	50	42	35
02	51	46	35

Table 6-21: Construction noise management levels –non-residential land uses

Receiver type	External NML $L_{Aeq,15min}$
Industrial premises	75 dBA
Offices and retail offices	70 dBA

Sleep disturbance

Sleep disturbance noise goals have also been established for residential receivers. Sleep disturbance criteria for both NCAs are a screening level RBL + 15dBA. Where construction works are planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed. The sleep disturbance criteria for the NCAs are presented in Table 6-22.

Table 6-22: Sleep disturbance criteria – screening

NCA	External screening criteria Night ($L_{A1,1min}$) [$L_{A90,15min}$ + 15dBA]
01	45 dBA
02	45 dBA

Construction vibration

Perceptible vibration can be an annoyance to building occupants, particularly if the duration or frequency of events is significant. Vibration criteria for human comfort is provided by *Assessing Vibration – A Technical Guideline* (Department of Environment and Conservation, 2006) and provides guidance in terms of continuous and impulsive vibration, and intermittent vibration. The vibration dose value criterion adopted for the proposal for human comfort is 0.2 mm/s$^{1.75}$ (between 7am and 10pm) and 0.13 mm/s$^{1.75}$ (between 10pm and 7am).

Impacts from vibration may also result in impacts to building structure (cosmetic damage). Of these considerations, the human comfort criteria are the more stringent and if compliance with human comfort criteria is achieved, it will follow that compliance is achieved for the building damage objectives.

The German Standard *Structural Vibration, Part 3: Effects of Vibration on Structures (DIN 4150-3)* identifies more stringent vibration levels for building damage and includes a category specifically for heritage buildings which would be applied for the proposal (refer Table 6-23). Further consideration would be given to heritage structures throughout the detailed design stage to ensure adequate mitigation and management measures are included in the construction strategy.

Table 6-23: Structural damage safe limits for building vibration DIN 4150-3

Structure type	Vibration frequency at foundation 1-10 Hz	Vibration frequency at foundation 1-10 Hz	Vibration frequency at foundation 1-10 Hz	Vibration at the horizontal plane of highest floor at all frequencies
Heritage building	3	3-8	8-10	8

Construction noise

The predicted noise impacts for the proposal are provided in Table 6-24. The table provides the highest noise level in each NCA, and the number of receivers which are predicted to exceed the NML in three bands. The number of highly affected receivers (ie noise levels above 75 dbA) is also presented. These impacts are also presented graphically in the form of noise contours in Appendix I.

Due to the small offset distance between the proposal and sensitive receivers, there would be exceedances of the NML during construction works. A small number of receivers would be highly affected at some point during the works. The noisiest stage is predicted to be vegetation clearing due to the operation of equipment like chainsaws, but which would last only two weeks.

Table 6-24: Summary of construction noise impacts per NCA

NCA	Maximum L_{Aeq} noise level dBA	No. of receivers exceeding NML 1-10 dBA	No. of receivers exceeding NML 11-20 dBA	No. of receivers exceeding NML >20 dBA	No. of highly affected receivers
Site preparation (six weeks)					
NCA01	72	136	59	7	0
NCA02	90	49	31	16	12
Site establishment (six weeks)					
NCA01	71	127	56	2	0
NCA02	89	48	29	13	12
Vegetation clearing (two weeks)					
NCA01	79	81	115	47	23
NCA02	97	23	46	38	24
Roadworks (70 weeks)					
NCA01	76	132	82	32	2
NCA02	94	41	37	28	16
Finishing works (ten weeks)					
NCA01	66	76	32	0	0
NCA02	97	37	16	17	11

Out of hours works and sleep disturbance

Two out of hours work scenarios were assessed as part of this proposal. These scenarios include road works, which is often required to be undertaken with traffic management measures outside peak periods, and the pedestrian bridge installation which also requires traffic management. Predicted noise impacts for out of hours works and sleep disturbance are presented in Table 6-25 and Table 6-26.

Road works taking place at night may cause major disturbances to the community, on this basis such activities should take place during daytime hours unless necessary. Where they must take place out of hours, the duration of works should be minimised.

Table 6-25: Out of hours construction noise impacts – night road works

NCA	L_{Aeq} NML dBA	Maximum L_{Aeq} noise level dBA	NML exceedance <5 dBA	NML exceedance 5-15 dBA	NML exceedance 15-25 dBA	NML exceedance >25 dBA	Highly noise affected
1	35	94	0	2	34	100	17
2	35	77	0	3	91	133	6

Table 6-26: Out of hours construction noise impacts – night pedestrian bridge installation

NCA	L_{Aeq} NML dBA	Maximum L_{Aeq} noise level dBA	NML exceedance < 5 dBA	NML exceedance 5-15 dBA	NML exceedance 15-25 dBA	NML exceedance >25 dBA	Highly noise affected
1	35	54	4	3	3	0	0
2	35	51	9	7	2	0	0

Construction traffic noise

The proposal is expected to have a maximum of 20 heavy vehicle deliveries and a workforce of 75 personnel. This has been assessed as an additional 40 heavy vehicle movements and 150 light vehicle movements during the daytime period. Existing traffic volumes are considered in Section 6.5 with more than 17,800 vehicles from combined light and heavy vehicles per day. Based on these additional traffic movements, the increase in noise from construction traffic is predicted to be less than 0.1 dB, and the additional movements would have a negligible impact on the local noise environment.

Construction vibration

Construction of the proposal has the potential for vibration impacts as a result of the use of vibration generating equipment such as jackhammers and vibratory rollers. Table 6-27 recommends the minimum working distances for various plant and equipment to meet human comfort and cosmetic building damage criteria. At the start of any vibration intensive works these distances would be checked and maintained on site to avoid any negative impacts.

Table 6-27: Minimum working distances

Plant item	Rating/description	Min working distance cosmetic damage (m)	Min working distance human comfort (m)
Vibratory roller	< 50 kN (typically 1 – 2 tonnes)	5	15 to 20
	< 100 kN (typically 2 – 4 tonnes)	6	20
	< 200 kN (typically 4 – 6 tonnes)	12	40
	< 300 kN (typically 7 – 13 tonnes)	15	100
	> 300 kN (typically 13 – 18 tonnes)	20	100
	> 300 kN (> 18 tonnes)	25	100
Small hydraulic hammer	300 kg (5 to 12 tonnes excavator)	2	7
Medium hydraulic hammer	900 kg (12 to 18 tonnes excavator)	7	23
Large hydraulic hammer	1,600 kg (18 to 34 tonnes excavator)	22	73
Vibratory pile driver	Sheet piles	2 to 20	20
Pile boring	≤ 800 millimetres	2	4
Jackhammer	Hand held	1	2

Construction work also has the potential to impact heritage structures from vibration. Table 6-28 provides a review of heritage structures and whether they may be impacted by vibration.

Table 6-28: Heritage structures and potential vibration impacts

Heritage structure	Distance to works (m)	Potentially vibration impacted
Medlow Bath Railway Station	18	Yes
Hydro Majestic Hotel	16	Yes
Hydro Majestic Hotel Heritage Wall	<5	Yes
Former Post and Telegraph Store, 1 Railway Parade	60	No
Urunga, 1 Park Street	60	No
Melbourne House, 2 Station Street	16	Yes
Cosy Cot, 4 Station Street	32	No
Shelaugh Cottage, 6 Station Street.	53	No

A range of heritage receivers have been identified which would require careful consideration with respect to vibration impact when planning works. Vibration monitoring and consideration of appropriate vibration generating equipment (such as vibratory rollers) would be required throughout the construction of the project.

Operation

Assessment criteria

The *Road Noise Policy* (RNP) (EPA, 2011) sets out criteria for assessment of noise from vehicles on public roads. The RNP sets out noise criteria for 'freeways', 'arterial', 'sub-arterial' and 'local' roads and provided in Table 6-29 and Table 6-30. The RNP considers the overall noise levels in the future, in addition to the change in noise due to the proposal. To achieve this, two scenarios were assessed: a 'do minimum' scenario; and 'do something' scenario. The difference between these two scenarios would be the impact of the proposal. For this, the year 2026 has been assessed as the year of opening and the year 2036 has been assessed as the design operational year.

Table 6-29: RNP criteria for existing residences (freeway/arterial/sub-arterial roads)

Type of project/land use	Day (7am-10pm)	Night (10pm-7am)
Existing residences affected by noise from redevelopment of existing freeway/ arterial/ sub-arterial roads	$L_{Aeq,15hr}$ 60 dBA (external)	$L_{Aeq,9hr}$ 55 dBA (external)
Existing residences affected by increases in traffic noise of 12 dB(A) or more from a freeway/ arterial/ sub-arterial road	Between $L_{Aeq,15hr}$ 42-60 dBA (external)	$L_{Aeq,9hr}$ 42-55 dBA (external)

Table 6-30: RNP criteria for non-residential residences

Receiver type	Existing sensitive land use	Day (7am-10pm)	Night (10pm-7am)
Non-residential	School classrooms	$L_{Aeq,1hr}$ 40 (internal) when in use	
Non-residential	Hospital wards	$L_{Aeq,1hr}$ 35 (internal)	$L_{Aeq,1hr}$ 35 (internal)
Non-residential	Place of worship	$L_{Aeq,\ (15\ hour)}$ 40 (internal)	$L_{Aeq,\ (15\ hour)}$ 40 (internal)
Non-residential	Open space (active use)	$L_{Aeq,\ (15\ hour)}$ 60 (internal)	
Non-residential	Open space (passive use)	$L_{Aeq,\ (15\ hour)}$ 55 (internal)	
Non-residential	Childcare facilities	Sleeping rooms $L_{Aeq,\ (1\ hour)}$ 35 (internal) Indoor play areas $L_{Aeq,\ (1\ hour)}$ 40 (internal) Outdoor play areas $L_{Aeq,\ (1\ hour)}$ 55 (external)	Existing traffic $L_{Aeq,9hr}$ + 12 dBA (external)

Operational noise – Great Western Highway

Noise level predictions for the year 2036 were calculated at the sensitive receivers identified within the proposal area and are presented in Appendix I. Almost all sensitive receivers are predicted to exceed the noise criteria by 5dBA or more, both with or without the proposal.

Prior to the consideration of noise mitigation, a total of 13 residential receivers would experience noise levels above the relevant criteria and have been identified as qualifying for consideration for noise mitigation in accordance with guidelines set out in the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015c). The exceedances identified above the relevant criteria are predominantly a result of the existing and future road traffic flows on the Great Western Highway and are not a direct result of the proposal.

At the Hydro Majestic Hotel (non-residential receiver), a noise level of 71 dBA during the daytime and 66 dBA during the night-time period has been predicted for the 'do something scenario'. These noise levels are predicted to reduce by less than 2 dBA from the 'do minimum scenario'. The RNP does not have noise criteria for hotels and in this situation operational road traffic noise levels are predicted to decrease as a result of the proposal.

Options for noise mitigation in the order of preference given in the RNP are:

- pavement design
- noise barriers
- at-property treatments.

The typical low noise pavement is stone-mastic asphalt and TfNSW recommends a correction factor of 0.0 dB for stone-mastic asphalt with a standard aggregate size of 10 millimetres. Given there is no acknowledged noise benefits, the standard low noise pavement is not recommended for the proposal. Options for noise barriers are not considered appropriate for the local environment given the village feel, several locally and state listed heritage items and views and high visual amenity along with existing space

constraints, and so at-property treatment would be investigated as part of detailed design to ensure operational noise levels are appropriately mitigated.

Operational noise – Bellevue Crescent U-turn bay

A U-turn bay is included in the design at Bellevue Crescent. The road has been assessed as a new local road, in accordance with the RNP. Vehicle movements would be generally slow speed throughout this area, with movements no greater than 10 kilometres per hour on average while using the bay itself. During the busiest one-hour period the traffic and transport assessment predicts 13 light vehicles and two heavy vehicles would use the U-turn bay in 2036. Traffic movements during 2026 and the night-time period are not available.

At the façade of the most affected receiver, 108 Great Western Highway, noise levels are predicted to be 54 dBA. Noise levels at the closest sensitive receiver, 3 Bellevue Crescent, are predicted to be 47 dBA during the busiest one-hour period. These predicted noise levels would comply with the daytime local road noise criteria of $L_{Aeq(1hour)}$ 55 dBA. While traffic volumes are not available for the night-time period, hourly night-time traffic volumes for 2036 are about 14 per cent of the daytime figures, which would yield noise levels about nine dB lower. Based on these volumes it is likely that night-time noise levels also comply with the night-time criteria of $L_{Aeq(1hour)}$ 50 dBA. Consideration of noise mitigation is not required for the operation of the U-turn bay.

Alternate Bellevue Crescent Option

At this stage of the design, only traffic volumes for the 2036 morning and afternoon peak periods are available for the alternate arrangement for Bellevue Crescent. The results of noise modelling indicate that three residential locations are predicted to exceed the applicable daytime noise criteria. Further analysis would be required during the detailed design stage to confirm the predicted noise levels during the night-time period. However, if this option was to proceed these three sensitive receivers would likely require consideration of additional noise mitigation measures. Low noise pavement and noise barriers would not be practicable in this location, and so at-property treatment would be investigated.

6.6.4 Safeguards and management measures

Table 6-31: Safeguards and management measures – Noise and vibration

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise and vibration	A Noise and Vibration Management Plan will be prepared and implemented as part of the CEMP. The plan will generally follow the approach in the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) and include the following: • the plan will consider potential vibration impacts associated with construction activities and would identify feasible and reasonable measures to mitigate these impacts, including safe working distances • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented, taking into account *Beyond the Pavement 2020: Urban design approach and procedures for road and maritime infrastructure planning, design and construction* (TfNSW Centre for Urban Design, 2020) • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria • stakeholder engagement will be a key feature of these measures, particular with key stakeholders such as the Hydro Majestic Hotel • vibration sensitive receivers identified will require careful consideration when planning works and, dependent on the nature of the works, may require vibration monitoring throughout the proposal.	Contactor	Detailed design / Pre-construction	Section 4.6 of *QA G36 Environment Protection*
Out of hours works	As part of the Noise and Vibration Management Plan, an out-of-hours work protocol will be developed, including any requirements set under the EPL which defines: • all scheduled and planned out-of-hours activities • any oversized and other deliveries needing to take place out-of-hours as required by the police or other authorities for safety reasons ·	Contractor	Pre-construction/ Construction	Appendix I

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• other tie-in, utility connection and intersection work that may need to take place out-of-hours for road user safety issues • out-of-hours emergency work needed to prevent the loss of life, property, to prevent harm or as agreed under negotiation with EPA and affected sensitive receivers • the record-keeping process for capturing agreed and emergency out-of-hours work. • very noisy activities should, as much as practicable, be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12:00am. In particular, there should be no jackhammering or saw cutting after midnight.			
Construction noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the proposal • construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information.	Contactor	Detailed design / Pre-construction	
Construction noise and vibration	The following general mitigation measures will be applied as practicable: • limit work to daylight hours and only night works during notified road closures. • perform noisy work during less sensitive time periods • select low-noise plant and equipment • ensure equipment has quality mufflers installed • where practicable use smaller/lower capacity plant in reference to the safe working distances • where possible, concentrate noisy activities at one location and move to another as quickly as possible • vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible	Contractor	Pre-construction / Construction	Section 6 of Appendix I

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• ensure equipment is well maintained and fitted with adequately maintained silencers • use only necessary sized equipment • implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible • consider alternatives, such as manually adjustable or ambient noise sensitive types ("smart" reversing alarms) and closed-circuit TV systems • consider installing temporary construction noise barriers • install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.			
Construction noise	Noise management controls will be implemented early in the work program to benefit receivers while the proposal is being built.	Contractor	Detailed design / Pre-construction	Appendix I
Construction noise and vibration	Where possible, plant will be located as far from residences as possible and behind site structures, barriers, screens and/or noise walls. Plan for the use of less noise/vibration equipment where reasonable and feasible.	Contractor	Pre-construction /Construction	Appendix I
Construction vibration	Any proposed works within the minimum safe working distances will be undertaken with concurrent vibration measurements to ensure the cosmetic damage criteria are not exceeded at sensitive receiver locations.	Contractor	Construction	Table 6-27 Appendix I
Construction vibration – heritage structures	Vibration resulting from construction and received at any heritage structure will be managed in accordance with *German Standard DIN 4150: Part 3 – 1999 Structural Vibration in Buildings: Effects on Structures.* Where required, monitoring will be undertaken to ensure guideline values are achieved, or additional vibration mitigation measures developed to manage risks.	Contractor	Construction	Table 6-23 *Structural Vibration, Part 3: Effects of Vibration on Structures (DIN 4150-3)* Appendix I
Operational noise	Architectural treatment will be investigated for properties where there are exceedances of the noise criteria. Based on the concept design, this will likely include fourteen residential properties:	Contractor	Detailed design	Appendix I

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• 2 Station Street • 4 Station Street • 40 Great Western Highway • 50 Great Western Highway • 100 Great Western Highway • 102 Great Western Highway • 104 Great Western Highway • 106 Great Western Highway (proposed acquisition) • 108 Great Western Highway • 110-114 Great Western Highway • 116-118 Great Western Highway • 14 Delmonte Avenue • 122 Great Western Highway • 126 Great Western Highway.			

6.7 Aboriginal cultural heritage

This section describes Aboriginal cultural heritage impacts associated with the proposal with research and findings sourced from the *Great Western Highway Duplication – Katoomba to Lithgow Archaeological Survey Report* (Jacobs, 2020).

6.7.1 Methodology

Potential impacts on Aboriginal heritage during construction and operation of the proposal have previousy been considered as part of the *Great Western Highway Duplication – Katoomba to Lithgow Archaeological Survey Report* (Jacobs, 2020). This report assessed a 37 kilometre proposed highway alignment between Katoomba and Lithgow (including the Medlow Bath proposal area) and included a 50 metre buffer either side (referred to as the project area in this report, which was prepared as part of the Stage 2 PACHCI process as discussed in Section 5.3).

Jacobs carried out surveys of public lands and accessible properties within the project area through 2019 and 2020. Representatives from the Local Aboriginal Land Councils (LALCs) relevant to the project area were present during each survey, apart from the March 2020 survey due to availability. As no recorded items were identified within the searches and the area generally disturbed, no additional field survey was undertaken for this REF.

A summary of the assessment is provided below, together with safeguards and management measures to mitigate any negative impacts associated with the proposal.

6.7.2 Existing environment

Aboriginal context

The project area spans three distinct Aboriginal language groups, these are the Darug, the Gundungurra, and the Wiradjuri peoples. During European contact it was recorded that the Darug occupied the main east-west ridge of the Blue Mountains, the northern Blue Mountains and the Cumberland Plain. The Gundungurra were to the south, and the Wiradjuri were to the west (Attenbrow 1993; Attenbrow 2010; Breckell 1993).

A variety of resources were exploited by Aboriginal groups within the upper Blue Mountains. The Macquarie River was considered to be a valuable source of food and fishing skills were considered expert as Aboriginal people showed ‘patience and ingenuity’ in making and using snares to catch prey (Meredith 1973: 104).

Stone artefactual material within the project area is part of the eastern regional sequence. The sequence consists of artefact types changing their appearance, frequencies of production, and use of different materials through time. Meredith (1973) provides descriptions of stone tools in the area including hafted stone axes and stone knives (Towle n.d: 87). Boswell (1890: 7) also provides descriptions of men carrying spears and nulla nullas ‘a sort of rude club’, as well as boomerangs which were carried in their belt (Boswell 1890: 7).

The first European thought to have entered the Blue Mountains, specifically into Gundungurra territory, was ex-convict John Wilson in 1792. He is supposed to have lived with the Gundungurra for several years in the Bargo – Picton area (Comber Consultants 2009: 9).

Aboriginal and European interaction and contact significantly increased the opening of Coxs Road across the Victoria Pass. The road was built in 1814 – 1815 and is the earliest built road in the Blue Mountains. Though this aided in the settlement of Europeans it came at the detriment of Aboriginal groups. Conflict and violence began to become more frequent. Disposition of Aboriginal groups and their culture continued in

the late nineteenth century and in the twentieth centuries. Aboriginal people were moved into missions and reserves where they had their existence monitored and controlled.

Landscape context

The proposal area follows a relatively narrow ridgeline which runs overall on a north-south alignment and crosses the Medlow Bath soil landscape which has a local relief of 20-50 metres, and a slope of 10-20 per cent. The underlying geology comprises Narrabeen Sandstone forming abrupt scarp edges and sandstone outcrops exposed within the dissected sandstone plateau landform pattern.

During site surveys undertaken by Jacobs, the project area was generally found to be highly disturbed with little to no areas of the natural land surface visible. Major landform modifications associated with previous expansion and realignment of the highway include cutting into the natural rock and clearance of vegetation on either side of the road corridor. Other types of disturbance are associated with the maintenance of the highway occur in the form of drainage channels and culverts that have disturbed any deposits that may have existed within the road corridor.

Hydrology

The main tributaries in the Upper Blue Mountains are the Grose River and Coxs River with the general drainage flowing west to east. The Grose River catchment and Coxs River catchment are both located in the Hawkesbury–Nepean catchment and covers approximately 2.2 million hectares and is the main source of drinking water for the Sydney, Blue Mountains, and Illawarra region.

Search of heritage registers and databases

A search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted on 29 October 2019 of the Great Western Highway corridor. This search identified 58 previously registered Aboriginal sites or areas of Potential Archaeological Deposit within the searched area however none of these were within the Medlow Bath proposal area. The search identified six Aboriginal sites within 500 metres of the project area (refer to Figure 6-12).

Additional AHIMS searches were conducted by MRB on 17 May 2021 of the proposal area (including a 200 metre buffer). This confirmed that no new Aboriginal sites or places had been identified on the database since the previous search was completed in 2019.

Searches of the Australian Heritage Places Inventory, the Register of the National Estate, the National Heritage List and the NSW Heritage Council's SHR websites identified no recorded Aboriginal sites within the proposal area.

Native title and land use agreements

A search of the National Native Title Register on 7 November 2019 by Jacobs shows there is one active native title claim (NC2018/002 – Warrabinga-Wiradjuri #7) and one Land Use Agreement (NI2014/001 – Gundungurra Area Agreement) over the project area (refer to Figure 6-13).

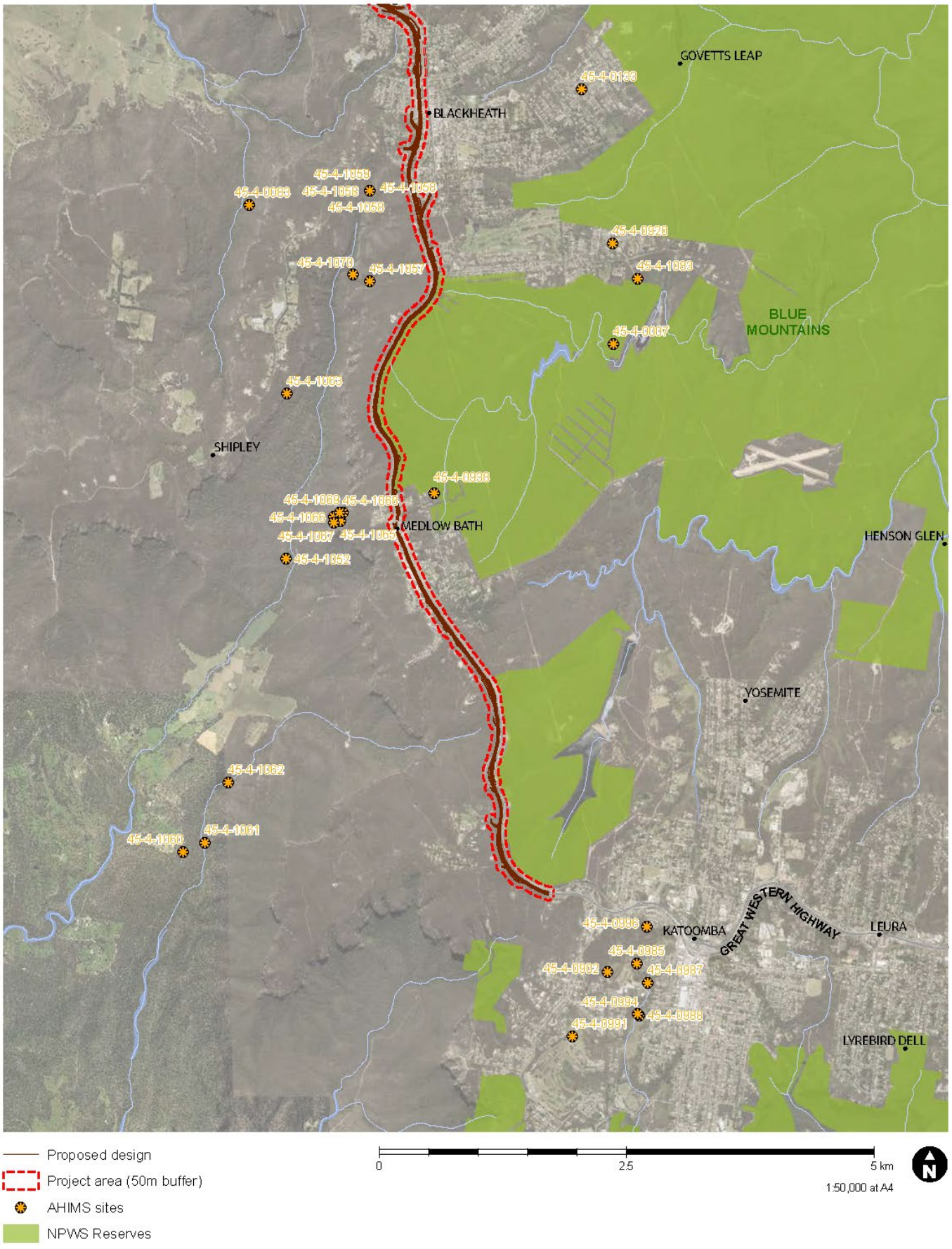

Figure 6-12: AHIMS sites around Medlow Bath (Jacobs, 2020)

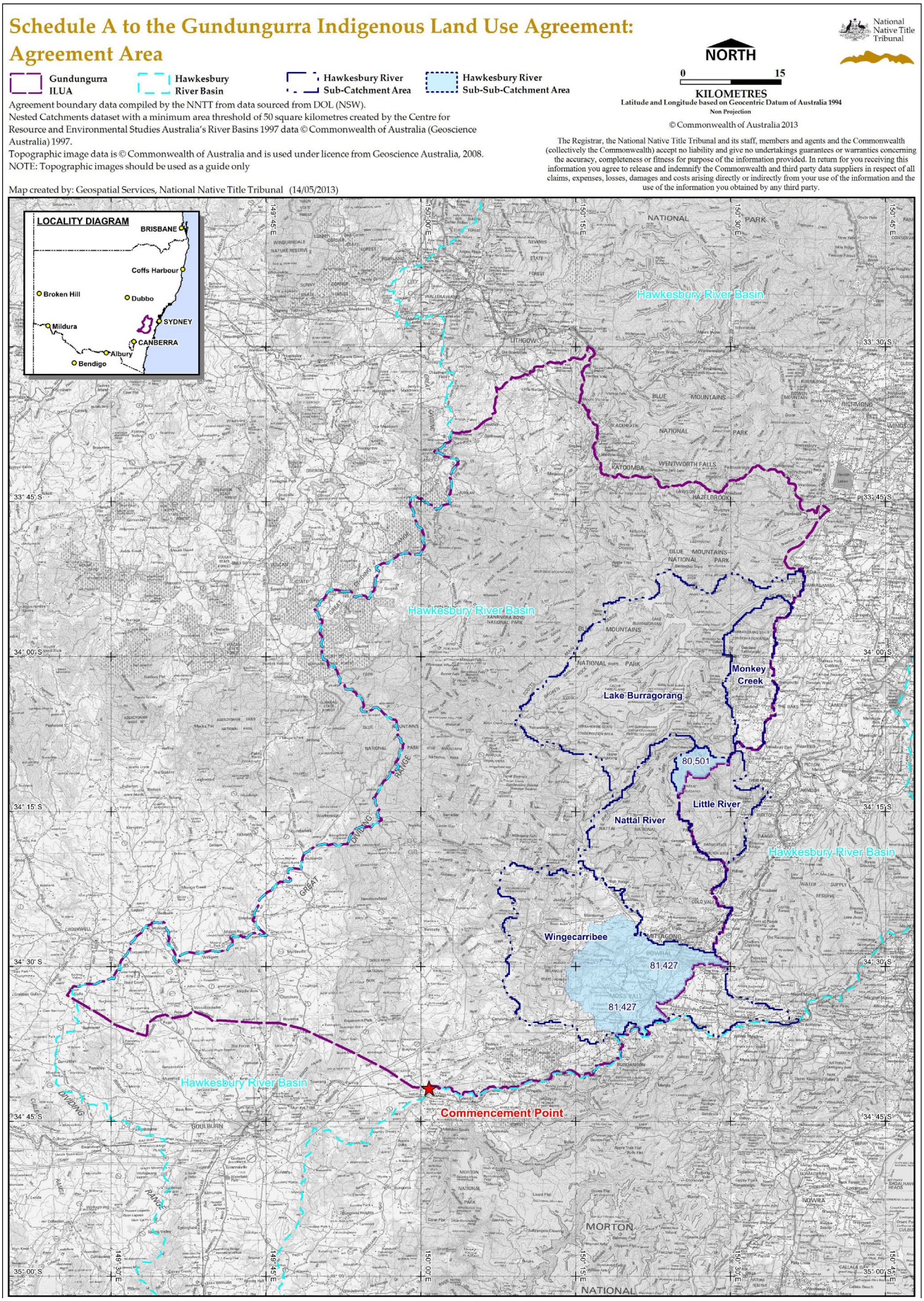

Figure 6-13: Gundungurra Indigenous Land Use Agreement area (National Native Title Tribunal, 2013)

6.7.3 Potential impacts

Construction

Construction would include excavation and other ground disturbing activities which can potentially impact Aboriginal archaeology, if present. There are no known Aboriginal sites identified within the proposal area. In addition, the proposal area has undergone extensive landscape modification and high level of disturbance from previous transport development which has been documented as part of previous Aboriginal heritage investigations (Jacobs, 2020). Therefore, there is a low likelihood that the proposal would impact any previously unidentified culturally sensitive items.

Operation

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

6.7.4 Safeguards and management measures

Table 6-32: Safeguards and management measures – Aboriginal heritage

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

6.8 Non-Aboriginal heritage

A Statement of Heritage Impact (SoHI) has been prepared by RPS (2021b) to assess the impact of the proposal on the significance of potential and registered non-Aboriginal heritage items located within, and adjacent to, the proposal area (refer to Appendix J). The SoHI recommends measures to avoid or minimise impact, and any approvals required under the NSW *Heritage Act 1977.* An additional SOHI specific to the State heritage-listed curtilage of the Medlow Bath Railway station will be written an accompany the Section 60 application.

6.8.1 Methodology

The non-Aboriginal heritage assessment consisted of a desktop assessment of the proposal area:

- including searches of the relevant heritage registers such as:
    - UNESCO World Heritage List
    - Commonwealth Heritage List
    - Australian heritage database
    - NSW State Heritage Register (SHR)
    - NSW State Heritage Inventory (SHI)
    - National Trust Register
    - former Roads and Maritime and RailCorp Section 170 Heritage and Conservation Registers
    - heritage schedule of the Blue Mountains LEP
- background research to inform the statement of significance
- an analysis of primary and secondary historical resources including original subdivision plans and parish maps for the proposal area
- review of conservation management plans relevant to the proposal including *Hydro Majestic Hotel, 52-88 Great Western Highway, Medlow Bath Conservation Management Plan* (Graham Brooks & Associates, 2010).

A visual inspection of the proposal area was undertaken on 23 December 2020 and 17 May 2021 to understand the site context and condition of the heritage items.

A SoHI was then prepared in accordance with the relevant heritage guidelines, and the level of impact assessed is in accordance with the definitions in Table 6-33, as sourced from the *Material Threshold Policy* (Heritage NSW, 2020).

Table 6-33: Definitions for the levels of impact to State heritage significance

Impact	Definition
Total loss of significance	Major adverse impacts to the extent where the place would no longer meet the criteria for listing on the SHR.
Adverse impact	Major (that is, more than minor or moderate) adverse impacts to State heritage significance. Moderate adverse impacts to State heritage significance. Minor adverse impacts to State heritage significance.
Little to no impact*	An alteration to State heritage significance that is so minor that it is considered negligible. *Little to no impact (as opposed to no impact) acknowledges that any change will result in some level of impact/alteration to State heritage significance.
Positive impact	Alterations that enhance the ability to demonstrate the State heritage significance of an SHR listed place.

6.8.2 Existing environment

Historical context

An overview of the historical context for the Proposal area is summarised in Table 6-34.

Table 6-34: Historical context

Historical aspect	Details
European crossing of the Blue Mountains (1815 onwards)	Cox's Road (the foundation for the Great Western Highway) was constructed over a period of about six months in 1815-1816, following the exploration of Blaxland Lawson, and Wentworth, and survey of William Evans. The alignment of the highway today largely follows the original alignment because it traverses ridges as much as possible and avoids gullies, which kept the road dry for horses, carts and carriages. A number of upgrades have taken place over the recent decades, including a new four lane railway bridge and improved alignment at Medlow Bath in December 2003.
Development of the Main West Line (1850-1870)	The railway line from Katoomba to Blackheath, through Medlow Bath, opened in 1868. A halt stop was established at Medlow Bath in 1881 undergoing some name changes until it was formally known as Medlow bath in 1903.
Township of Medlow Bath (1881 onwards)	The 1890 maps of the Blackheath, Kanimbla and Megalong Parishes indicate that at this time, land had been opened up to Crown land sales. The subdivision and sale of land continued in Medlow Bath through the early twentieth century, particularly with land to the east of the railway station in 1914 through to 1922.
Mark Foy and the Hydro Majestic (1900 onwards)	The Hydro Majestic Hotel (Blue Mountains LEP Item No. MB002) and Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP Item No. MB026) were developed by Mark Foy through bringing together three existing buildings into a complex from 1904 onwards. To emphasise the Hydro and provide a distinct point of reference for all travellers by both road and rail, Foy planted Avenue of Trees (Blue Mountains LEP Item No. MB015) around 1904.
Residential development (1900 onwards)	Following the subdivision and sale of land for the township of Medlow in the early 1900s, construction of houses and holiday retreats commenced. A group of four houses (Melbourne House, Cosy Cot, Sheleagh Cottage) is listed on the heritage schedule of the Blue Mountains LEP (Item No. MB019).
Medlow Post and Telegraph Store (1903 onwards)	The Post and Telegraph Store, Former (Blue Mountains LEP Item No. MB008) is to the north east of the proposal area and was first purchased by Isabella Jane Smith in 1903 and has since been utilised for a number of uses including as a post office, a dance hall for Hydro guests and a church hall. Today, the building is now an antique shop, book-shop and tearoom.
St Luke's Anglican Church (1908 onwards)	After initially holding services in a cave and private residence, St Luke's Anglican Church (Blue Mountains LEP Item No. MB010) was then built in 1913. It comprised a nave, chancel and transept, however the chancel was partly destroyed through storm damage in 1920. The building has since undergone various repairs and modifications, and was later deconsecrated and converted into a one bedroom home.
Annis and George Bills horse-trough (1930-1940)	Annis and George Bills were animal lovers who gave considerable sums to animal societies. When George died in 1927 and after various personal bequests, the remainder of his estate was to be used to construct and pay for horse troughs to prevent cruelty and alleviate the suffering of animals. The Medlow Bath example, Horse Trough (Blue Mountains LEP Item No. MB0013), was one of 700 troughs erected and located east of the proposal area at the corner of Somerset Street and Railway Parade, is a characteristic Bills' trough, with a small trough for small animals such as dogs to the right (Heritage NSW 2020f).

Heritage listings

The proposal traverses a number of heritage items listed on the SHR and Blue Mountains LEP, while the Greater Blue Mountains Area is listed a National and World Heritage site (refer to Table 6-35). Figure 6-14 and Figure 6-15 show the heritage listings in relation to the proposal area.

Table 6-35: Heritage listings within and in the vicinity of the proposal area

Item	Register	ID	Significance	Location
Medlow Bath Railway Station Group	SHR TfNSW RailCorp s170 Register Blue Mountains LEP 2015	01190 MB003 4801011	State	Proposal area
Avenue of Trees (formerly Avenue of Radiata Pines)	Blue Mountains LEP 2015	MB015	Local	Proposal area
Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic)	Blue Mountains LEP 2015	MB026	Local	Proposal area
Hydro Majestic	Blue Mountains LEP 2015	MB002	Local	Adjacent to proposal area
Former Post and Telegraph Store	Blue Mountains LEP 2015	MB008	Local	Adjacent to proposal area
Melbourne House, Cosy Cot, Sheleagh Cottage	Blue Mountains LEP 2015	MB019	Local	Adjacent to proposal area
Urunga	Blue Mountains LEP 2015	MB017	Local	Adjacent to proposal area
St Luke's Anglican Church	Blue Mountains LEP 2015	MB010	Local	Vicinity of proposal area
Greater Blue Mountains Area	World Heritage List National Heritage List	917 105999	World / National	Vicinity of proposal area
Horse Trough	Blue Mountains LEP 2015	MB013	Local	Vicinity of proposal area

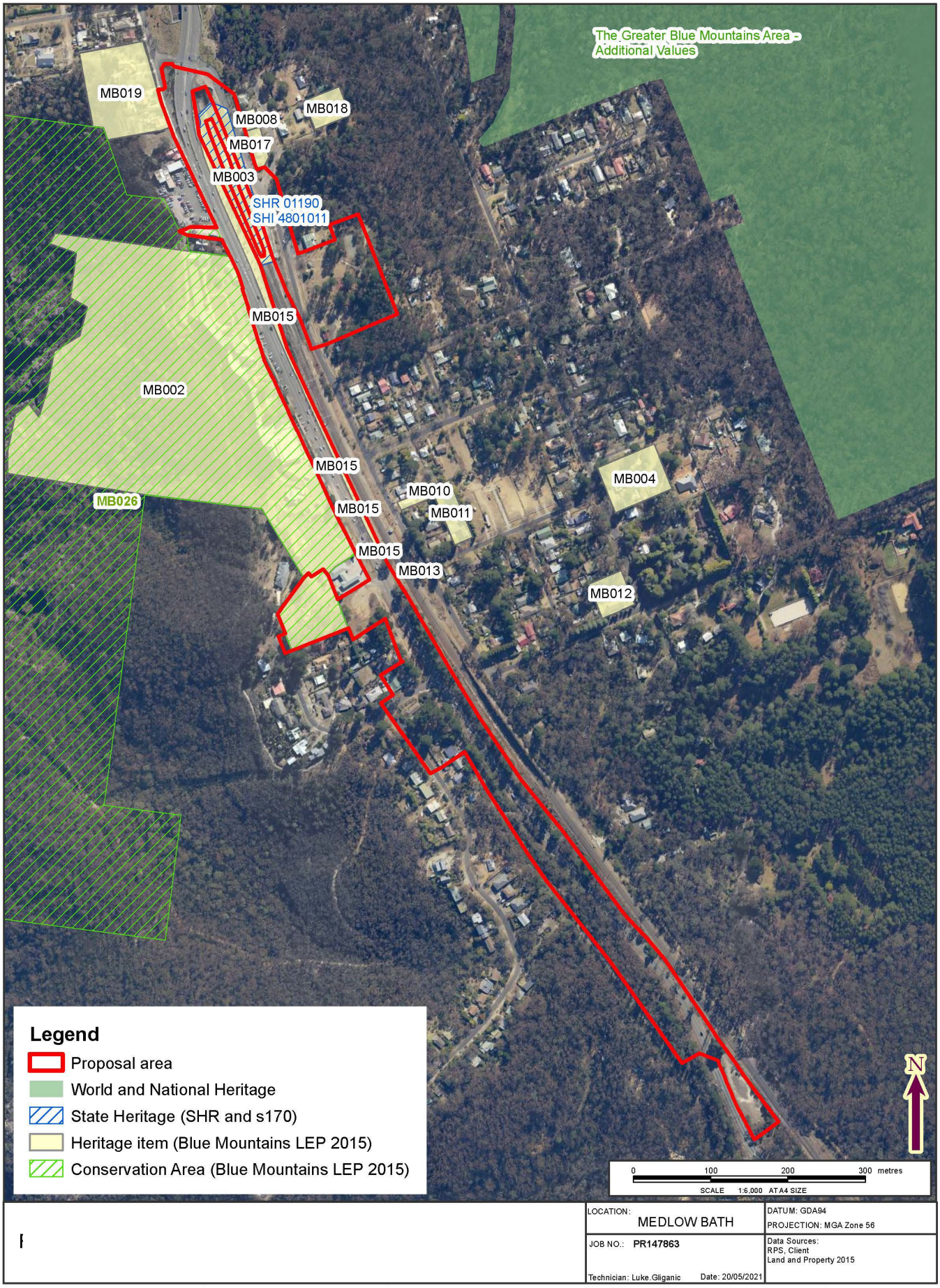

Figure 6-14: Heritage listings in relation to the proposal area (RPS, 2021b)

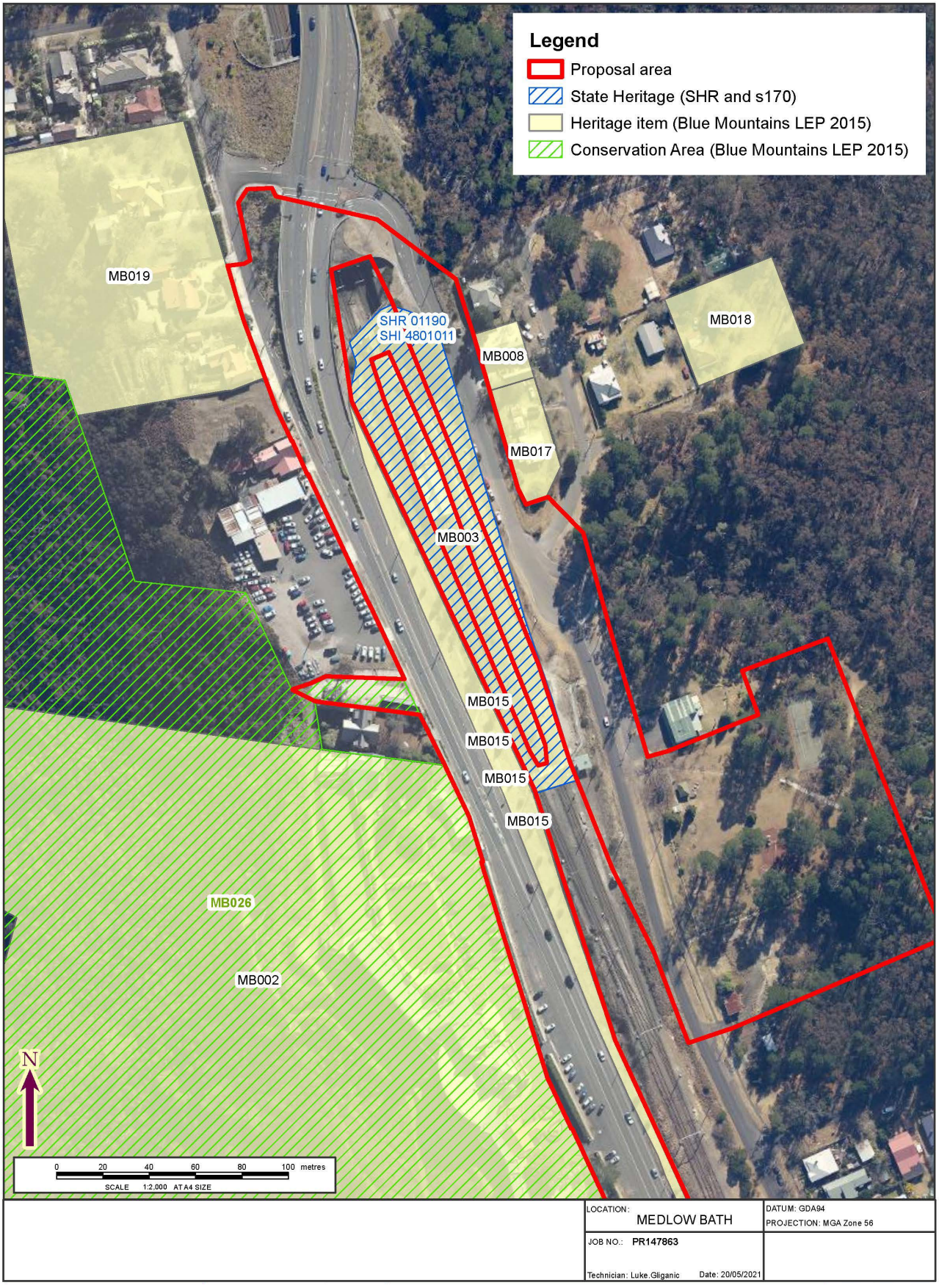

Figure 6-15: Heritage listings in relation to the proposal area near Medlow Bath Station (RPS, 2021b)

Railway Station Group

The statement of significance for the SHR item *Medlow Bath Railway Station Group* as presented on the SHR is:

Medlow Bath Railway Station is significant as part of the early construction phase of railway line duplication on the upper Blue Mountains demonstrating the technological and engineering achievements in railway construction at the beginning of the 1900s. Constructed in anticipation of a boom period in the mountains particularly in connection with large holiday resorts such as the Hydro-Majestic Hotel, Medlow Bath station building is a good example of a Federation free classical railway station. The station building demonstrates typical architectural elements of the standard Federation style island platform buildings that were built between Penrith and Lithgow when the line was duplicated.

The statement of significance for the Blue Mountains LEP 2015 item *Medlow Bath Railway Station Group* as presented on the SHI is: *The Medlow Bath Railway Station is one of a group of stations which are associated with the construction and duplication of the railway line across the Blue Mountains.*

The station is a representative example of a Federation free classical railway station.

Avenue of Trees

The statement of significance for the Blue Mountains LEP 2015 item Avenue of Trees as presented on the SHI is:

The avenue is an integral part of the significance of the Hydro Majestic, telling testimony to the public image of the resort projected by Mark Foy and continuing today. Viewed as part of the whole, aesthetically and historically, the avenue, like the hotel, has state significance.

After a review of site conditions, it is noted that the original radiata pine plantings have all been replaced.

Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic)

The statement of significance for the Blue Mountains LEP 2015 item *Medlow Bath Hydro Majestic original walking track complex* as presented on the SHI is:

The Hydro Majestic Hotel walking track complex has State Significance as the most extensive privately constructed walking track complex in Australia and for its association with Australia's only hydropathical resort developed on the European model.

The Hydro Majestic walking track complex has State Significance for its association with entrepreneur Mark Foy junior who made a fortune in retailing and invested most of it in developing the Hydro Majestic hydropathic resort. The track complex has local significance for its association with William Hargraves, Chief Clerk in Equity of NSW and Blackheath pioneer.

The Hydro Majestic walking track complex has aesthetic significance at the State level for the design values in its construction which demonstrate superb integration of natural and constructed features.

As nearly all of the track complex is intact, it offers an opportunity to research late 19th and early 20th century walking track design and construction techniques, significant at the local level.

The Hydro Majestic walking track network is a rare example of a very extensive privately constructed walking track complex, mostly over 100 years old, which as survived virtually fully intact to the present time.

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

Hydro Majestic

The statement of significance for the Blue Mountains LEP 2015 item *Hydro Majestic* as presented on the SHI is:

The grandest of the grand hotels in the mountains, the Hydro has state significance as a pioneering spa resort with advanced facilities for the health and pleasure of guests. The century and more of use as a hotel, capitalising on one of the finest situations in the mountains, is also of state significance. The Hydro Majestic Hotel is a unique overlay of hotel building styles including the pre-fabricated Casino and Federation free-style Reception buildings and the art deco Hargravia, Belgravia and main wings and the federation free classical south wing. The hotel also includes a number of freestanding buildings with a unity of styling and detailing such as the north bunkhouse, toilet block and rear of the Road Bar.

The arrangement of buildings along the ridge parallel to the Great Western Highway with the distinctive street fencing and row of mature radiata pinus trees quickly became, and remains, a significant landmark on the road through the Blue Mountains.

Some individual elements including the Casino and Reception buildings are fine examples of Federation free style architecture.

The tennis courts have a rare quality with their rustic stone walling and location on the edge of the ridge.

The unusual feature of a prefabricated imported casino which became a showpiece for some of the greatest singers of the Edwardian period, the art collection and the cuisine further enhance the social significance of the Hydro.

Technical interest attaches to the remains of the flying fox into the Megalong and the symbiosis between the hotel and valley below has remained a significant element in the Hydro's success.

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

Former Post and Telegraph Store

The statement of significance for the Blue Mountains LEP 2015 item *Former Post and Telegraph Store* as presented on the SHI is:

The hall and store have high local significance because of their association with the Hydro Majestic and Mark Foy's touristic entrepreneurship, particularly in catering for the interest in Jenolan Caves. The long-standing association with motor-cars is a particularly significant feature.

It is an unusual example of a Federation gothic shopfront. An unusual form for a post office, the building features 155renelated parapet, twisted columns and a decorative shield in the centre of the façade.

The hall had a high local profile as a centre for dances, films and, after World War II, a wide variety of Catholic and community functions, while the store and post-office played their usual key role for the residents and visitors alike

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

Melbourne House, Cosy Cot, Sheleagh Cottage

No statement of significance for the Blue Mountains LEP 2015 item *Melbourne House, Cosy Cot, Sheleagh Cottage* is presented on the SHI. After historical research and review of site conditions, the following statement of significance is proposed:

The four houses, Lot 1 Great Western Highway, Melbourne House, Cosy Cot and Sheleagh Cottage, are significant as they represent a unique group constructed independently of each other in the early boom years of Medlow Bath. Cosy Cot and Sheleagh Cottage are significant for their association with renowned

historical figures. Melbourne House and Sheleagh Cottage are aesthetically significant for their use of particular materials.

Urunga

The statement of significance for the Blue Mountains LEP 2015 item Urunga as presented on the SHI is:

The association of the house with the railway and the growth of rail traffic at Medlow Bath associated with the Hydro gives the cottage local historical significance.

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

St Luke's Anglican Church

The statement of significance for the Blue Mountains LEP 2015 item St Luke's Anglican Church as presented on the SHI is:

The church has had social significance for the Anglican community around Medlow Bath for over eighty years. It is a representative example of a Federation carpenter gothic church built for a small rural village, although it took its present simpler shape only after storm damage in 1920.

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

Greater Blue Mountains Area

The *Greater Blue Mountains Area* is listed the World Heritage List (WHL) (Reference No. 917) and is located within the vicinity of the proposal area.

Horse Trough

The statement of significance for the Blue Mountains LEP 2015 item *Horse Trough* as presented on the SHI is:

All the Annis and George Bills horse-troughs have some local significance as evidence of philanthropy towards animals, even though they were erected when the days of the horse on the roads were almost over.

Historical research and review of site conditions confirms this is an accurate assessment of the heritage significance of this item.

Potential heritage items

Three potential heritage items were identified during the site inspection. The location of each potential heritage item in relation to the proposal area is shown in Figure 6-16.

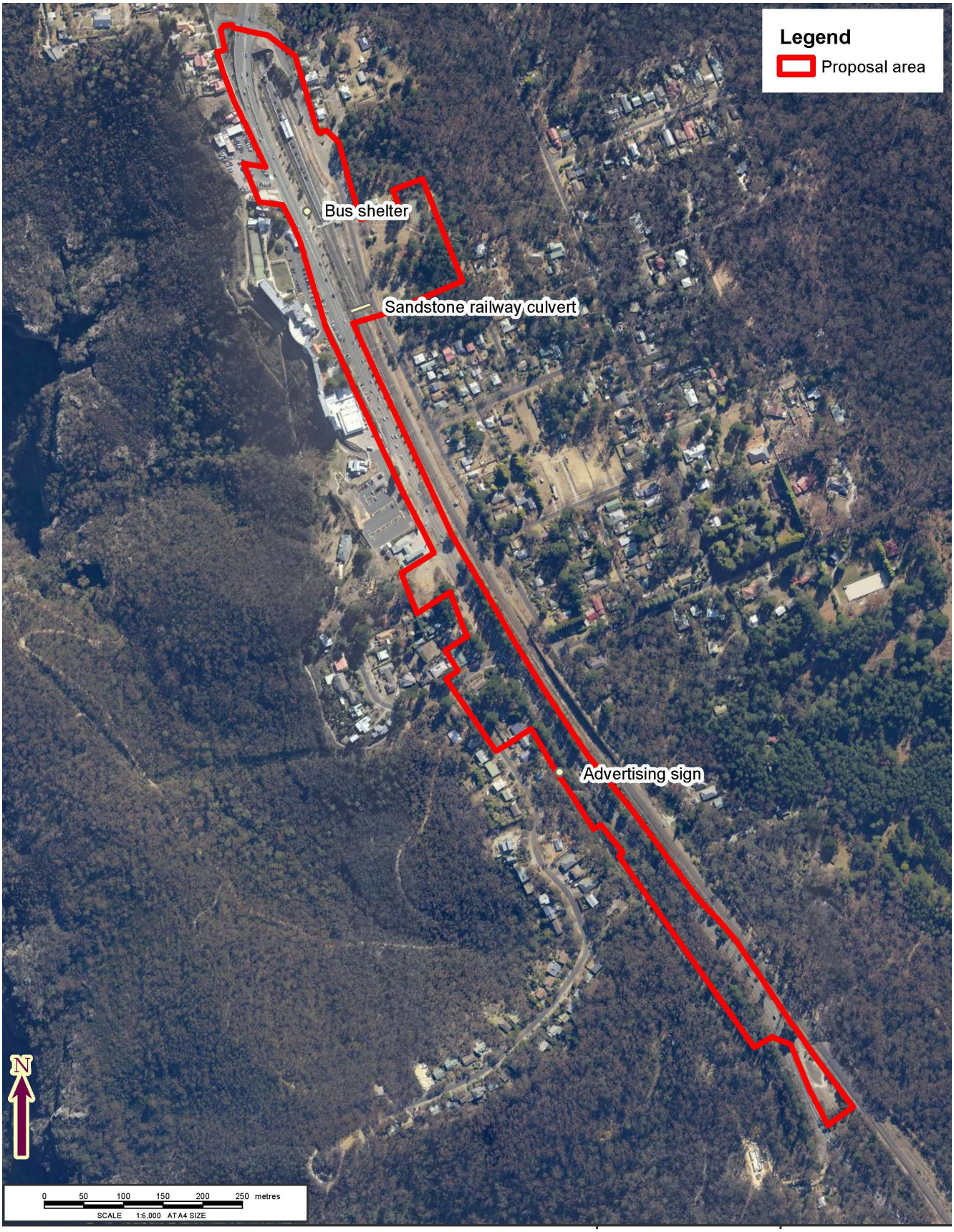

Figure 6-16: Location of potential heritage items in relation to the proposal area (RPS, 2021b)

Bus shelter

The concrete bus shelter is located at the bus stop near the southern entrance to Medlow Bath Railway Station. The bus shelter has been painted inside and out with murals. The interior boasts a mural of an historic view of the Hydro Majestic Hotel and Great Western Road, while the exterior is decorated with foliage motifs and naturalistic scenes. The bus shelter is shown in Figure 6-17.

After research and review of site conditions, the following statement of significance is proposed:

The bus shelter is considered to be of aesthetic significance for its historic mural and of social significance as it forms part of an extended mural campaign throughout the Blue Mountains.

Figure 6-17: Bus shelter looking north, showing interior mural (RPS, 2021b)

In addition to the findings of the SoHI prepared by RPS (2021b), a REF for the Great Western Highway – Katoomba to Mount Victoria Road Safety Upgrades was completed in 2016. The SoHI conducted by Artefact (2015b) to support the REF also identified the Medlow Bath Bus Shelter as a potential heritage item.

The bus shelter is proposed to be relocated to a location to be determined in consultation with the heritage interpretation strategy.

Sandstone railway culvert

The sandstone culvert runs beneath the railway embankment south of Medlow Bath Railway Station, within the proposal area. Visible on both sides of the embankment, the culvert has been recently modified through the addition of a plastic pipe. The sandstone culvert is shown in Figure 6-18.

After historical research and review of site conditions, the following statement of significance is proposed:

The culvert is considered to be of local significance for its association with railway engineering through the Blue Mountains. The culvert provides physical evidence of the construction of the railway in the 1860s. It provides physical evidence of the original rail alignment and of the workmanship of the period. It is of historical and archaeological significance.

Figure 6-18: Sandstone culvert on western side of railway embankment, looking east (RPS, 2021b)

Hydro Majestic sign

The timber sign advertising the “Majestic Lounge and Public Bar” is located on the western road embankment of the Great Western Highway in the southern section of the proposal area. Overgrown with roadside vegetation, the sign is in a dilapidated condition. The Advertising sign is shown in Figure 6-19 and Figure 6-20.

After historical research and review of site conditions, the following statement of significance is proposed:

The Advertising sign is considered to be significant for its association with the Hydro Majestic.

Figure 6-19: Rear of advertising sign, looking east (RPS, 2021b)

Figure 6-20: Front of advertising sign, looking north (RPS, 2021b)

Potential archaeological features

The archaeological potential of the proposal area is assessed to be low, with an area of moderate to high archaeological sensitivity identified south of the Hydro Majestic Hotel. The archaeological potential of the proposal area is associated with the potential for the following archaeological resources:

- low potential evidence of former road surfaces along the Great Western Highway from Foy Avenue to the rail overpass
- low potential evidence of former road surfaces along Railway Parade
- low potential evidence of former waiting shed beneath Medlow Bath Railway Station platform
- low to moderate potential evidence of former goods shed and platform to the west of Medlow Bath Railway Station
- moderate to high potential evidence of former house 'Glenara Cottage' on vacant land at south (eastbound) end of proposal area immediately south of Hydro Majestic.

6.8.3 Potential impacts

The summary of the SoHI for each heritage or potential heritage item impacted by the proposal are summarised below and in Table 6-36.

Table 6-36: Summary of the SoHI for each heritage or potential heritage item impacted by the proposal

Item	Listing	ID	Significance	Potential impact	Potential impact on significance by proposal
Medlow Bath Railway Station Group	SHR Transport for NSW RailCorp s170 Register Blue Mountains LEP 2015	01190 MB003 4801011	State	While the proposal would not physically impact significant fabric, the partial removal of elements such as the garden beds and the alteration of its heritage setting would impact the overall significance of the station. The addition of a pedestrian bridge would add an additional built form to the station complex which would visually dominate the heritage item.	The proposal would have a minor adverse physical impact and a major adverse visual impact on this heritage item.
Avenue of Trees	Blue Mountains LEP 2015	MB015	Local	The proposal would impact and greatly reduce the heritage curtilage and likely impact critical root zones of trees, or require the removal of trees altogether. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item.	The proposal would have a major adverse impact and visual impact on this heritage item.
Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic)	Blue Mountains LEP 2015	MB026	Local	No physical impact is proposed within the heritage curtilage of this item for the preferred design option. No walking tracks associated with this heritage item appear to be within the alternate design proposal area, therefore the alternate design proposal would have no physical impact on significant fabric of this heritage item.	The proposal 'preferred option' would have little to no physical impact and a moderate adverse visual impact on this heritage item. However, the proposed 'alternate design' for Bellevue Crescent would have an additional minor adverse impact on this

Item	Listing	ID	Significance	Potential impact	Potential impact on significance by proposal
					heritage item through the reduction of its heritage curtilage
Hydro Majestic	Blue Mountains LEP 2015	MB002	Local	No physical impact is proposed within the heritage curtilage, however vibration from construction may have a minor to moderate adverse impact to the significant fabric of the stone fence by causing destabilisation. Additionally, excavation works associated with the proposal may have a minor to moderate adverse impact on significant trees *radiata pinus* located within the Hydro Majestic's heritage curtilage through impact to critical root zones. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item. The proposed alternate design for Bellevue Crescent would have an additional minor adverse impact on this heritage item through the reduction of its heritage curtilage and impact on potentially significant pine plantings and archaeological resources.	The proposal may have a minor to moderate adverse physical impact and would have a moderate to major adverse visual impact on this heritage item.
Former Post and Telegraph Store	Blue Mountains LEP 2015	MB008	Local	No physical impact is proposed within the heritage curtilage or to significant fabric of this heritage item. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item.	The proposal would have little to no physical impact and a moderate visual impact on this heritage item.
Melbourne House, Cosy Cot, Sheleagh Cottage	Blue Mountains LEP 2015	MB019	Local	No physical impact is proposed within the heritage curtilage or to significant fabric of this heritage item. However, vibration from adjacent construction may have a minor adverse impact on significant fabric, particularly the house and shop located at Lot 1 Great Western Highway which abuts the proposal area. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item.	The proposal would have little to no physical impact and a moderate to major adverse visual impact on this heritage item.
Urunga	Blue Mountains LEP 2015	MB017	Local	No physical impact is proposed within the heritage curtilage or to significant fabric of this heritage item. Installation of the pedestrian bridge would introduce a new built form to the views and vistas both to and from the heritage item.	The proposal would have little to no physical impact and a moderate to major visual impact on this heritage item.

Item	Listing	ID	Significance	Potential impact	Potential impact on significance by proposal
St Luke's Anglican Church	Blue Mountains LEP 2015	MB010	Local	No physical impact is proposed within the heritage curtilage or to significant fabric of this heritage item. The proposed new pedestrian bridge would not visually impact views to this heritage item, however it would alter views from the heritage item.	The proposal would have little to no physical impact and a minor to moderate visual impact on this heritage item.
Greater Blue Mountains Area	World Heritage List	917	World	No physical impact is proposed within the heritage curtilage of this heritage item and the proposed new pedestrian bridge would not visually impact views and vistas to or from this heritage item.	The proposal would have little to no impact on this heritage item.
Horse Trough	Blue Mountains LEP 2015	MB013	Local	No physical impact is proposed within the heritage curtilage or to significant fabric of this heritage item and the proposed new pedestrian bridge would not visually impact views and vistas to or from this heritage item.	The proposal would have little to no impact on this heritage item.
Medlow Bath Bus Shelter	NA – potential heritage item	NA	Local	While removal of the bus shelter is required for the proposal, this would be mitigated by relocating the bus shelter elsewhere within the township, enabling it to retain its mural and setting within Medlow Bath and the Blue Mountains LGA	The proposal would have a minor to moderate physical impact and a moderate adverse visual impact on this potential heritage item.
Sandstone railway culvert (potential heritage item)	NA-potential heritage item	NA	Local	While new stormwater drains may connect to the same drainage network, no physical impact is proposed to any potentially significant fabric.	The proposal would have little to no impact on this potential heritage item.
Advertising sign (potential heritage item)	NA-potential heritage item	NA	Local	The potential heritage item may require removal and subsequent demolition to accommodate the proposed turning bay into Bellevue Crescent.	The proposal may have a major adverse impact on this potential heritage item.

Construction

The following aspects of the Proposal respect or enhance the heritage significance of the item or conservation area for the following reasons:

The proposal respects the heritage significance of a number of heritage items by, where possible, keeping within the designated road reserve alignment and avoiding impact to abutting heritage curtilages and significant heritage fabric.

The proposal requires the removal of the bus shelter, a potential heritage item. The proposal respects the identified potential heritage significance of this bus shelter by proposing to relocate the shelter elsewhere within the township, enabling it to retain its mural and setting within Medlow Bath township and the Blue Mountains LGA.

The following aspects of the Proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures taken to minimise impacts:

The new pedestrian bridge would introduce a new visual element to Medlow Bath Railway Station that would visually dominate the heritage setting as well as block views to and from the station complex. The pedestrian bridge would also impact views and vistas across Medlow Bath, impacting views to and from surrounding heritage items.

Construction of the highway and installation of pedestrian bridge would physically impact Avenue of Trees through the reduction of its heritage curtilage. Critical root zones of the trees would also be impacted, while some trees would require removal.

Construction of the alternate intersection design for Bellevue Crescent:

- could potentially impact archaeological resources associated with the former Glenara Cottage
- would impact the remaining stands of pine trees seemingly associated with the former Glenara Cottage. Some trees would require removal, while others may have their critical root zones impacted
- would have a minor adverse impact on Hydro Majestic (Blue Mountains LEP 2015 Item No. MB002) and Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No. MB026) through the reduction of their respective heritage curtilages.

Archaeological impact

The proposal area has been assessed to be of low archaeological potential. Potential impacts due to excavation is considered to be unlikely. However, the proposal may have a moderate to major adverse impact on the archaeological potential of the proposal area, if archaeological resources survive.

If surviving, archaeological resources associated with former road surfaces are most likely to occur in the form of compacted earth, bitumen or ballast. Historical sources do not make reference to the proposal area being macadamised or paved with stone however, these should still be considered a possibility. If identified, it is likely that any archaeological resources associated with former road surfaces would have been impacted by twentieth century road resurfacing and would provide little research potential.

If surviving, archaeological resources associated with the former waiting shed or goods shed and associated platform would likely be in the form of post holes or brick foundations dependant on the original structural material. If identified, these resources would likely provide limited information and have little to no research potential.

If surviving, archaeological resources associated with the former house would likely comprise building foundations, cess pit or well structures and associated potential occupation deposits. If identified, these resources could provide information about the structure and use of Glenara Cottage, which is relatively unknown. Potential research material would likely be limited to the local historical context.

Operation

The new pedestrian bridge would introduce a new visual element to Medlow Bath Railway Station that would visually dominate the heritage setting as well as block views to and from the station complex. The pedestrian bridge and also the removal of some trees along the Avenue of Trees would also impact views and vistas across Medlow Bath, impacting views to and from surrounding heritage items.

6.8.4 Safeguards and management measures

Table 6-37: Safeguards and management measures – non-Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage. The plan will be prepared in consultation with Heritage NSW.	Contractor	Detailed design, pre-construction	Section 4.10 of *QA G36 Environment Protection*
Non-Aboriginal heritage	The detailed design will be developed and refined in consultation with either a heritage architect or a built heritage consultant. The detailed design would aim to further minimise the impact of the proposal, with particular reference to the pedestrian bridge through the use of appropriate form, proportion and materials. Bulk should be minimised, and new built forms should be clearly separate from existing heritage fabric. Where appropriate, the detailed design should also respond to existing and significant architectural detail, such as the architectural detailing of the station building, or the footbridge. Detailed design should be undertaken in accordance with appropriate Sydney Trains and TfNSW guidelines, including: • *Railway Footbridges Heritage Conservation Strategy* (NSW Government Architect's Office Heritage Group for Sydney Trains, 2016) • *Heritage Platforms Conservation Management Strategy* (Australian Museum Consulting for Sydney Trains, 2015) • *Heritage Technical Note: Installation of New Electrical and Data Services at Heritage Sites* (Sydney Trains, 2017a) • *Station Components Guide* (Sydney Trains 2017b).	Contractor	Detailed design	Appendix J SoHI recommendation 1

Impact	Environmental safeguards	Responsibility	Timing	Reference
State heritage	A Section 60 Application would be required for proposed works within the SHR curtilage of Medlow Bath Railway Station. The Application must be granted prior to works commencing.	TfNSW	Pre-construction	Appendix J SoHI recommendation 2
Archaeology	An Historic (non-Aboriginal) Archaeological Assessment will be prepared for the Hydro Majestic land proposed for use for the alternate design arrangement for Bellevue Crescent known as Lots 3, 4, 5 and 20 of DP25570. The assessment will be undertaken by a suitably qualified archaeologist in accordance with the *Heritage Act 1977* and the Heritage NSW publication *Assessing Significance of Historical Archaeological Sites and Relics* (2009). The purpose of the assessment is to determine the nature, extent and significance of any archaeological or historical resources associated with the former Glenara Cottage in this area and provide appropriate management recommendations in relation to the proposal.	TfNSW	Pre-construction	Appendix J SoHI recommendation 3
Non-Aboriginal heritage awareness training	• Works within the proposal area are being undertaken in an area of heritage significance. Prior to works commencing, contractors will be briefed as to the sensitive nature of the proposal area and informed of any recommended mitigation measures or controls required. • Non-Aboriginal heritage awareness training will be provided for all contractors and personnel prior to commencement of works to outline the identification of potential heritage items and associated procedures to be implemented in the event of the discovery of non-Aboriginal heritage materials, features or deposits (that is, unexpected finds), or the discovery of human remains.	Contractor	Pre-construction	Appendix J SoHI recommendation 4
Non-Aboriginal heritage protection of significant fabric	Works will be undertaken with care. To avoid impact to significant fabric during the construction of the proposal the following is recommended:	Contractor	Pre-construction	Appendix J SoHI recommendation 5

Impact	Environmental safeguards	Responsibility	Timing	Reference

	• machinery should be placed with sufficient clearance to significant heritage structures to avoid any inadvertent harm to significant fabric or incidental damage from vibration as per the TfNSW recommended minimum working distances for vibration intensive plant (refer Table 6-27 of the REF). In particular, care should be taken when working near:
	  ○ Hydro Majestic's stone fence
	  ○ Medlow Bath Railway Station platform structures, platform edges and footbridge
	  ○ Former Post and Telegraph Store
	  ○ Urunga
	  ○ Melbourne House, Cosy Cot and Sheleagh Cottage, in particular Lot 1 Great Western Highway
	  ○ Sandstone Railway culvert
	  ○ archaeologically sensitive vacant land north of the United Petrol Station
	• Protection of significant fabric – Hydro Majestic stone fence
	  ○ protective barriers or fencing should be erected between the works corridor boundary and the Hydro Majestic's stone fence for the duration of works within the vicinity of this significant fabric to ensure no inadvertent harm occurs
	  ○ machinery and works should be placed with sufficient clearance to significant fabric and associated protective barriers to avoid inadvertent harm from machinery or incidental damage from vibration
	  ○ vibration monitoring of the stone fence should be put in place for the duration of works			

Impact	Environmental safeguards	Responsibility	Timing	Reference

	• Protection of significant fabric – Sandstone Railway culvert
	  ○ redundancy of the Sandstone Railway culvert should not include work to significant fabric
	  ○ if closure or blocking of the culvert is required, these works should be undertaken in a manner that would not impact significant fabric
	  ○ if work to significant fabric is required, this should be undertaken in consultation with either a heritage architect or heritage consultant, and be conducted in a manner that minimises harm as much as practicable
	• Protection of significant fabric – bus shelter
	  ○ measures should be put place to protect significant fabric of the bus shelter during its proposed removal and relocation
	  ○ relocation position, and details of where and how it will be removed, stored and relocated, should be determined in consultation with Blue Mountains City Council
	  ○ after relocation, conservation of the mural should be undertaken to prevent further loss, or to sympathetically reinstate missing portions
	• Protection of significant fabric – advertising sign
	  ○ if removal of the advertising sign is required for the proposal, it should be salvaged and relocated
	  ○ relocation position, and details of where and how it will be removed, stored and relocated, should be determined in consultation with Blue Mountains City Council			

Impact	Environmental safeguards	Responsibility	Timing	Reference
	○ if removal of the advertising sign is not required for the proposal, appropriate measures should be put in place to protect it during proposed works, such as the installation of protective barriers or fencing • Protection of significant fabric – potential archaeological site of former Glenara Cottage ○ prior to use as an ancillary facility / stockpile area, the vacant land north of the petrol station should be covered with geotextile, or other suitable protective material, to ensure no inadvertent harm to potential archaeological resources occurs ○ no ground scraping, levelling or landscaping of this area should occur before, during or after the use of the area as an ancillary facility / stockpile area ○ this protection measure may not be required if a Historic (non- Aboriginal) Archaeological Assessment does not identify any significant archaeological potential.			
Protection and management of trees	A qualified arborist will be engaged to undertake an Arboricultural Impact Assessment of the proposal area, with a particular focus on trees associated with heritage items, Hydro Majestic (Blue Mountains LETP Item No.MB002), Avenue of trees (formerly Avenue of Radiata Pines) (Item No.MB015) and Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No.MB026) . Management and protection measures recommended in the Arboricultural Impact Assessment should be implemented accordingly to ensure the protection and management of significant trees throughout the implementation of the proposal.	Contractor	Pre-construction	Appendix J SoHI recommendation 6

Impact	Environmental safeguards	Responsibility	Timing	Reference
Tree replacement	Trees removed as part of the proposal within the heritage curtilage of Hydro Majestic (Item No.MB002), Avenue of trees (formerly Avenue of Radiata Pines) (Item No.MB015) or Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No.MB026) will be replaced in a manner that is consistent with, and accurately reflect, the extent, nature and significance of the respective heritage item. The location, species and number of trees to be planted will be determined in consultation with the land owner, Blue Mountains City Council and a qualified arborist with reference to the identified heritage significance of the respective heritage item.	Contractor	Construction	Appendix J SoHI recommendation 7
Movable heritage	All moveable heritage identified as part of this assessment will be managed in accordance with a moveable heritage procedure. Moveable heritage identified on Hydro Majestic (Blue Mountains LEP Item No. MB002) land will be managed in accordance with Section 6.5, *Conserving Moveable Heritage, in the Hydro Majestic Hotel, Medlow Bath, Conservation Management Plan* (Graham Brooks and Associates, 2010).	Contractor	Construction	Appendix J SoHI recommendation 8
Before and after photographic record	Prior to construction, an archival photographic recording of the heritage items impacted by the proposed works is to be prepared in accordance with the NSW Heritage Division of the Department of Environment and Heritage guidelines titled *"Photographic Recording of Heritage Items using Film or Digital Capture".* The photographic should be prepared by a heritage consultant and must document significant heritage elements and items that will be impacted by the proposed works. The record should also document significant views and vistas as selected by the heritage consultant. This archival recording should include the following items as a minimum: • Medlow Bath Railway Station Group (SHR No.01190, TfNSW Section 170 SHI No. 4801011, Blue Mountains LEP 2015 Item No. MB003) • Hydro Majestic (Item No. MB002)	Contractor	Pre-construction, Operation	Appendix J SoHI recommendation 9

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Former Post and Telegraph Store (Item No. MB008) • Avenue of Trees (Item No. MB015) • Urunga (Item No. MB017) • Melbourne House, Cosy Cot, Sheleagh Cottage (Item No. MB019) • Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No. MB026) • Bus Shelter (potential heritage item) • Sandstone Railway culvert (potential heritage item) • Advertising sign (potential heritage item).			
Heritage interpretation	A heritage interpretation plan will be formulated and implemented in accordance with the Heritage NSW, *Interpreting Heritage Places and Items* (Heritage Office (former) 2005) as part of the proposed upgrade of the Great Western Highway. This is to be undertaken with the consent and co-operation of authorised owners or land managers and Blue Mountains City Council. Heritage interpretation should communicate the history of Medlow Bath, with reference to its identified heritage items, and enable audiences to engage with the significance of these places and the wider Blue Mountains area. It should be integrated into the broader cultural heritage design and heritage interpretation strategy for the overall Great Western Highway Katoomba to Lithgow Upgrade Program, and pick up themes relevant to the overall Great Western Highway route as well as Medlow Bath.	Contractor	Construction	Appendix J SoHI recommendation 10
Non-Aboriginal heritage	In the event that unexpected archaeological resources are identified in the course of the proposal, all work in the affected area should cease, the area should be cordoned off, and Heritage NSW should be notified, in accordance with Section	Contractor	Construction	Appendix J SoHI recommendation 11

Impact	Environmental safeguards	Responsibility	Timing	Reference
	146 of the *Heritage Act 1977*. The TfNSW (2016) *Unexpected Heritage Finds Guideline* should be adhered to.			
Non-Aboriginal heritage	If the proposed works, or proposal area, are modified to those discussed in this report, additional heritage advice may be required to appropriately manage and mitigate any potential impacts caused by these changes.	Contractor, TfNSW	Pre-construction, Construction	Appendix J SoHI recommendation 12

6.9 Landscape character and visual impacts

Potential impacts of the proposal on landscape character and visual amenity have been assessed in the *Great Western Highway Upgrade Medlow Bath – Urban Design, Landscape Character and Visual Impact Assessment* prepared by Spackman Mossop Michaels (2021) which is provided in Appendix K. A summary of the assessment is presented in this section, together with safeguards and management measures to mitigate any negative impacts.

6.9.1 Methodology

The assessment was prepared in accordance with the Roads and Maritime *Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment (EIA-N04)* (Roads and Maritime Services, 2018b). The sensitivity and magnitude of the landscape and visual impact was assessed to produce a combined impact rating of negligible, low, moderate and high (refer to Figure 6-21).

SENSITIVITY \ MAGNITUDE	HIGH	MODERATE	LOW	NEGLIGIBLE
HIGH	HIGH	HIGH-MODERATE	MODERATE	NEGLIGIBLE
MODERATE	HIGH-MODERATE	MODERATE	MODERATE-LOW	NEGLIGIBLE
LOW	MODERATE	MODERATE-LOW	LOW	NEGLIGIBLE
NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

Figure 6-21: Landscape character and visual impact rating matrix (NSW Roads and Maritime, 2018)

Below is a summary of the key activities undertaken for the landscape character and visual impact assessment.

- Undertaking an initial site visit and field investigation, reviewing relevant literature, analysing aerial photographs and topographic maps to understand the study area.
- Reviewing the preferred engineering concept design on a regular basis, and other supporting material to gain an appreciation of the project.
- Developing an Urban Design Strategy comprising objectives and principles to guide the development of the concept design.
- Defining landscape character through a study area analysis, including a detailed site investigation.
- Identifying and describing landscape character zones and evaluating the proposal's impact on them.
- Evaluating the impact of the project on these landscape character zones by combining the sensitivity of the zone and the magnitude of the works to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix.
- Identifying the visual catchment of the proposed works for the visual impact assessment.
- Selecting viewpoints within the visual catchment representing a range of different land uses.

- Evaluating the visual impact of the project by comparing the sensitivity of viewpoints and the magnitude of the impact of the project upon them to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix.
- Developing the Urban and Landscape Concept Design, described in plans, sections/ elevations, precedent photographs and other drawings as appropriate.
- Identifying urban design and landscape opportunities and methods of mitigating adverse visual impacts, both within and outside of the project scope to assist the ongoing development of the concept design and for consideration in the detail design phase of the proposal.

6.9.2 Existing environment

The proposal area is surrounded by land zoned for residential, recreational and conservation purposes.

The Great Western Highway along with the Main West Line, forms the primary transport corridors through the Blue Mountains, connecting Penrith to Lithgow. The villages along the Great Western Highway have vast and undisturbed views over the Greater Blue Mountains World Heritage Area.

The journey along the Great Western Highway through the Blue Mountains, crosses landscapes that have rich natural, cultural, scenic and historical values that enhance its attractive and picturesque setting. Generally, urban developments along the highway are located along the ridgeline above and are discrete in nature and separated by natural bushland creating a repeating sequence of urban areas and natural bushland, sometimes referred to as a “string of pearls”.

The village of Medlow Bath is located between Blackheath, to the north, and Katoomba, to the south and mostly consists of single story dwellings, guest-houses and retreats. The western edge of the Great Western Highway is physically and visually dominated by the Hydro Majestic Hotel, which is positioned atop the Megalong Valley escarpment. The escarpment is locally protected due to its high scenic values. To the east of the Great Western Highway, vegetation creates a buffer between Medlow Bath residential tree-lined streets and the existing highway and rail corridor. Further east, low density housing backs onto the national park.

Within the Medlow Bath village and to the east of the railway line, there is one public open space facility at Medlow Bath Park, adjacent to the Rural Fire Brigade station which provides public amenity in the form of a playground, picnic tables and landscaped gardens. Surrounding the village, there are several popular bushwalking tracks that provide recreational facilities for locals and tourists, as well as regional and local cycle routes that link to the Blue Mountains Trail and Mountain Bike Trails to Point Pilcher.

Landscape character

The proposal area comprises three distinct landscape character zones (LCZ). A LCZ is defined as the collective qualities including the built form, natural elements, and the cultural and social facets that combine to provide a locale with a unique sense of place. Each LCZ reflects broadly homogenous visual characteristics particularly in terms of vegetation, land use and landform.

Table 6-38 provides a summary description and attributes associated with each LCZ and Figure 6-22 provides the approximate extent of these landscape zones.

Table 6-38: Landscape Character Zones Categories (Spackman Mossop Michaels, 2021)

LCZ	Description
LCZ 1 – Enclosed Bushland	High quality plant communities, heavily vegetated enclosed bushland with prominent rock cuttings, edged by roadside vegetation.
LCZ 2 – Medlow Bath Western Plateau	Plateau adjacent to the Megalong Valley escarpment, Rich in high visual and scenic qualities.
LCZ 3 – Medlow Bath East Village	Flat to gently undulating topography, predominantly low-density housing surrounded by remnant stands of woodland vegetation and mature planted exotics.

Visual receivers/viewpoints

The extent from which the proposal would be visible from adjoining areas varies along the length of Medlow Bath. It is influenced by topography, vegetation, and associated buildings. Detailed field and desktop assessments were undertaken in conjunction with a viewshed analysis on the site digital elevation model to determine the area from where the proposal would be visible, defined as the Visual Envelope Map as illustrated in Figure 6-23.

The visual receivers of the proposal include residents, tourists, recreational and park users, pedestrians, cyclists and motorists; with views of proposal elements generally constrained by existing rail corridor infrastructure. Elements including the proposed pedestrian bridge and associated works are more likely to be seen from a greater distance given the approximate height of nine metres. The seven viewpoints selected for the visual impact assessment are identified in Figure 6-23, and photomontages to show the existing view and potential future view with the proposal are illustrated in Figure 6-24 to Figure 6-35.

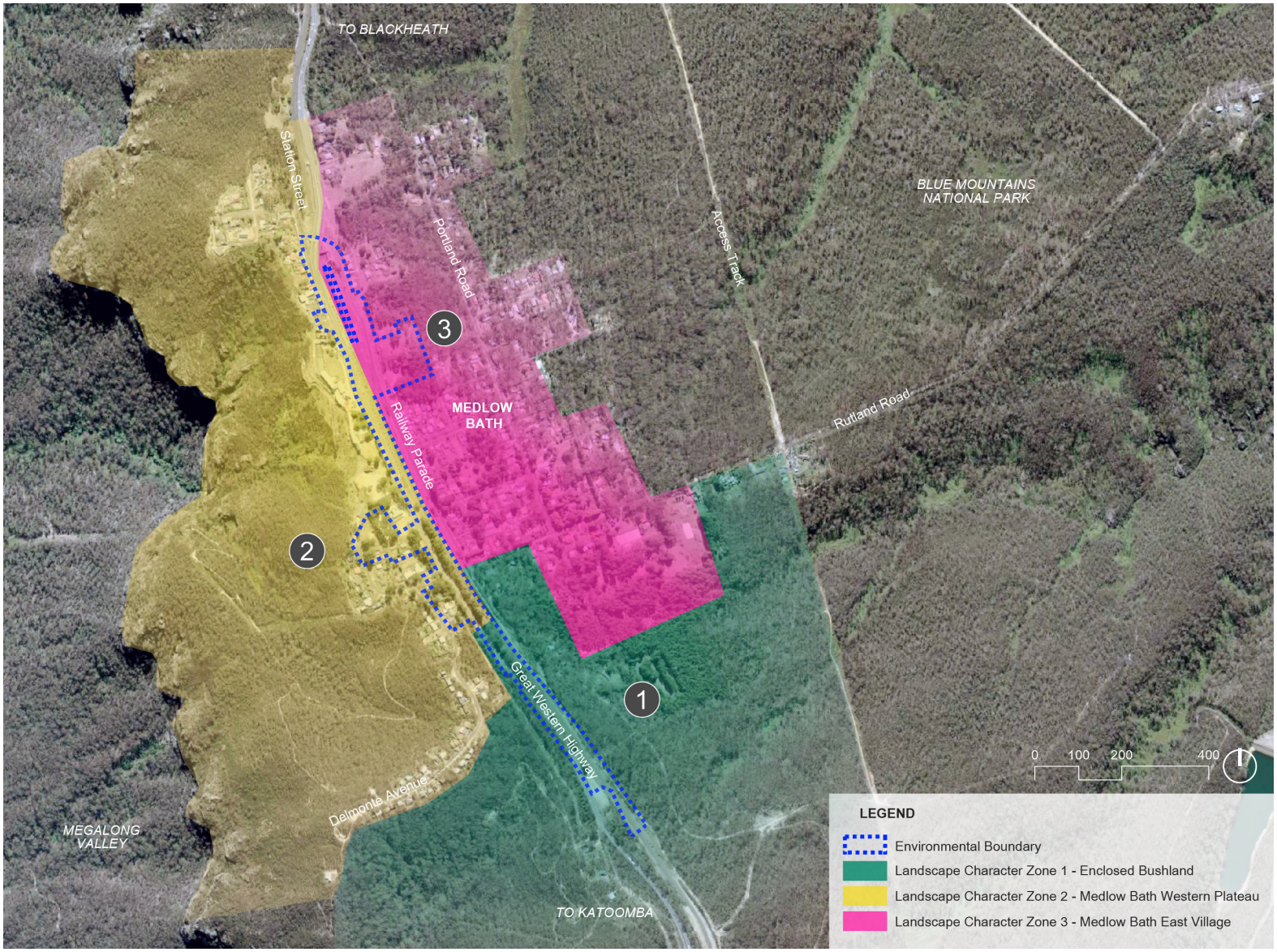

Figure 6-22: Map of identified Landscape Character Zones (SMM, 2021)

Figure 6-23: Visual impact assessment viewpoint locations (SMM, 2021)

6.9.3 Potential impacts

Construction

Construction of the proposal would result in a combination of temporary and permanent impacts to the existing landscape. Temporary visual impacts would be from construction work and materials, including:

- ancillary facilities such as site compounds
- traffic control vehicles and personnel
- construction vehicles
- various machinery and equipment
- construction fencing
- signage material
- stockpiling
- storage areas
- night-work lighting
- vegetation removal.

The ancillary facilities described in Section 3.3, would require the storage of construction materials, a site office, construction vehicles, plant and stockpiled materials. These impacts would occur throughout construction, but construction staging would result in the impact not being spread across the entire proposal area at the one time.

Operation

The *Urban Design, Landscape Character and Visual Impact Assessment* (Spackman Mossop and Michaels, 2021) outlines how key design initiatives have sought to minimise visual impacts.

- Develop an integrated design that fits with the existing visual qualities, ecology and character of Medlow Bath and the Blue Mountains setting through:
    - integrating the road into existing vegetation communities to maintain a sense of place
    - minimising the removal of vegetation to maximise opportunities to mitigate visual impacts through the refinement of retaining walls and assessment of new landscape treatment opportunities at cuttings and embankments
    - consolidating the road and rail corridor as much as possible in areas where there are limited landscape buffer zones along critical verges, such as the Hydro Majestic Hotel
    - maximising the area for verges to allow for a buffer between the shared path and highway and where space permits, the incorporation of street trees and endemic shrub planting to strengthen village character and user amenity.
- Minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal through:
    - enhancing heritage identity by using suitable materials within the landscape that enhance the character of Medlow Bath and the Blue Mountains. For example, the pedestrian bridge materials would be selected for their robustness and durability, considering tendencies to develop a patina (ie the green film formed over copper/bronze structures) as they age. The natural colours and materials of weathered steel is proposed for the pedestrian bridge, which is considered visually lightweight. Further the glass lifts proposed to be installed on the pedestrian bridge would help to reduce bulky forms given the pedestrian bridge is the most dominant feature of the proposal
    - maintaining views to heritage and cultural elements where possible to enhance Medlow Bath's cultural identity.

- ensuring materials used in public gathering spaces are complementary to Medlow Bath conditions and character, are robust and easily maintained and deter graffiti or at least allow for easy graffiti removal.

- Contribute to the functionality of public spaces and enhance local and regional connectivity through:
  - maintaining appropriate safety criteria and sightlines to strengthen village character and protecting users of the proposed shared path along the Great Western Highway
  - providing safe, direct and obvious connections between the pedestrian bridge and existing/proposed pedestrian and cycling circulation and access networks within Medlow Bath and its surrounds.

Artist's impressions have been prepared for Viewpoints 1-7, to provide an illustration of how the proposal may appear during operation and are included in the following figures.

Figure 6-24: Viewpoint 1 (existing): looking north from the western side of the highway at Bellevue Crescent

Figure 6-25: Viewpoint 1 (visualisation of proposal): looking north from the western side of the highway at Bellevue Crescent

Figure 6-26: Viewpoint 2 (existing): looking north along the existing highway shared user path towards the pedestrian bridge

Figure 6-27: Viewpoint 2 (visualisation of proposal): looking north along the existing highway shared user path towards the pedestrian bridge

Figure 6-28: Viewpoint 3 (existing): looking south along the existing shared user path toward the proposed pedestrian bridge from adjacent to the Blue Mountains Mazda

Figure 6-29: Viewpoint 3 (visualisation of proposal): looking south along the existing shared user path toward the proposed pedestrian bridge from adjacent to the Blue Mountains Mazda

Figure 6-30: Viewpoint 4 (existing) looking north toward the pedestrian bridge and Railway Parade

Figure 6-31: Viewpoint 4 (visualisation of proposal) looking north toward the pedestrian bridge and Railway Parade

Figure 6-32: Viewpoint 5 (existing) looking north from the Medlow Bath Station platform toward the pedestrian bridge and Railway Parade

Figure 6-33: Viewpoint 5 (visualisation of proposal) looking north from the Medlow Bath Station platform toward the pedestrian bridge and Railway Parade

Figure 6-34: Viewpoint 6 (existing) from Railway Parade looking south toward the proposal

Figure 6-35: Viewpoint 6 (visualisation of proposal) from Railway Parade looking south toward the proposal

Table 6-39 provides a summary of the visual impact assessment undertaken for seven viewpoints located across the LCZs (refer to Figure 6-22 for viewpoint locations). In summary the proposal would result in Moderate-Low to High impacts for several viewpoints. One viewpoint (Viewpoint 7) would have a High visual impact, three viewpoints would have a High-Moderate visual impact (Viewpoint 1, 4, and 6), two viewpoints would have a Moderate visual impact (Viewpoint 2 and Viewpoint 5), and one viewpoint would have a Moderate to Low visual impact (Viewpoint 3).

Table 6-39: Visual impact assessment for key viewpoints

Viewpoint	Location	LCZ	Sensitivity	Magnitude	Overall impact
1	Northern corner of Bellevue Crescent and the Great Western Highway, looking north towards the proposal. The viewpoint is representative of a number of views from residencies along this portion of the Great Western Highway.	1	The existing road infrastructure consists of a large portion of the existing view composition, especially from the motorists' perspective when travelling along the road. However, although the sensitivity of the existing road corridor to change would be low, the removal of existing vegetation along the fringes of the corridor which screens the existing highway from residencies along the Great Western Highway and Bellevue Crescent would be sensitive to change.	The proposal would introduce the widening of hardstand resulting in clearing between the existing road and rail corridors. Although there would be vegetation within private property would contribute to a green backdrop, the new bridge structure, widening of the roadway and subsequent shared property access, traffic signals and turning area would result in visual changes. Landscape works would reduce the visual effect over time, introducing formalised streetscape plantings and a succinct village character.	Sensitivity: High Magnitude: Moderate Impact: **High-Moderate**
2	Along the existing shared user path, adjacent to the Great Western Highway and Hydro Majestic Hotel, looking north towards the new pedestrian bridge.	2 and 3	The existing road infrastructure and associated perpendicular parking makes up a predominant proportion of the existing view. In particular, pedestrian views which are screened by existing vegetation and buildings to the west. Due to the combination of existing infrastructure and the transient nature of pedestrians, the sensitivity is considered to be low.	The clearing of trees and the proposed widening of the road corridor to the east of this viewpoint would partially remove vegetative screening of the rail corridor. Additionally, within the mid-ground, the new pedestrian bridge would provide a dominant visual feature. The proposal design and landscaping would contribute to a better visual outcome however the pedestrian bridge would contribute to the overall magnitude of change. Tree and shrub plantings along the median would introduce a succinct village character.	Sensitivity: Moderate Magnitude: Moderate Impact: **Moderate**
3	Along the existing shared user path, adjacent to Blue Mountains Mazda dealership, looking south toward sthe new pedestrian bridge.	2 and 3	Although the existing view is dominated road corridor and existing shared user path, it is exposed and does not offer much opportunity for the view to absorb changes.	The scale and material of the proposed pedestrian bridge result in a significant change to the existing view. The existing vegetation which frames the view and partially screens the rail corridor would be only partially reinstated. Soft	Sensitivity: Low Magnitude: Moderate Impact: **Moderate-Low**

				edges in the form of planted verges will only provide minimal reduction in impact.	
4	Station Street looking south toward the proposal. The viewpoint is representative of a number of views from residencies along this portion of the Great Western Highway/Station Street.	2 and 3	The view is comprised of built elements associated with the road infrastructure including an existing retaining wall, light posts, hardstand and gravel trail, with grasses and small trees providing a buffer between the highway and Station Street. The view would have a moderate sensitivity given the existing conditions and composition of the view.	The combination of hardstand widening, the proposed shared path and pedestrian bridge would result in the magnitude being assessed as moderate. Over time, the Proposal landscape design would contribute to a reduction in magnitude.	Sensitivity: High Magnitude: Moderate Impact: **High-Moderate**
5	Medlow Bath Station platform looking north toward the pedestrian bridge and Railway Parade.	2 and 3	Existing rail and road infrastructure comprise a large portion of the existing view composition, especially from patrons of the rail station. Although the scale of the new pedestrian bridge would impact this view, given the existing infrastructure, the sensitivity of the viewpoint to change would be moderate.	The view would be characterised by the pedestrian bridge, background landscape and rail corridor. Proposal landscape design would contribute to a reduction in magnitude of the scale and materiality of the bridge, adding to the improvement of character.	Sensitivity: Moderate Magnitude: Moderate Impact: **Moderate**
6	Railway Parade looking south toward the proposal. The viewpoint is representative of a number of views from businesses and residencies along Railway Parade.	2 and 3	The view is predominantly made up of road and rail infrastructure with fringe tree and larger shrub plantings along the fence-line. The sensitivity of this view to change is moderate given the existing infrastructure and character within this viewpoint would remain largely unchanged with the exception of localised vegetation clearing and formalisation of the roadway.	The bridge provides a dominant built element, given its scale and materiality when compared to surrounding elements. Changes to lighting, around the proposed forecourt, will also contribute to increased magnitude of change at night. Landscaped vegetation would reduce the visual effect of change over time.	Sensitivity: Moderate Magnitude: High Impact: **High-Moderate**
7	Bellevue Crescent, looking east toward the optional road realignment of Bellevue Crescent. The viewpoint is representative of a number of views from residences along Bellevue Crescent.	1 and 2	The view is predominantly made up a vegetated landform with a strong presence of larger tree plantings. The sensitivity of this view to change is high given the majority of the existing view is made up of vegetation with only a small portion of built form resulting in a significant change to the character and land use of this view for residents along Bellevue Crescent.	The proposed realignment of Bellevue Crescent sits in the foreground of this viewpoint and provides a dominant built element in place of significant existing vegetation which acts as a buffer between the Great Western Highway and residents. The removal of trees in this location Would be significant and given the increase of hardstand and significant increase in traffic in this location the overall magnitude of change in this location would be high.	Sensitivity: High Magnitude: High Impact: **High**

The proposal includes an alternate option for Bellevue Crescent with a new road through vacant lots to connect to the existing Bellevue Crescent and approximately 25 metres south of the United Petrol Station.

As a result, the proposed turning circle located at 106 Great Western Highway, Medlow Bath would not be required, ultimately reducing the impact on residents, as well as reducing the removal of existing mature trees within this location. The proposed option would also provide a stronger entry gateway into Medlow Bath, through the use of mature trees planted at the entry to the previous entrance into Bellevue Crescent.

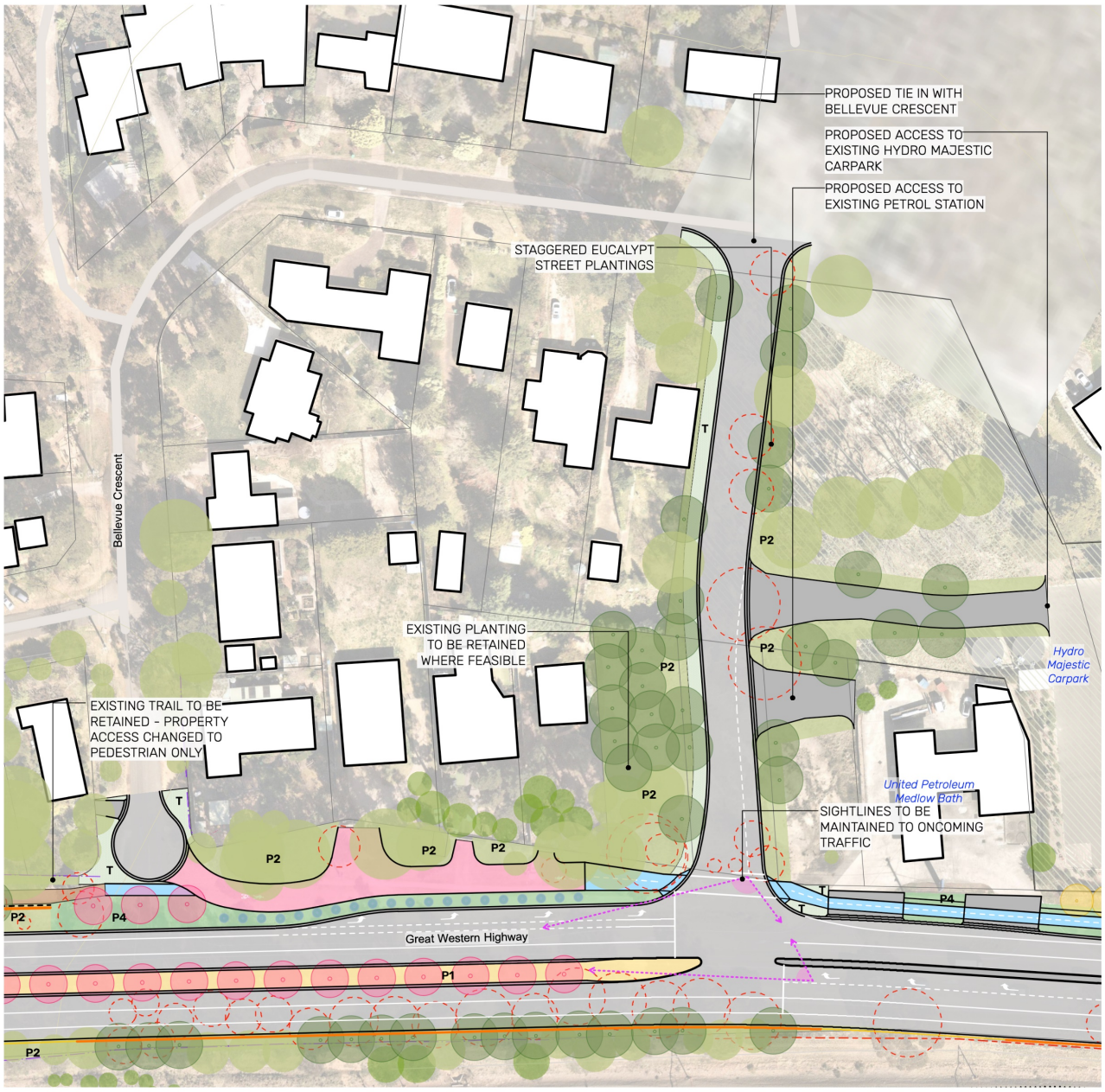

Figure 6-36: Proposed alternative option for Bellevue Crescent (including landscape treatments) (SMM, 2021)

The existing views of the location of the alternative Bellevue Crescent is as per Figure 6-37. As can be seen in Figure 6-36, there would be additional tree plantings in this area.

Figure 6-37: Viewpoint 7 (existing) from Bellevue Crescent looking east toward the option road realignment of Bellevue Crescent

6.9.4 Safeguards and management measures

Table 6-40: Safeguards and management measures – Visual and urban design

Impact	Environmental safeguards	Responsibility	Timing	Reference
Proposal Design	The following principles are to continue to be incorporated into the overall design of the proposal: • the motorists experience and attract people to town centre through the feature planting characteristic of the Blue Mountains area • screening of rail infrastructure where possible, using shrubs and trees, both native and exotic depending on the location • rounding of cut and fill batters to help integrate into the existing landform and create a more naturalised appearance • exploration of opportunities to reduce the Proposal footprint and need for temporary and ancillary sites to reduce impacts on surrounding landscape areas • Consolidating barriers and fences to increase visual access and pedestrian permeability in civic spaces • selection of lighting, signage and bus stops to compliment the Great Western Highway character • retention of views to existing non-aboriginal heritage items identified in the contextual analysis	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
Bridge Design	The following principles are to continue to be incorporated into the design of the bridge: • The simplification of the bridge forecourts to enhance sightlines and access and enable equitable access for all users, • The refinement of the pedestrian bridge design to reduce its visual impact, by increasing the visual permeability, the positioning of the bridge to reduce the required height and the visual elongation of the bridge through the design of the bridge truss bays that extend beyond the lift structures, • Maximising of opportunities to increase public amenity within the bridge forecourt and between proposed bus shelter/bus stops to enhance the public domain.	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
Accessibility	The design is to continue to provide improvements to cyclist and pedestrian access through new and upgraded, footpaths and shared paths to create a complete network around Medlow Bath	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Station, connecting into the existing network along the Great Western Highway between Katoomba and Leura.			
Finishes of Structures	The design of new retaining walls to have finishes of a high standard and quality, that is in keeping with the Great Western Highway character	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
Landscaping	The following principles are to continue to be incorporated into the design of landscaping: • Planting strategies that respond to the existing historical and local context of Medlow Bath, • The planting of feature trees at the entry into Medlow Bath village, and to highlight access into Medlow Bath Station and proposed bus shelters, • The introduction of buffer planting in front of the retaining wall at the southern entry into Medlow Bath to minimise visual impacts, • Maximising of new tree planting where possible; within medians turning facilities, and verges to reduce the scale of the proposal over time as the tree plantings mature. Consideration has been given to sight lines for motorists when identifying possible locations, • Utilisation of native and endemic plantings along the highway outside of the village to consider pedestrians and cyclists using the existing trails as links to regional routes, • Maximisation of revegetation with appropriate species along the highway to reduce perceived corridor width.	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
Design Integration	The following measures are to be adopted during the Detailed Design stage: • All reasonable measures taken to minimise the loss of existing vegetation along the proposal corridor. Those measures will include minimise clearing of trees for construction access, rationalisation of maintenance access, • Investigate the borrowed landscape and opportunities for additional tree plantings along the proposal corridor, • Investigate opportunities to incorporate heritage qualities within the bridge design, • Further opportunities investigated to increase landscape zones within the road corridor,	TfNSW / Contractor	Detailed design / Construction	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Lighting and signage to be well-considered in its placement and should not detrimentally add to the visual impact, • At locations where greater visual impacts have been identified, the specification and planting of more mature sized shrubs and trees would be adopted to help reduce the visual impact upon opening of the road since the proposed planting would take a number of years (approximately between 3 to 10 years) to establish at adequate height, • Where site compounds are needed rehabilitate to previous state.			

6.10 Socio-economic, property and land use

A socio-economic impact assessment (SEIA) has been prepared by RPS (2021c) for the proposal. The assessment is provided in Appendix L and is summarised in the following sections.

6.10.1 Methodology

The SEIA was prepared in accordance with the *SEIA Practice Note Guidelines* (January 2020) and *Assessing significance: socio-economic impacts* (Roads and Maritime Services, 2019). This included the incorporation of the following methodology:

- determining the study area based on the likely geographical extent of the impacts during both construction and operation
- reviewing the existing conditions including demographics, socio-economic status, income, employment, land use, business activity and social infrastructure using publicly available sources such as data from the Australian Bureau of Statistics, and relevant planning and policy documents
- assessing the likely social and economic impacts during construction, which may include but not be limited to, property acquisition, amenity impacts and disruption to trade
- assessing the level of significance of potential impacts by considering the sensitivity of the receptor and the magnitude of the proposed work
- consideration of cumulative social or economic impacts by considering other existing or planned proposals likely to interact with the proposal. For example, cumulative impacts related to nearby projects/proposals such as the Richmond Road Upgrade, Bandon Road Upgrade, etc
- identifying recommended mitigation measures to manage the extent of impacts.

The SEIA is also informed by the outcomes of various other technical reports prepared for the proposal, including the assessment of impacts to heritage, traffic and transport, noise and vibration, urban design, landscape character and visual amenity.

The study area for the assessment is shown in Figure 6-38. It comprises the Katoomba – Leura Statistical Area Level 2 (SA2 #124011452, 2016). The study area was chosen because it comprises areas that are most likely to be directly impacted during both construction and operation of the proposal.

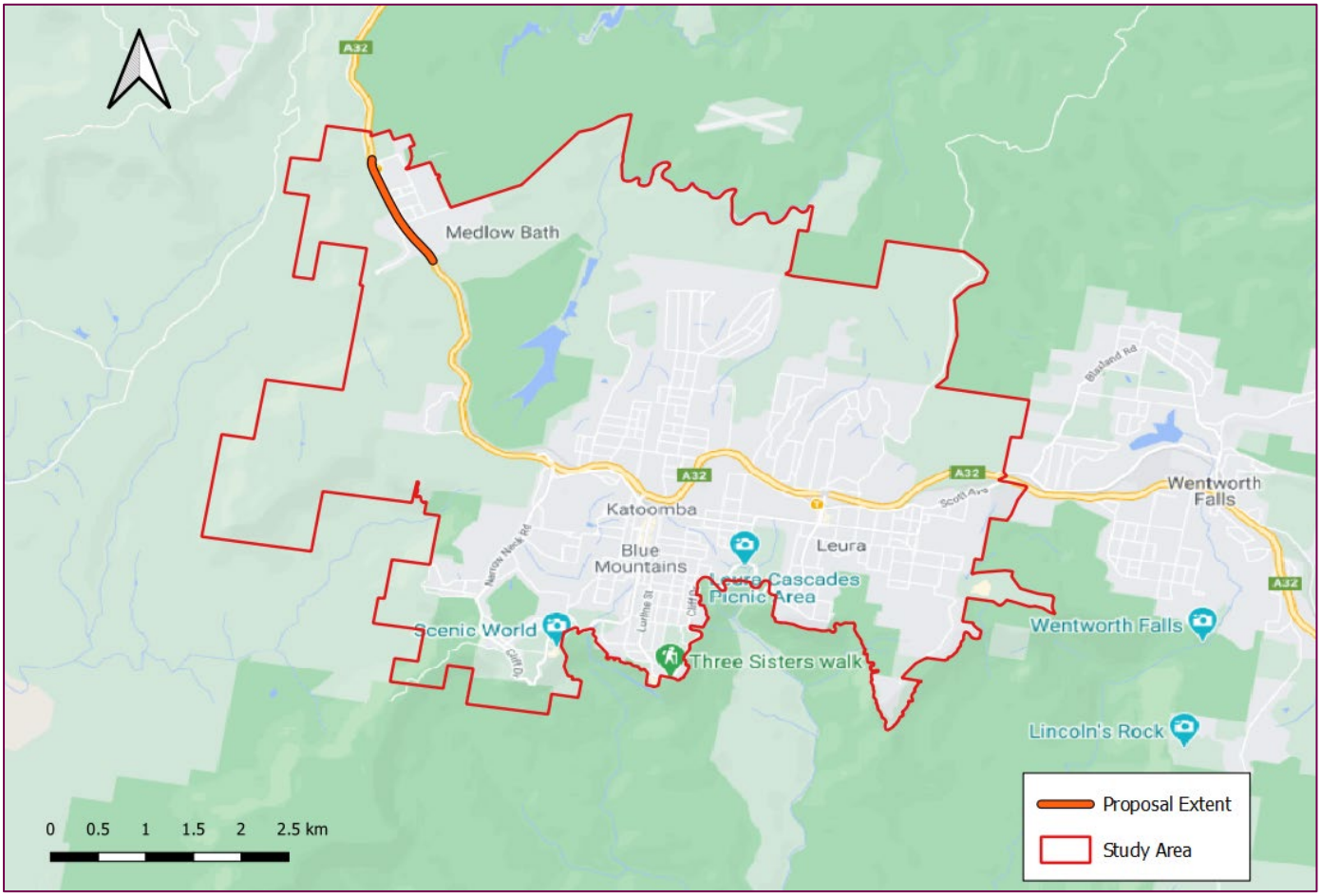

Figure 6-38: Study area and proposal corridor extent (RPS, 2021c)

6.10.2 Existing environment

Population and demographics

The proposal area is located in the Blue Mountains LGA. The population of the study area, Blue Mountains LGA, and the Western City District region in 2016 was 1,024,444 of which 13,222 lived in the study area. The study area and Blue Mountains LGA has a greater number of Australian born and English-speaking households than in the Western City District. The study area has a greater proportion of separate detached dwellings than in the Blue Mountains LGA or Western City District, reflecting an older established community. The study area had a labour force of 10,551 persons as of the 2016 census. Labour force participation and unemployment rates are broadly consistent across the study area, Blue Mountains LGA, and Western Sydney District, with the study area demonstrating marginally higher workforce participation and employment.

Local business and industry

The largest sector in the Blue Mountains LGA is Health Care and Social Assistance accounting for 3,442 jobs and 17.6 per cent of total employment. Tourism is the second largest sector in the Blue Mountains LGA, accounting for 2,430 jobs and 12.5 per cent of total employment in the region. Comparatively, approximately 4.2 per cent of jobs in Greater Western Sydney, 6.1 per cent in NSW and 6.3 per cent in Australia more broadly are supported by tourism, demonstrating the importance of this sector for the Blue Mountains LGA in supporting jobs.

Key attractions for the Blue Mountains LGA include the Three Sisters, Jenolan Caves, Blackheath Gardens, Blue Mountains Explorer Bus, Blue Mountains Cultural Centre, Scenic World and various restaurants, waterfalls, scenic bushwalking tracks, museums, and wineries.

The Hydro Majestic Hotel is a key landmark and destination for visitors to the Medlow Bath area. It also houses a range of other accommodation options such as bed and breakfasts with close access to walking trails and picturesque views. Other businesses include retail, a service station, and a car dealership. Some of these businesses cater for the needs of the local community. The Katoomba Airport is located nearby, outside the proposal area, but within the village of Medlow Bath.

Social infrastructure and community facilities

Near the study area, there are parks, reserves, trails, and creeks that provide key recreation, cultural and other public services to support the local community and tourism. Social infrastructure, nature and recreational facilities near the study area includes:

- recreation and leisure facilities such as:
    - Medlow Bath Park on Railway Parade
    - Blackheath Glen Reserve on Megalong Road
    - Coachwood Glen Nature Trail on Megalong Road
    - Pulpit Hill Creek on Megalong Road
    - Lake Medlow Dam / Adams Creek on Portland Road
- public services, such as:
    - Medlow Bath Station at the intersection of Station Street and Railway Parade
    - bus stops at Medlow Bath Station
    - rail customer car park on Railway Parade.

There are relatively few shops and services within the project corridor. As a result, residents must travel elsewhere in the Blue Mountains LGA for many of the shops, services, and facilities that support the day-to-day needs of the wider communities, in particular the Katoomba-Leura and Blackheath and Wentworth Falls townships, which are closest to the study area. These include education facilities, health and medical services, sports, recreation and leisure facilities, and community and cultural facilities.

Community values

Medlow Bath and the surrounding area predominantly has a land use that reflects its links to the environment. Much of Medlow Bath is currently zoned as Environmental Living (E4) and made up of low-density residential development that has a prominent rural character. Many heritage items are located within and adjacent to the proposal area and contribute to the village character of Medlow Bath.

In addition to the Environmental living zones, Medlow Bath Park, along Railway Parade provides public amenity in the form of local outdoor space, with consideration required to ensure pedestrian linkages to the railway station and proposed pedestrian bridge across the Great Western Highway.

Roadways, public and active transport

Roadways

The Great Western Highway and the Main West Line are two important transport infrastructure assets that pass-through Medlow Bath. This road and rail corridor not only links the local and regional centres but provides access to Sydney and the Orana regions. As a result, it plays a critical role in supporting the livelihood of the community.

The proposal is accessible via two intersections: one at Bellevue Crescent and another at Railway Parade westbound. The corridor provides access to a service station, Hydro Majestic Hotel, a Mazda dealership, and Medlow Bath Station. The Blue Mountains and the Medlow Bath area attracts significant weekend traffic and is a popular tourism destination for weekend travellers.

Public transport

Medlow Bath is served by a rail station located at the northern extent of the study area at the intersection of Station Street, Railway Avenue, and the Great Western Highway. The station is serviced by the Blue Mountains Line providing services between Central Station and Bathurst. Additionally, the proposal area is served by bus routes that connect the Blue Mountains villages along the highway. Currently there is one westbound and eastbound bus stop location in Medlow Bath in proximity to the school bus facilities located on Railway Parade.

Active transport

The existing pedestrian connections within the proposal area are minimal. Footpaths along the Great Western Highway are visually exposed with little to no shade or protection from noise and high levels of traffic along the highway.

Pedestrian access to the existing rail customer car park and bus stop is via Railway Parade, however, there are non-compliant footpaths onto the station platform and no footpaths between the northern access and the accessible entry in the south along Railway Parade.

Existing cycling and pedestrian links are located along the corridor in the form of the Great Blue Mountains Trail, which provides recreational links to the Greater Blue Mountains Area. Although pedestrian access is well patronised in the form of bushwalkers and recreational walkers, safe pedestrian amenity is lacking around Railway Parade and local roads to the east; with accessible links to the existing Medlow Bath Station platform only exist via a level crossing at the southern end of the platform.

6.10.3 Potential impacts

To support an assessment of the potential socio-economic impacts during the construction and operation phases, detailed layouts of the proposal are provided in Figure 6-39 (southern section), Figure 6-40 (middle section) and Figure 6-41 (northern section).

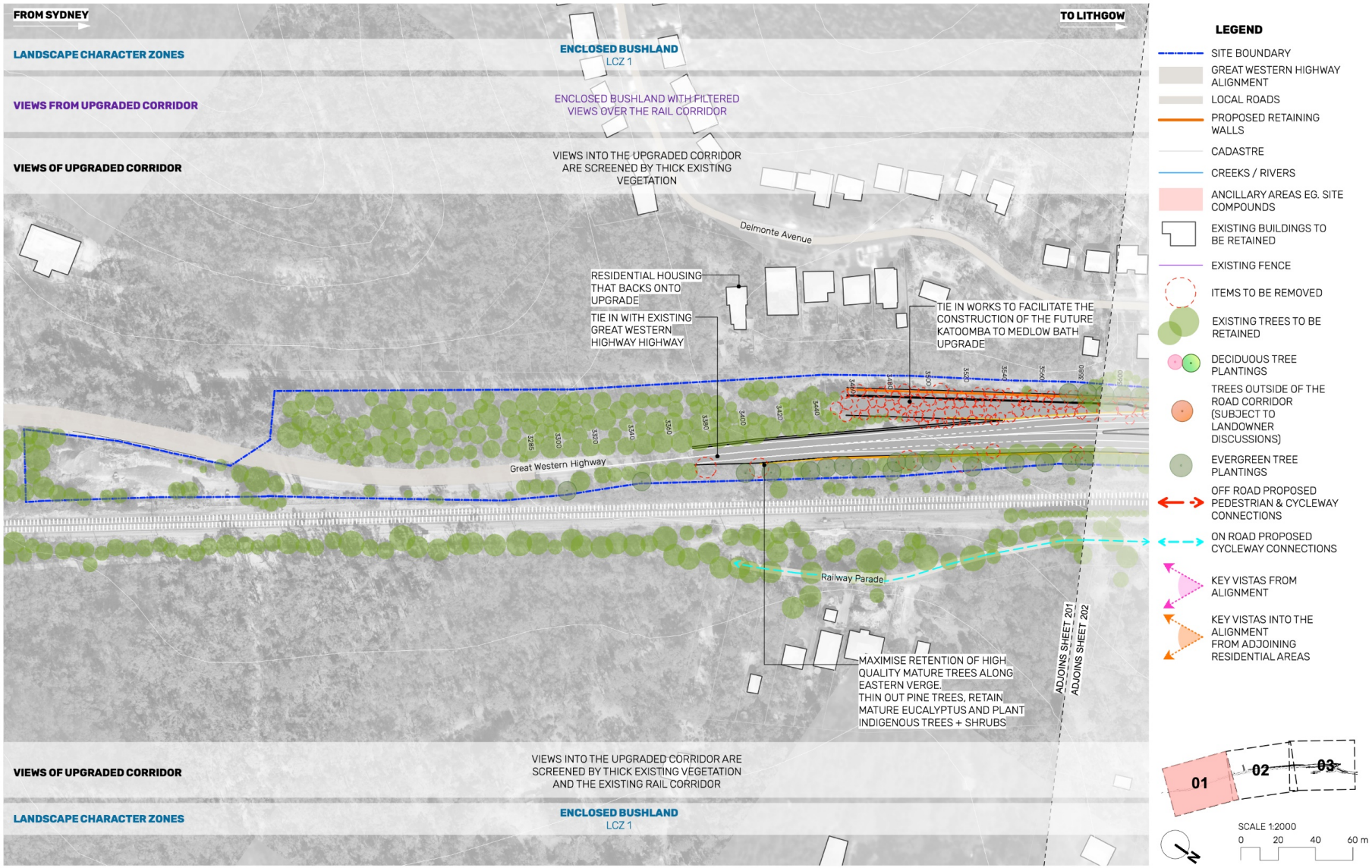

Figure 6-39: The proposal (southern section)

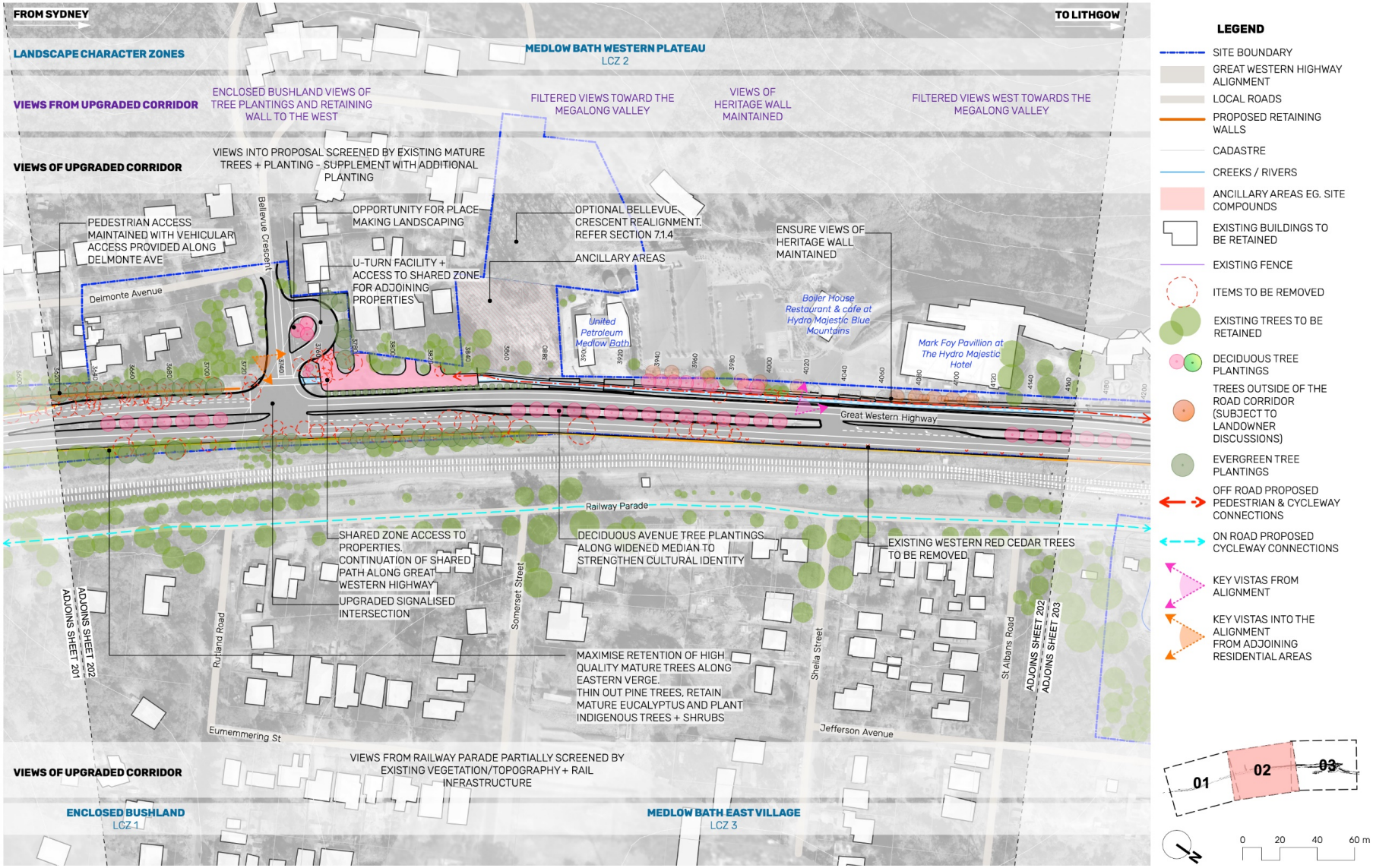

Figure 6-40: The proposal (middle section)

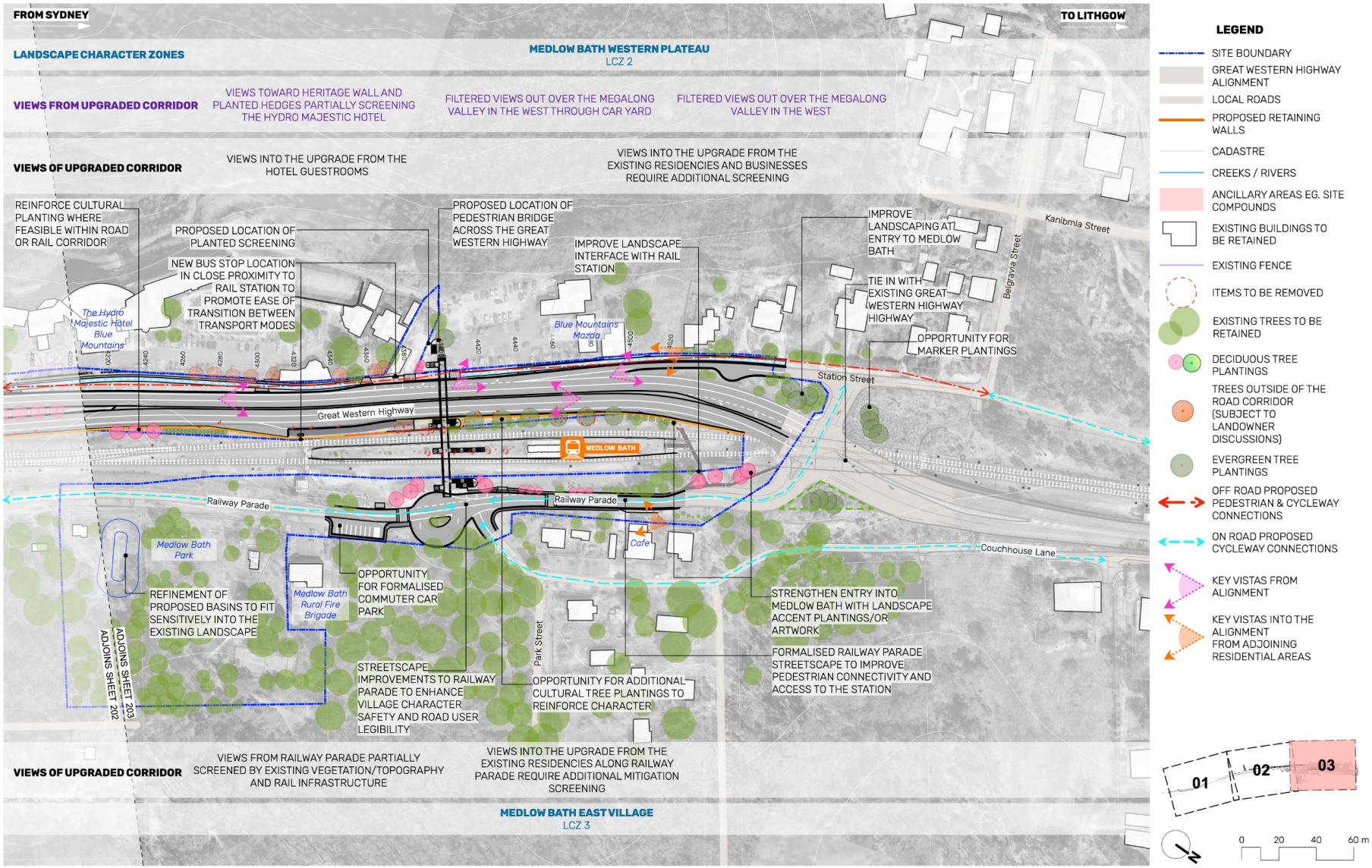

Figure 6-41: The proposal (northern section)

Construction

Access and connectivity

The main impact to residents and businesses would likely result from traffic movements of light and heavy construction vehicles. Construction would occasionally require altered traffic operations at times (one hour road shut down to allow for crane operations to install the new pedestrian bridge, temporary realignment of traffic etc). However, high traffic activities would be encouraged to be held during off peak hours to minimise delays and congestion.

The removal of 40 perpendicular parking spaces is required during construction to facilitate works to widen the highway. While the removal also reflects a permanent impact, the parking has already been compensated for through additional parking for the Hydro Majestic Hotel southern car park works. The rail customer car park would not be impacted during the construction phase.

Several properties with direct access to the road network within the proposal area would experience some impacts with respect to ease of access. Access to affected properties would be maintained throughout, and temporary changes to property access would be provided where required. TfNSW would work with Blue Mountains City Council to ensure local road connectivity is maintained for users during construction.

Given the relatively rural and low-density character of the area, negative impacts are expected to be temporary and relatively minor provided effective construction staging is implemented.

Social infrastructure

During construction, there would be temporary disruptions to some footpaths and cycling infrastructure, which would obstruct access to some of the rural recreational and historic assets and public transport facilities and may result in increased walking distances and safety risks as conditions change.

Community values and amenity

Noise and vibration from construction activities have the potential to disrupt amenity for occupants of some residencies and businesses in proximity to the proposal area. Due to the small offset distance between the proposal and sensitive receivers, there would be exceedances of the noise management levels during construction works. A small number of receivers would be highly affected at some point during the works with levels likely to exceed 75 dBA. The noisiest stage is predicted to be vegetation clearing due to the operation of equipment like chainsaws, but which would last only two weeks.

It is unlikely that vibration generating equipment would be in use within 10 metres of buildings and as such it is unlikely that there would be vibration with potential to cause damage to buildings or disturb human comfort.

Further community values and amenity impacts during construction are likely to be:

- removal of some established trees during construction. Areas impacted by construction would be rehabilitated, including planting of new trees and vegetation alongside the road and on the median
- visual impacts during construction would be minimal, and over time, the planting of new trees and vegetation would provide visual and amenity benefits.

Business impacts

Access to businesses on affected roads would be maintained during construction. There would be some disruption to parking access to parking spaces located at the Hydro Majestic Hotel and along Railway Avenue. Additionally, the presence of construction vehicles and workers is expected to increase demand for parking along Railway Parade, although where possible contractors would park in compound areas. The overall impact to businesses is expected to be minimal given the low-density nature of the area and potential for alterative parking spots.

A number of noise sensitive receivers within the community, including the Hydro Majestic Hotel have been identified as being potentially adversely impacted by noise levels. Predicted noise levels are considered to be typical of road infrastructure projects and the implementation of suitable noise mitigation measures would help manage and mitigate the impacts of noise on the community.

Given the relatively few businesses within the proposal area, the anticipated negative impacts from construction are expected to be minimal. There may be some positive impacts for some small businesses in the retail/hospitality sector as contractors purchase local goods and services.

Impacts to property

It may be necessary for some properties to be to be partially or fully acquired by TfNSW to facilitate the proposal (refer Section 3.5). The details for property acquisition would be determined during detailed design and any property acquisition would be undertaken in accordance with the provisions of the NSW *Property Acquisition (Just Terms Compensation) Act 1991*. Consultation would be conducted with property owners prior to the relocation of this infrastructure. TfNSW has commenced consultation with potentially affected property owners and would continue to engage with them through the detailed design phase about specific property impacts, including the acquisition process.

Operation

Access and connectivity impacts

At present traffic flows are generally good at the intersection of Station Street, Railway Parade, and the Great Western Highway. However, the level of service at Bellevue Crescent is currently moderate and would benefit from the proposed enhancements. Over the long term, residents and businesses in the proposal area would benefit from improved access and connectivity, especially with respect to pedestrian safety and amenity (for example the new pedestrian bridge would allow pedestrians/cyclists to safely cross the highway and access public transport facilities).

In addition to benefiting local traffic, the proposal would improve safety and travel times for tourists, freight and other regionally-based traffic. The highway would be able to support longer, heavier vehicles that are able to transport more freight per vehicle. This would provide improvements to safety and sustainability as well as improvements in productivity. This is expected to increase the volume of freight, but reduce the number of vehicles required to transport the freight along the highway.

Impacts to social infrastructure

Over the long term the proposal would have a positive impact and provide improved footpaths and pavement within the proposal area, including the formalisation of a shared path which would promote cycling and walking which are known to promote better health. The shared path would provide an important link to nearby walking trails which are popular with tourists.

It would also enhance connections to public transport assets by providing a safe and accessible path of travel including for those with a disability, carers with prams or customers with luggage both across the corridor and to the station and bus stops. The addition of canopies at lift waiting areas would provide weather protection while indented bus bays, kiss and ride and the new pedestrian bridge would help to reduce potential interactions with moving vehicles.

In addition, following completion of the proposal, a positive visual and amenity impact is expected due to replanting of trees and vegetation.

Community values and amenity

The proposal would increase the amount of the road-related infrastructure within the zone and would require some additional clearing of mature bushland vegetation. This would result in changes to the natural landform to accommodate the necessary road design requirements.

However, the proposal is located within an existing corridor meaning that it would result in minimal new negative impacts. Further, the proposal would have beneficial outcomes in terms of the reduction of congestion and improvements to connectivity, which help moderate the proposal's overall impact.

The SEIA concluded that over the long term the proposal would result in improved safety, access, and connectivity within the area once complete. Replanting of trees and vegetation would have positive visual and amenity impact on the area.

Business impacts

Over the long term, the operation of the proposal is not expected to negatively impact business operations within the proposal area. Where property might be negatively impacted, mitigation measures have been outlined in the next section. Additionally, businesses would likely benefit indirectly as travel through the corridor becomes easier, making it a more attractive destination.

Impacts to property

Key operational impacts of the proposal to local properties are related to noise and water.

Based on modelling of operational noise levels, owners of properties adjacent to the new U-turn bay proposed for Bellevue Crescent should not be significantly adversely affected by vehicle movements. In other areas, modelling has identified a number of receivers where the design noise criteria may be exceeded and would be eligible for consideration of additional noise mitigation during detailed design.

Changes to the proposal area by the increase in hardstand area needs to consider potential issues associated with the management of water. Upstream flooding impacts from increased impervious surfaces would be mitigated by additional stormwater systems to mitigate localised flooding. To alleviate pressure in the downstream areas, flooding impacts are to be mitigated through the use of flow control structures including the addition of detention basins. These impacts are generally considered minor, given the minimal vertical alignment changes, maintenance of flow discharge splits to downstream receivers, and general increase in available stormwater storage will also mitigate localised flooding.

Over the long term, the operation of the proposal is not expected to marginally increase noise for businesses and residents significantly beyond what is currently experienced within the proposal area. Where property might be negatively impacted, mitigation measures have been outlined in the next section.

Alternative Bellevue Crescent option

The alternative design for Bellevue Crescent would require some property acquisition to facilitate construction of the left turning lane from the Great Western Highway to the new corridor connecting to Bellevue Crescent. Potentially affected properties are not residential properties but vacant land, and the impact to property owners whose land would be fully or partially acquired would be minimal. Construction would also result in the removal of some trees on these vacant lots, the impact of which would be minimal.

Operation of the new corridor connecting the Great Western Highway to Bellevue Crescent would result in noise impacts to three residential receivers on Bellevue Crescent (17, 18 & 22 Bellevue Crescent). These residents would be impacted by an increase in vehicle movements along their property as a result of the alternative design. It is noted that these vehicle movements would mainly be by other residents in that part of Medlow Bath, which has a very small population, and the overall impact will be minimal when operational. If the alternative design proposal were to proceed, these residents would need to be considered for additional noise mitigation measures, such as architectural treatment.

6.10.4 Safeguards and management measures

Traffic, noise and vibration, visual and biodiversity management measures are addressed in the relevant sections of this REF. Additional management measures to address socio-economic impacts are included in Table 6-41.

Table 6-41: Safeguards and management measures – Socio-economic

Impact	Environmental safeguards	Responsibility	Timing	Reference
Property	A Property Acquisition Plan will be prepared and implemented in accordance with the requirements of the *Property Acquisition (Just Terms Compensation) Act 1991.*	TfNSW	Pre-construction	Standard safeguard
Community	A Communications Plan will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The plan will include (as a minimum): • identification of key stakeholders such as the Hydro Majestic Hotel, private residences and business, Blue Mountains City Council • mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • contact name and number for complaints • the plan will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Detailed design / Pre-construction	Standard safeguard
Construction	Access to private residential properties, businesses and the Hydro Majestic Hotel would be maintained throughout the construction period.	Contractor	Construction	Appendix L

6.11 Cumulative impacts

This section discusses the potential cumulative impacts that may arise as a result of the construction and operation of the proposal, and the interaction of these impacts with other identified major developments within the local area. The cumulative impacts relate to both the individual environmental impacts of the proposal as well as the combined effects of this and other proposals in the vicinity of the proposal that form part of the wider program to upgrade the Great Western Highway.

6.11.1 Proposal area

The proposal area is defined in Section 1.1 and Figure 1-2. The cumulative impact assessment has considered the wider Blue Mountains region.

6.11.2 Broader program of work

The proposal is part of the Great Western Highway Upgrade Program between Katoomba and Lithgow. The program will ultimately deliver around 34 kilometres of four lane divided highway, building on the already upgraded section between Emu Plains and Katoomba. Subject to funding, the target is to open the full 34 kilometres to traffic by 2028. The Great Western Highway Upgrade Program includes:

- upgrade of the Great Western Highway between Katoomba and Mount Victoria
    - upgrade a 1.2 kilometre section of the Great Western Highway at Medlow Bath between Railway Parade and around 330 metres south of Bellevue Crescent
- upgrade of the Great Western Highway between Mount Victoria and Lithgow.

The program would provide a safer and more efficient link between Central West NSW and the Sydney Motorway network for freight, tourist and general traffic.

6.11.3 Other projects and developments

A search of the following registers was completed in April 2021:

- Department of Planning, Industry and Environment's Major Projects Register
- Sydney and Regional Planning Panel Development and Planning Register
- Blue Mountains City Council Development Application Register.

The search identified one major development application listed within Medlow Bath, for additions and alterations to the Hydro Majestic Hotel, and two projects under assessment by Blue Mountains City Council. Details of the search results are provided in Table 6-42.

Table 6-42: Past, present and future projects

Project	Construction impacts	Operational impacts
Additions and alterations to the existing Hydro Majestic Hotel Status: Determined DA number: X/773/2009, Address: 52 – 88 Great Western Highway, Medlow Bath Planning panel reference number: PPS-2009SYW011 Capital investment value: $22,700,000	Construction impacts of this project include: • increased traffic • increased dust during earthwork • increased noise • potential offsite water pollution due to poor erosion and sediment control • contribution to greenhouse gas emissions due to embodied carbon and energy consumption	Operational impacts of this project, including benefits: • better tourist/accommodation facilities • contribution to greenhouse gas emissions due to energy consumption.
Subdivision of one lot into two for residential housing which includes changes to the existing access driveway Status: Under Assessment DA number: S/29/2020 Address: 26 – 28 Rutland Road, Medlow Bath	Construction impacts of this project include: • increased dust during earthwork • increased noise • potential offsite water pollution due to poor erosion and sediment control • contribution to greenhouse gas emissions due to embodied carbon and energy consumption.	Operational impacts of this project, including benefits: • contribution to greenhouse gas emissions due to energy consumption.
A single storey manufactured home with detached garage- as modified – PAN # 70922 Status: Under Assessment DA number: XM/213/2018/A Address: 90 Railway Parade, Medlow Bath	Construction impacts of this project include: • increased dust during earthwork • increased noise • potential offsite water pollution due to poor erosion and sediment control • contribution to greenhouse gas emissions due to embodied carbon and energy consumption.	Operational impacts of this project, including benefits: • contribution to greenhouse gas emissions due to energy consumption.

6.11.4 Potential impacts

An assessment of the potential cumulative impacts is included in Table 6-43.

Table 6-43: Cumulative impact assessment

Environmental factor	Construction	Operation
Noise	It is likely that some overlap would occur during construction of the proposal, additions to the Hydro Majestic Hotel and the residential projects listed in Section 6.11.3. Considering the limited scale of the residential projects and temporary duration of the overlap, the cumulative noise impacts from the construction of these projects would be minimal. Construction of the road upgrade projects listed in Section 6.11.2 and the proposal would likely occur with some overlap and together construction would be for around five years. Over the five years some residences may regularly experience noise levels exceeding the relevant noise criteria.	The road upgrade projects listed in Section 6.11.2 would provide a safer and more efficient link between Central West NSW and the Sydney Motorway Network for freight, tourist and general traffic. The existing and future road traffic flows on the Great Western Highway could potentially result in receivers exceeding the cumulative noise limit which protects the community from impacts where noise levels are predicted to be 5 dBA or more above the RNP noise criteria. Measures recommended in accordance with the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015c) would be required to mitigate the cumulative noise impacts from the road upgrade projects.
Air quality and greenhouse gas emissions	The construction of all projects, including the road projects would contribute to air quality impacts in the area due to dust and exhaust emissions. All projects, including the road projects would contribute to greenhouse gas emissions due to energy and fuel consumption and embodied carbon during construction.	All projects, including the road projects would contribute to greenhouse gas emissions due to energy and fuel consumption.
Traffic	There would be an increase in construction related traffic on the road network due to traffic restrictions during road work, construction worker movement and spoil transfer. The cumulative traffic impacts from the residential projects listed in Section 6.11.3 projects would be minimal due to the location and limited scale of the projects. Alterations and additions to the Hydro Majestic Hotel, the road upgrade projects listed in Section 6.11.2 and the Proposal would likely occur with some overlap and together there would be some cumulative traffic delays on certain routes.	The upgrades to the Great Western Highway upgrade projects listed in Section 6.11.2 and the Proposal would provide a safer and more efficient link between Central West NSW and the Sydney Motorway Network for freight, tourist and general traffic. Traffic impacts from the residential and Hydro Majestic Hotel projects would be minimal.
Flooding	Construction of the road upgrade projects listed in Section 6.11.2 and the proposal could potentially obstruct and divert flood waters and overland flow if not managed correctly. Cumulative flooding impacts are considered temporary, are expected to be minor and would be managed through the implementation of standard construction techniques.	The Great Western Highway upgrade projects, and the proposal would result in a cumulative increase to existing impervious areas or change in horizontal/vertical alignments which would impact upstream flood levels or downstream peak flow rates thereby affecting properties. Such impacts are to be limited through the use of flow control structures and detailed design to TfNSW standards.
Biodiversity	The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the	The accumulating impacts of historic vegetation clearing for agriculture and urban development have contributed to the loss of biodiversity. The road upgrade projects listed in Section 6.11.2

Environmental factor	Construction	Operation
	Biodiversity Conservation Act 2016 or *Fisheries Management Act 1994*. The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.	and the proposal would result in long-term effects such as habitat fragmentation and some loss of wildlife connectivity corridors in the area. Invasion and further spread of weeds, pests and pathogens, and changes to surface hydrology may occur as a result of the proposal and associated vegetation removal.
Impact fatigue	Impact fatigue is where people and environmental receivers are affected for a longer period of time than it would take to build the proposal. This can often happen in areas of high development where the building of several projects overlaps. In the case of the proposal, it would be reasonable to assume that any of the above projects would be built around the same time as the proposal; however, they may start or finish before or after the proposal. As such, any of the above impacts could be experienced for a longer period than assessed in the REF. This would lead to impact fatigue. It would be managed through consultation with the developers before work starts and by ensuring the safeguards and management measures committed to in this REF are implemented, effective, managed, audited and maintained throughout to minimise impacts.	

6.11.5 Safeguards and management measures

Table 6-44: Safeguards and management measures – Cumulative impacts

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative construction impacts	Other developers will be consulted: • to obtain information about project timeframes and impacts. Identify and implement appropriate safeguards and management measures to minimise cumulative impacts • to manage the interfaces of the proposal's staging and programming in combination with the other projects occurring in the area.	TfNSW / Contractor	Pre-construction	Section 5.2
Cumulative construction impacts	All environmental management plans (including but not limited to the Traffic Management Plan and Noise and Vibration Management Plan) will be prepared to consider other developments in the area.	Contractor	Pre-construction	Section 6.1.4, Section 6.5.4, Section 6.6.4,

7. Environmental management

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

7.1 Environmental management plans

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the TfNSW Environment Officer, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the QA Specification *G36 – Environmental Protection (Management System)*, QA Specification *G38 – Soil and Water Management (Soil and Water Plan)*, QA Specification *G40 – Clearing and Grubbing*, QA Specification *G10 – Traffic Management.*

7.2 Summary of safeguards and management measures

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

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General – minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the TfNSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / TfNSW Project Manager	Detailed design / Pre-construction	
GEN2	General – notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / TfNSW Project Manager	Pre-construction	
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular “toolbox” style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • areas of heritage sensitivity/heritage items • threatened species habitat • adjoining residential areas requiring particular noise management measures • alternative traffic arrangements.	Contractor	Detailed design / Pre-construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO1	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with TfNSW's *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the *Landscape Design Guideline* (Roads and Maritime Services, 2018a) • pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (Department of Primary Industries Fisheries, 2013) • protocols to manage weeds and pathogens.	Contractor	Detailed design / Pre-construction	Section 4.8 of *QA G36 Environment Protection*
BIO2	Removal of native vegetation	Areas for native vegetation and habitat removal will be minimised through detailed design.	Contractor	Detailed design	Appendix D
BIO3	Removal of native vegetation	Pre-clearing surveys and habitat removal will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a). Where possible, hollow bearing trees should be retained or relocated.	Contractor	Pre-construction	Appendix D
BIO4	Removal of native vegetation	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D
BIO5	Removal of native vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	TfNSW	Post construction	Appendix D
BIO6	Removal of native vegetation	The unexpected species find procedure will be followed under the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal area.	Construction contractor	Construction	Appendix D
BIO7	Aquatic habitat	Aquatic habitats will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a) and Section 3.3.2 Standard precautions and mitigation measures of the *Policy and guidelines for fish habitat conservation and management Update 2013* (Department of Primary Industries Fisheries, 2013).	Contractor	Construction	Appendix D
BIO8	Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO9	Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D
BIO10	Invasion and spread of pests	Pest species will be managed within the proposal area.	Contractor	Construction	Appendix D
BIO11	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity of RTA projects* (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix D
HYD1	Blockage causing increased flooding potential	Develop a blockage assessment of the pavement and cross drainage strategy.	Contractor	Detailed design /Pre-construction	Best practice
HYD2	Overland flows causing localised flooding	Flow diversion bunds and sediment fencing are to be used for redirection of overland flows to dedicated management areas including sediment basins and ultimately to discharge locations.	Contractor	Construction	Best practice
WAT1	Soil degradation and water pollution	A Soil and Water Management Plan will be prepared and implemented as part of the CEMP. The plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. The Soil and Water Management Plan will be reviewed by a soil conservationist on the TfNSW list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The Plan will then be revised to address the outcomes of the review.	Contractor	Detailed design / Pre-construction	Section 2.1 of *QA G38 Soil and Water Management*
WAT2	Soil degradation and water pollution	Site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan. The Plan/s will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. The site specific Erosion and Sediment Control Plan/s will be developed in accordance with the principles and requirements in *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom 2004) and *Volume 2D* (DECCW 2008), commonly referred to as the 'Blue Book'.	Contractor	Detailed design / Pre-construction	Section 2.2 of *QA G38 Soil and Water Management*
WAT3	Run-off velocity (scour)	Level spreaders will be installed at all discharge locations to the natural surface used to reduce velocity and depth of the flows reaching the natural watercourses /s. New discharge outlets will be designed with appropriate energy dissipation and scour protection measures as required to minimise the potential for sediment disturbance and	Contractor	Detailed design / Pre-construction	Best practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		resuspension in the receiving waters. Outlet design and energy dissipation/scour protection measures will be informed by drainage modelling. Check dams or velocity managing devices are installed into flow paths particularly in areas with steep gradients.			
WAT4	Water quality	Maintenance requirements for all stormwater treatment systems and devices installed as part of the proposal will be identified and included in relevant operational maintenance schedules/systems.	TfNSW	Post construction	Best practice
WAT5	Spill containment	Dedicated diversion equipment will be implemented for the storage of spills to avoid direct discharge to receiving watercourses.	Contractor	Detailed design / Pre-construction	Best practice
WAT6	Sediment run-off from construction site	Sediment basins will be designed and constructed for the collection of sediment runoffs through reduction of flow velocity.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*
WAT7	Sediment run-off from construction site	The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*
WAT8	Sediment run-off from construction site	Disturbed ground and exposed soils will be permanently stabilised and proposed landscaped areas will be suitably profiled and vegetated as soon as possible following disturbance to minimise the potential erosion.	Contractor	Construction	Section 2.2 of *QA G38 Soil and Water Management*
CON1	Contaminated land	A targeted Phase 2 investigation providing general coverage of the proposed alignment and areas of potential contamination sources (including areas where fill would be encountered during construction and hydrocarbon migration from the United Petrol Station) will be undertaken. The investigation will address the potential risk that fill material may pose to construction workers and future users of the site. Assessments will be carried out in accordance with guidance made or endorsed by the NSW EPA. The contaminated land investigations will be carried out and the report verified by a suitably qualified and experienced environmental consultant.	TfNSW	Detailed design / Pre-construction	Appendix G
CON2	Contaminated land	A Contaminated Land Management Plan will be prepared in accordance with *the Guideline for the Management of Contamination* (TfNSW, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: • capture and management of any surface runoff contaminated by exposure to the contaminated land	Contractor	Detailed design / Pre-construction	Section 4.2 of *QA G36*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• any further investigations required to determine the extent, concentration and type of contamination • management of the remediation and subsequent validation of the contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction. If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the TfNSW Environment Manager and/or EPA.			*Environment Protection* Appendix G
CON3	Pollution from run-off	The following measures will be included to limit sediment and other contaminations entering receiving waterways: • chemicals will be stored within a sealed or bunded area • appropriate controls will be in place where plant is stored • run-off from ancillary facilities will be controlled and treated before discharging into downstream waterways • vehicle movements will be restricted to designated pathways where feasible. Areas that will be exposed for extended periods, such as car parks will be stabilised where feasible.	Contractor	Construction	Additional safeguard
CON4	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the TfNSW *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including TfNSW and EPA officers).	Contractor	Detailed design / Pre-construction	Section 4.3 of *QA G36 Environment Protection*
TRA1	Traffic and transport	A Traffic Management Plan will be prepared and implemented as part of the CEMP. The plan will be prepared in accordance with the *Traffic Control at Work Sites Manual* (TfNSW, 2020c) and *QA Specification G10 Control of Traffic.* The plan will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident	Contractor	Detailed design / Pre-construction	*QA Specification G10*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.			
TRA2	Traffic and transport	• The local bus operators will be consulted to confirm alternative temporary bus stop and operations during construction. • The local community will be notified about the agreed local temporary bus stop location, as coordinated and managed under the consultation strategy.	Contractor	Construction	
TRA3	Property access	• Property access will be maintained where feasible and reasonable and property owners will be consulted before starting any work that may temporarily restrict or control access. • (Side) road and lane closures will be minimised where feasible and reasonable.	Contractor	Construction	
NOI1	Construction noise and vibration	A Noise and Vibration Management Plan will be prepared and implemented as part of the CEMP. The plan will generally follow the approach in the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) and include the following: • the plan will consider potential vibration impacts associated with construction activities and would identify feasible and reasonable measures to mitigate these impacts, including safe working distances • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented, taking into account *Beyond the Pavement 2020: Urban design approach and procedures for road and maritime infrastructure planning, design and construction* (TfNSW Centre for Urban Design, 2020) • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria • stakeholder engagement will be a key feature of these measures, particular with key stakeholders such as the Hydro Majestic Hotel. • vibration sensitive receivers identified will require careful consideration when planning works and, dependent on the nature of the works, may require vibration monitoring throughout the proposal.	Contactor	Detailed design / Pre-construction	Section 4.6 of *QA G36 Environment Protection*
NOI2	Out of hours works	As part of the Noise and Vibration Management Plan, an out-of-hours work protocol will be developed, including any requirements set under the EPL which defines: • all scheduled and planned out-of-hours activities	Contractor	Pre-construction/ Construction	Appendix I

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• any oversized and other deliveries needing to take place out-of-hours as required by the police or other authorities for safety reasons · • other tie-in, utility connection and intersection work that may need to take place out-of-hours for road user safety issues • out-of-hours emergency work needed to prevent the loss of life, property, to prevent harm or as agreed under negotiation with EPA and affected sensitive receivers • the record-keeping process for capturing agreed and emergency out-of-hours work • very noisy activities should, as much as practicable, be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12:00am. In particular, there should be no jackhammering or saw cutting after midnight.			
NOI3	Construction noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the proposal • construction period and construction hours • contact information for project management staff • complaint and incident reporting how to obtain further information.	Contactor	Detailed design / Pre-construction	
NOI4	Construction noise and vibration	The following general mitigation measures will be applied as practicable: • limit work to daylight hours and only night works during notified road closures. • perform noisy work during less sensitive time periods • select low-noise plant and equipment • ensure equipment has quality mufflers installed • where practicable use smaller/lower capacity plant in reference to the safe working distances • where possible, concentrate noisy activities at one location and move to another as quickly as possible • vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible • ensure equipment is well maintained and fitted with adequately maintained silencers • use only necessary sized equipment • implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible • consider alternatives, such as manually adjustable or ambient noise sensitive types (“smart” reversing alarms) and closed-circuit TV systems • consider installing temporary construction noise barriers • install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.	Contractor	Pre-construction / Construction	Section 6 of Appendix I

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NOI5	Construction noise	Noise management controls will be implemented early in the work program to benefit receivers while the proposal is being built.	Contractor	Detailed design / Pre-construction	Appendix I
NOI6	Construction noise and vibration	Where possible, plant will be located as far from residences as possible and behind site structures, barriers, screens and/or noise walls. Plan for the use of less noise/vibration equipment where reasonable and feasible.	Contractor	Pre-construction / Construction	Appendix I
NOI7	Construction vibration	Any proposed works within the minimum safe working distances will be undertaken with concurrent vibration measurements to ensure the cosmetic damage criteria are not exceeded at sensitive receiver locations.	Contractor	Construction	REF Table 6-27 Appendix I
NOI8	Construction vibration – heritage structures	Vibration resulting from construction and received at any heritage structure will be managed in accordance with *German Standard DIN 4150: Part 3 – 1999 Structural Vibration in Buildings: Effects on Structures.* Where required, monitoring will be undertaken to ensure guideline values are achieved, or additional vibration mitigation measures developed to manage risks.	Contractor	Construction	REF Table 6-23 *Structural Vibration, Part 3: Effects of Vibration on Structures (DIN 4150-3)* Appendix I
NOI9	Operational noise	Architectural treatment will be investigated for properties where there are exceedances of the noise criteria. Based on the concept design, this will likely include fourteen residential properties: • 2 Station Street • 4 Station Street • 40 Great Western Highway • 50 Great Western Highway • 100 Great Western Highway • 102 Great Western Highway • 104 Great Western Highway • 106 Great Western Highway (proposed acquisition) • 108 Great Western Highway • 110-114 Great Western Highway • 116-118 Great Western Highway • 14 Delmonte Avenue • 122 Great Western Highway • 126 Great Western Highway.	Contractor	Detailed design	Appendix I
ABO1	Aboriginal heritage	The *Standard Management Procedure – Unexpected Heritage Items* (Roads and Maritime Services, 2015d) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where TfNSW does not	Contactor	Construction	Section 4.9 of *QA G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work will only re-commence once the requirements of that procedure have been satisfied.			
HER1	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage. The plan will be prepared in consultation with Heritage NSW.	Contractor	Detailed design, Pre-construction	Section 4.10 of *QA G36 Environment Protection*
HER2	Non-Aboriginal heritage	The detailed design will be developed and refined in consultation with either a heritage architect or a built heritage consultant. The detailed design would aim to further minimise the impact of the proposal, with particular reference to the pedestrian bridge through the use of appropriate form, proportion and materials. Bulk should be minimised, and new built forms should be clearly separate from existing heritage fabric. Where appropriate, the detailed design should also respond to existing and significant architectural detail, such as the architectural detailing of the station building, or the footbridge. Detailed design should be undertaken in accordance with appropriate Sydney Trains and TfNSW guidelines, including: • Railway Footbridges Heritage Conservation Strategy (NSW Government Architect's Office Heritage Group for Sydney Trains, 2016) • Heritage Platforms Conservation Management Strategy (Australian Museum Consulting for Sydney Trains, 2015) • Heritage Technical Note: Installation of New Electrical and Data Services at Heritage Sites (Sydney Trains, 2017a) • Station Components Guide (Sydney Trains 2017b).	Contractor	Detailed design	Appendix J SoHI recommendation 1
HER3	State heritage	A Section 60 Application would be required for proposed works within the SHR curtilage of Medlow Bath Railway Station. The Application must be granted prior to works commencing.	TfNSW	Pre-construction	Appendix J SoHI recommendation 2
HER4	Archaeology	An Historic (non-Aboriginal) Archaeological Assessment will be prepared for the Hydro Majestic land proposed for use for the alternate design arrangement for Bellevue Crescent known as Lots 3, 4, 5 and 20 of DP25570. The assessment will be undertaken by a suitably qualified archaeologist in accordance with the *Heritage Act 1977* and the Heritage NSW publication *Assessing Significance of Historical Archaeological Sites and Relics* (2009). The purpose of the assessment is to determine the nature, extent and significance of any archaeological or historical resources associated with the former Glenara Cottage in this area and provide appropriate management recommendations in relation to the proposal.	TfNSW	Pre-construction	Appendix J SoHI recommendation 3

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HER5	Non-Aboriginal heritage awareness training	• Works within the proposal area are being undertaken in an area of heritage significance. Prior to works commencing, contractors will be briefed as to the sensitive nature of the proposal area and informed of any recommended mitigation measures or controls required. • Non-Aboriginal heritage awareness training will be provided for all contractors and personnel prior to commencement of works to outline the identification of potential heritage items and associated procedures to be implemented in the event of the discovery of non-Aboriginal heritage materials, features or deposits (that is, unexpected finds), or the discovery of human remains	Contractor	Pre-construction	Appendix J SoHI recommendation 4
HER6	Non-Aboriginal heritage protection of significant fabric	Works will be undertaken with care. To avoid impact to significant fabric during the construction of the proposal the following is recommended: • machinery should be placed with sufficient clearance to significant heritage structures to avoid any inadvertent harm to significant fabric or incidental damage from vibration as per the TfNSW recommended minimum working distances for vibration intensive plant (refer Table 6-27 of the REF). In particular, care should be taken when working near: ○ Hydro Majestic's stone fence ○ Medlow Bath Railway Station platform structures, platform edges and footbridge ○ Former Post and Telegraph Store ○ Urunga ○ Melbourne House, Cosy Cot and Sheleagh Cottage, in particular Lot 1 Great Western Highway ○ Sandstone Railway culvert ○ archaeologically sensitive vacant land north of the United Petrol Station • Protection of significant fabric – Hydro Majestic stone fence ○ protective barriers or fencing should be erected between the works corridor boundary and the Hydro Majestic's stone fence for the duration of works within the vicinity of this significant fabric to ensure no inadvertent harm occurs ○ machinery and works should be placed with sufficient clearance to significant fabric and associated protective barriers to avoid inadvertent harm from machinery or incidental damage from vibration ○ vibration monitoring of the stone fence should be put in place for the duration of works • Protection of significant fabric – Sandstone Railway culvert	Contractor	Pre-construction	Appendix J SoHI recommendation 5

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		○ redundancy of the Sandstone Railway culvert should not include work to significant fabric ○ if closure or blocking of the culvert is required, these works should be undertaken in a manner that would not impact significant fabric ○ if work to significant fabric is required, this should be undertaken in consultation with either a heritage architect or heritage consultant, and be conducted in a manner that minimises harm as much as practicable • Protection of significant fabric – bus shelter ○ measures should be put place to protect significant fabric of the bus shelter during its proposed removal and relocation ○ relocation position, and details of where and how it will be removed, stored and relocated, should be determined in consultation with Blue Mountains City Council ○ after relocation, conservation of the mural should be undertaken to prevent further loss, or to sympathetically reinstate missing portions • Protection of significant fabric – advertising sign ○ if removal of the advertising sign is required for the proposal, it should be salvaged and relocated ○ relocation position, and details of where and how it will be removed, stored and relocated, should be determined in consultation with Blue Mountains City Council ○ if removal of the advertising sign is not required for the proposal, appropriate measures should be put in place to protect it during proposed works, such as the installation of protective barriers or fencing • Protection of significant fabric – potential archaeological site of former Glenara Cottage ○ prior to use as an ancillary facility / stockpile area, the vacant land north of the petrol station should be covered with geotextile, or other suitable protective material, to ensure no inadvertent harm to potential archaeological resources occurs ○ no ground scraping, levelling or landscaping of this area should occur before, during or after the use of the area as an ancillary facility / stockpile area ○ this protection measure may not be required if a Historic (non- Aboriginal) Archaeological Assessment does not identify any significant archaeological potential.			
HER7	Protection and management of trees	A qualified arborist will be engaged to undertake an Arboricultural Impact Assessment of the proposal area, with a particular focus on trees associated with heritage items, Hydro Majestic (Blue Mountains LETP Item No.MB002), Avenue of trees (formerly Avenue of Radiata Pines)	Contractor	Pre-construction	Appendix J SoHI recommendation 6

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		(Item No.MB015) and Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No.MB026) . Management and protection measures recommended in the Arboricultural Impact Assessment should be implemented accordingly to ensure the protection and management of significant trees throughout the implementation of the proposal.			
HER8	Tree replacement	Trees removed as part of the proposal within the heritage curtilage of Hydro Majestic (Item No.MB002), Avenue of trees (formerly Avenue of Radiata Pines) (Item No.MB015) or Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No.MB026) will be replaced in a manner that is consistent with, and accurately reflect, the extent, nature and significance of the respective heritage item. The location, species and number of trees to be planted will be determined in consultation with the land owner, Blue Mountains City Council and a qualified arborist with reference to the identified heritage significance of the respective heritage item.	Contractor	Construction	Appendix J SoHI recommendation 7
HER9	Movable heritage	All moveable heritage identified as part of this assessment will be managed in accordance with a moveable heritage procedure. Moveable heritage identified on Hydro Majestic (Blue Mountains LEP Item No. MB002) land will be managed in accordance with Section 6.5, *Conserving Moveable Heritage, in the Hydro Majestic Hotel, Medlow Bath, Conservation Management Plan* (Graham Brooks and Associates, 2010).	Contractor	Construction	Appendix J SoHI recommendation 8
HER10	Before and after photographic record	Prior to construction, an archival photographic recording of the heritage items impacted by the proposed works is to be prepared in accordance with the NSW Heritage Division of the Department of Environment and Heritage guidelines titled "Photographic Recording of Heritage Items using Film or Digital Capture". The photographic should be prepared by a heritage consultant and must document significant heritage elements and items that will be impacted by the proposed works. The record should also document significant views and vistas as selected by the heritage consultant. This archival recording should include the following items as a minimum: • Medlow Bath Railway Station Group (SHR No.01190, TfNSW Section 170 SHI No. 4801011, Blue Mountains LEP 2015 Item No. MB003) • Hydro Majestic (Item No. MB002) • Former Post and Telegraph Store (Item No. MB008) • Avenue of Trees (Item No. MB015) • Urunga (Item No. MB017) • Melbourne House, Cosy Cot, Sheleagh Cottage (Item No. MB019) • Medlow Bath Hydro Majestic original walking track complex (only the parts within the grounds of the Hydro Majestic) (Blue Mountains LEP 2015 Item No. MB026) • Bus Shelter (potential heritage item) • Sandstone Railway culvert (potential heritage item) • Advertising sign (potential heritage item).	Contractor	Pre-construction, Operation	Appendix J SoHI recommendation 9

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HER11	Heritage interpretation	A heritage interpretation plan will be formulated and implemented in accordance with the Heritage NSW, *Interpreting Heritage Places and Items* (Heritage Office (former) 2005) as part of the proposed upgrade of the Great Western Highway. This is to be undertaken with the consent and co-operation of authorised owners or land managers and Blue Mountains City Council. Heritage interpretation should communicate the history of Medlow Bath, with reference to its identified heritage items, and enable audiences to engage with the significance of these places and the wider Blue Mountains area. It should be integrated into the broader cultural heritage design and heritage interpretation strategy for the overall Great Western Highway Katoomba to Lithgow Upgrade Program, and pick up themes relevant to the overall Great Western Highway route as well as Medlow Bath.	Contractor	Construction	Appendix J SoHI recommendation 10
HER12	Non-Aboriginal heritage	In the event that unexpected archaeological resources are identified in the course of the proposal, all work in the affected area should cease, the area should be cordoned off, and Heritage NSW should be notified, in accordance with Section 146 of the *Heritage Act 1977*. The TfNSW (2016) *Unexpected Heritage Finds Guideline* should be adhered to.	Contractor	Construction	Appendix J SoHI recommendation 11
HER13	Non-Aboriginal heritage	If the proposed works, or proposal area, are modified to those discussed in this report, additional heritage advice may be required to appropriately manage and mitigate any potential impacts caused by these changes.	Contractor, TfNSW	Pre-construction, construction	Appendix J SoHI recommendation 12
LAN1	Proposal Design	The following principles are to continue to be incorporated into the overall design of the proposal: • the motorists experience and attract people to town centre through the feature planting characteristic of the Blue Mountains area • screening of rail infrastructure where possible, using shrubs and trees, both native and exotic depending on the location • rounding of cut and fill batters to help integrate into the existing landform and create a more naturalised appearance • exploration of opportunities to reduce the Proposal footprint and need for temporary and ancillary sites to reduce impacts on surrounding landscape areas • Consolidating barriers and fences to increase visual access and pedestrian permeability in civic spaces • selection of lighting, signage and bus stops to compliment the Great Western Highway character • retention of views to existing non-aboriginal heritage items identified in the contextual analysis	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
LAN2	Bridge Design	The following principles are to continue to be incorporated into the design of the bridge: • The simplification of the bridge forecourts to enhance sightlines and access and enable equitable access for all users, • The refinement of the pedestrian bridge design to reduce its visual impact, by increasing the visual permeability, the positioning of the bridge to reduce the required	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		height and the visual elongation of the bridge through the design of the bridge truss bays that extend beyond the lift structures, • Maximising of opportunities to increase public amenity within the bridge forecourt and between proposed bus shelter/bus stops to enhance the public domain.			
LAN3	Accessibility	The design is to continue to provide improvements to cyclist and pedestrian access through new and upgraded, footpaths and shared paths to create a complete network around Medlow Bath Station, connecting into the existing network along the Great Western Highway between Katoomba and Leura.	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
LAN4	Finishes of Structures	The design of new retaining walls to have finishes of a high standard and quality, that is in keeping with the Great Western Highway character	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
LAN5	Landscaping	The following principles are to continue to be incorporated into the design of landscaping: • Planting strategies that respond to the existing historical and local context of Medlow Bath, • The planting of feature trees at the entry into Medlow Bath village, and to highlight access into Medlow Bath Station and proposed bus shelters, • The introduction of buffer planting in front of the retaining wall at the southern entry into Medlow Bath to minimise visual impacts, • Maximising of new tree planting where possible; within medians turning facilities, and verges to reduce the scale of the proposal over time as the tree plantings mature. Consideration has been given to sight lines for motorists when identifying possible locations, • Utilisation of native and endemic plantings along the highway outside of the village to consider pedestrians and cyclists using the existing trails as links to regional routes, • Maximisation of revegetation with appropriate species along the highway to reduce perceived corridor width.	TfNSW	Detailed design	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)
LAN6	Design Integration	The following measures are to be adopted during the Detailed Design stage: • All reasonable measures taken to minimise the loss of existing vegetation along the proposal corridor. Those measures will include minimise clearing of trees for construction access, rationalisation of maintenance access, • Investigate the borrowed landscape and opportunities for additional tree plantings along the proposal corridor, • Investigate opportunities to incorporate heritage qualities within the bridge design, • Further opportunities investigated to increase landscape zones within the road corridor,	TfNSW / Contractor	Detailed design / Construction	Appendix K, UD, LC and VIA mitigation measures (Chapter 12)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Lighting and signage to be well-considered in its placement and should not detrimentally add to the visual impact, • At locations where greater visual impacts have been identified, the specification and planting of more mature sized shrubs and trees would be adopted to help reduce the visual impact upon opening of the road since the proposed planting would take a number of years (approximately between 3 to 10 years) to establish at adequate height, • Where site compounds are needed rehabilitate to previous state.			
SOC1	Property	A Property Acquisition Plan will be prepared and implemented in accordance with the requirements of the *Property Acquisition (Just Terms Compensation) Act 1991.*	TfNSW	Pre-construction	Standard safeguard
SOC2	Community	A Communications Plan will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The plan will include (as a minimum): • identification of key stakeholders such as the Hydro Majestic Hotel, private residences and business, Blue Mountains City Council • mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • contact name and number for complaints • the plan will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (Roads and Traffic Authority, 2008).	Contractor	Detailed design / Pre-construction	Standard safeguard
SOC3	Construction	Access to private residential properties, businesses and the Hydro Majestic Hotel would be maintained throughout the construction period.	Contractor	Construction	Appendix L
CUM1	Cumulative construction impacts	Other developers will be consulted: • to obtain information about project timeframes and impacts. Identify and implement appropriate safeguards and management measures to minimise cumulative impacts • to manage the interfaces of the proposal's staging and programming in combination with the other projects occurring in the area.	TfNSW / Contractor	Pre-construction	REF Section 5.2
CUM2	Cumulative construction impacts	All environmental management plans (including but not limited to the Traffic Management Plan and Noise and Vibration Management Plan) will be prepared to consider other developments in the area.	Contractor	Pre-construction	REF Section 6.1.4, REF Section 6.5.4, REF Section 6.6.4,

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Heritage Act 1977 (s60)	Permit to carry out activities to an item listed on the State Heritage Register (ie Medlow Bath Railway Station) or to which an interim heritage order applies from the Heritage Council of NSW.	Prior to start of the activity
Protection of the Environment Operations Act 1997 (s43)	Environment protection licence for scheduled activities, including road construction and excavation activities, from the EPA.	Prior to start of the activity
Roads Act 1993 (s138)	Road occupancy licence from Transport Management Centre and Blue Mountains City Council for work on TfNSW and council operated roads.	Prior to the start of the activity

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

8.1 Justification

The proposal is needed to provide a safer and more efficient link between Central West NSW and the Sydney Motorway Network for freight, tourist and general traffic.

An upgrade of the Great Western Highway between Katoomba and Lithgow can be supported by reference to several strategic planning and policy documents including *NSW Future Transport Strategy* 2056 (TfNSW, 2018a) and the *NSW Freight and Ports Plan* (TfNSW, 2018b). The proposal has been reviewed against and is found to be consistent with relevant strategic plans.

Average daily traffic volumes in the corridor vary from around 20,000 vehicles per day near Katoomba to around 8,500 vehicles per day towards Forty Bends, and are growing between one to 1.7 per cent per annum. There is a relatively high proportion of heavy vehicles along the corridor (between 12 and 24 per cent) and this reflects the fact that the Great Western Highway link to the Central West carries 18,800 tonnes of freight per day (10,300 towards Sydney and 8,500 towards the Central West).

Upgrading to dual carriageway would provide travel time savings for all traffic users and would largely maintain those savings well into the future. Without an upgrade, travel times would worsen, while congestion would deteriorate to unacceptable levels.

The current performance of the corridor constrains access for freight infrastructure from the Central West to Sydney which would include the proposed Parkes National Logistics Hub and the Inland Rail Program.

As part of a staged upgrade program, the Medlow Bath proposal aims to deliver benefits consistent with Great Western Highway Upgrade Program objectives. The proposal would also provide safe and equitable access to the Medlow Bath Station platforms and to the pedestrian network surrounding the station, where it does not currently meet key requirements of the DSAPT or the DDA.

Through the design and environmental assessment process TfNSW has concluded that out of the options considered the preferred alignment for the Katoomba to Medlow Bath zone is the existing road corridor as it best meets the proposal objectives and development criteria for the proposal.

8.2 Objects of the EP&A Act

Table 8-1: How the proposal aligns to the objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. An integrated design is proposed that fits with the existing high visual qualities, ecology and character of Medlow Bath and the Blue Mountains setting. In addition, the proposal would contribute to the functionality of public spaces and enhance local and regional connectivity.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	One of the proposal objectives is to maintain and enhance the local amenity and character and protect environmental and cultural assets. The proposal would improve active transport and local traffic connectivity along and across the corridors. As well as preserve local heritage assets and enhance local amenity and character through sensitive urban design. Ecological sustainable development is addressed in Section 8.2.1.
1.3l To promote the orderly and economic use and development of land.	The proposal forms part of the overall Great Western Highway Upgrade between Katoomba and Lithgow. One of the key objectives of the proposal, aligned with the Great Western Highway Upgrade Program objectives, is to improve the ability to drive regional economic development and freight productivity. The proposal would provide four lanes with dedicated turn lanes to separate heavy vehicle flow from locally turning traffic. The proposal would promote the orderly and economic use and development of land for the Blue Mountains region and along the freight transport corridor.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3l To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Section 6.1 addresses the biodiversity assessment for the proposal and identifies appropriate mitigation and management measures to avoid, minimise and mitigate potential impacts to threatened and other species of native animals and plants, ecological communities and their habitats.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal would minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal. Environmental assessment addressing potential impacts and appropriate mitigation and management measures to preserve non-Aboriginal heritage and Aboriginal heritage and promote the sustainable management of built and cultural heritage is discussed in Section 6.7 and Section 6.8.
1.3(g) To promote good design and amenity of the built environment.	One of the key features of the proposal is the construction of a new pedestrian bridge that connects Railway Parade, Medlow Bath Station and new indented bus bays on both sides of the Highway in line with Transport Access Program requirements. The design of the pedestrian bridge and other features of the proposal would be sensitive to the locality to promote good design and amenity to the built environment.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	One of the proposal objectives is to reduce actual and perceived safety risks. The proposal would separate traffic flows and user groups, upgrade objectives and provide safer facilities. Also, trees that have reached their end of life would be removed to address the risk of falling trees along the highway and rail corridor.

Object	Comment
	The proposal would also make network provisions for emergency services and provide safe continuous access to transport services.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	The community and relevant other key stakeholders have been consulted throughout the strategic and concept design of the proposal, assisting to shape the proposal to address the needs of the community. Consultation would be ongoing throughout detailed design and during construction of the proposal. Community involvement in the proposal is discussed in Chapter 5.

8.2.1 Ecologically sustainable development

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

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

The precautionary principle

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

This principle was considered during route options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures. Specialist studies were incorporated to gain a detailed understanding of the existing environment and identify best practice environmental mitigation and management measures to minimise environmental risks.

Intergenerational equity

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

The economic benefits in the form of freight efficiency and development potential for surrounding areas for the current and future generation were identified. In addition, benefits that the project provides to current and future generations of local communities and the surrounding region that would maintain or enhance the health, diversity and productivity of the environment were identified.

Conservation of biological diversity and ecological integrity

Preserving biological diversity and ecological integrity requires that ecosystems, species and genetic diversity within species are maintained.

Landscape strategy was developed and implemented which reflected the structure and species of locally endemic flora to ensure that biological diversity in the local area is maintained. Also, site selection criteria were established for construction phase facilities that include minimising native vegetation clearance.

Improved valuation, pricing and incentive mechanisms

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

Environmental issues were considered as key matters in the route selection process and in the economic and financial feasibility assessments for the project. The value of the project to the community in terms of improved safety was recognised.

Mitigation measures for the avoidance, reuse, recycling and management of waste during construction and operation are to be implemented.

8.3 Conclusion

The proposed Great Western Highway Upgrade at Medlow Bath is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

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

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on non-Aboriginal heritage, landscape character and visual impact, noise and vibration, soils and water, contamination, traffic and transport. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve road safety and reduce travel times. On balance the proposal is considered justified and the following conclusions are made.

8.3.1 Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

There would be no significant impact on any other aspect of the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.3.2 Significance of impact under Commonwealth legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of Agriculture, Water and the Environment is not required.

This REF has been prepared to meet the requirements of the EPBC Act strategic assessment approval for TfNSW Division 5.1 road activities. A referral to the Australian Department of Agriculture, Water and the Environment is not required.

9. Certification

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

Tim Graffen

Environment Officer

Transport for NSW

Date:

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Pete Styles

Project Development Manager – Great Western Highway Upgrade Program

Transport for NSW

Date:

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Terms and acronyms used in this REF

Term / Acronym	Description
AEP	Annual exceedance probability. The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.
AHIMS	Aboriginal Heritage Information Management System
AOBV	Areas of outstanding biodiversity value
BC Act	*Biodiversity Conservation Act 2016* (NSW).
Blue Mountains LEP	*Blue Mountains Local Environmental Plan 2015*
CEMP	Construction environmental management plan
CLM Act	*Contaminated Land Management Act 1997* (NSW)
Concept design	The preliminary design presented in this REF, which would be refined by the contractor (should the proposal proceed) to a design suitable for construction (subject to TfNSW acceptance).
Contractor	The entity to be appointed by TfNSW to undertake the detailed design and construction of the proposal.
DDA	*Disability Discrimination Act 1992* (Commonwealth)
Determining authority	A Minister or public authority on whose behalf an activity is to be carried out or public authority whose approval is required to carry out an activity (under Division 5.1 of the EP&A Act).
DOS	Degree of Saturation. Refers to ratio of traffic using an intersection to its capacity. A DOS value greater than 1.0 indicates that the intersection is over capacity.
DSAPT	Disability Standards for Accessible Public Transport
EEC	Endangered ecological community
EIA	Environmental impact assessment
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EPA	Environment Protection Authority (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environment protection licence, issued under the POEO Act.
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	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009)
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
KTP	Key threatening process
LALC	Local Aboriginal Land Council
LCZ	Landscape character zone. Defined as the collective qualities including the built form, natural elements, and the cultural and social facets that combine to provide a locale with a unique sense of place
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.

Term / Acronym	Description
LGA	Local government area
LOS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
MRB	Mott MacDonald, RPS and BG&E. A joint venture engaged by TfNSW to prepare the concept design and REF.
NCA	Noise catchment area. Refers to a group of receivers within a similar noise environment for the purposes of a noise assessment.
NML	Noise management level. Calculated as per the methodology in the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) and represent an increase in the noise level that is likely to be acceptable during construction.
NorBE	Neutral or Beneficial Effect. An assessment tool published by WaterNSW to understand potential impacts within the Sydney Drinking Water Catchment.
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
Out of hours works	Defined as works undertaken *outside* standard construction hours (ie outside of 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work on Sundays/public holidays).
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PCT	Plant community type
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PPV	Peak particle velocity
Proposal	The construction and operation of a 1.2 kilometre section of the Great Western Highway at Medlow Bath, between Railway Parade and around 330 metres south of Bellevue Crescent
Proposal area	The area where the construction and operation of the proposal would be undertaken and which has been assessed in this REF (ie Figure 1-2 and areas nominated in this REF for ancillary facilities).
RBL	Rating background level. A measure of the existing noise level calculated in accordance with the *Noise Policy for Industry* (EPA, 2017).
RCP	Representative Concentration Pathway. Refers to climate change scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases and aerosols and chemically active gases, as well as land use / land cover. An RCP of 8.5 represents a scenario at the higher end of likely temperature increases.
REF	Review of Environmental Factors (this document).
RNP	*Road Noise Policy* (EPA, 2011)
Roads Act	*Roads Act 1993* (NSW)
Roads and Maritime	NSW Roads and Maritime Services, now known as Transport for NSW.
SEIA	Socio-economic impact assessment
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SHI	State Heritage Inventory
SHR	State Heritage Register
SIDRA	Signalised Intersection Design Research Aid. A type of traffic modelling software.

Term / Acronym	Description
SMM	Spackman Mossop Michaels
SoHI	Statement of Heritage Impact
Strategic design	An earlier design stage for the Medlow Bath section of the Great Western Highway Upgrade which was displayed for community feedback in July 2020.
TEC	Threatened ecological community
TfNSW	Transport for NSW
THPSS	Temperate Highland Peat Swamp on Sandstone. A type of threatened ecological community.
QA Specifications	Specifications developed by TfNSW for use with road work and bridge work contracts let by TfNSW.

Appendix A

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

Clause 228(2) checklist

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

Factor	Impact
a) Any environmental impact on a community? Construction of the proposal would result in some short term negative impacts due to • construction noise due to the use of construction plant and machinery for the proposal during and outside of standard work hours for the duration of construction • visual amenity due to the removal of vegetation and the construction of the proposal • traffic impacts due to an increase in construction vehicles and heavy vehicles transporting materials to and from the proposal, traffic and safety management measures temporarily reducing speed limits within the construction area, and temporary traffic changes resulting in increased traffic. Environmental impacts on the community would be mitigated following the safeguards and mitigation measures within this REF (refer to Chapter 7). The construction of the proposal would result in long term minor positive improvements to road safety and traffic efficiency within the community and broader Blue Mountains region, and maintenance and enhancement of the local amenity and character of Medlow Bath including the protection of environmental and cultural assets. This would result in a positive net benefit to the community.	Short term, minor (negative) Long term, minor (positive)
b) Any transformation of a locality? The proposal would temporarily transform the locality during construction due to the visual amenity, traffic and noise impacts from construction works. The proposal would result in the long term transformation of the locality through the upgrade and duplication of the existing surface road corridor, intersection improvements and a new pedestrian bridge in Medlow Bath resulting in long term improvements to traffic, safety and access.	Short term minor (negative) Long term minor (positive)
c) Any environmental impact on the ecosystems of the locality? Construction of the proposal would have the potential to involve the removal of native vegetation, removal of threatened fauna habitat, removal of threatened flora, aquatic impacts, fauna injury or mortality, impacts from construction noise, light and vibration. Furthermore, operation of the proposal would have the potential to result in reduced wildlife connectivity and habitat fragmentation, edge effects on adjacent native vegetation, invasion and spread of weeds, pests, pathogens and disease, changes to hydrology, impacts to groundwater dependent ecosystems and cumulative biodiversity impacts. The proposal would have a minor negative impact on the ecosystems of the locality in both the short term and the long term. Mitigation and management measures are proposed to minimise impacts on the ecosystems to the locality (refer to Chapter 7).	Short term and long term, minor (negative)
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposal would temporarily reduce the visual amenity of the locality due to the removal of vegetation, and visibility of the construction works. During operation, the new pedestrian bridge would be visible to residents, businesses and travellers through Medlow Bath. The proposal is being designed sympathetic to the existing natural, social, and cultural values of the locality to minimise aesthetic impacts. Further, landscaping would be implemented during operation of the proposal to mitigate visual amenity impacts of the proposal. During construction there would be additional construction traffic movements and traffic impacts on the Medlow Bath locality, and to travellers passing through Medlow Bath along the Great Western Highway. During operation, traffic and safety aspects of the proposal are anticipated to be improved. No scientific or recreational values of the locality are anticipated to be impacted due to the proposal.	Short term, minor, (negative) Long term (neutral)
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?	Short term and long term, minor (negative)

Factor	Impact
There are a number of listed heritage items located within the proposal area. The proposal would impact on the State heritage listed Medlow Bath Station due to the upgrade and installation of the new pedestrian bridge, and would also impact local heritage listed items such as the Hydro Majestic and Avenue of Trees. Mitigation and management measures would be implemented during construction and operation of the proposal to minimise impacts to non Aboriginal heritage due to the proposal. The proposal would not impact on any known Aboriginal heritage items or places.	
f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974)?* Approximately 0.32 hectares of potential habitat of threatened flora, fauna and migratory bird species with a moderate or greater likelihood of occurrence would be removed by the proposal. The proposal is however not considered to have a significant impact on any threatened or endangered species or threatened ecological community. Mitigation and management measures are outlined in Chapter 7 to minimise biodiversity impacts due to the proposal.	Short term and long term, minor (negative)
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal is considered not likely to endanger any species of animal, plant or other form of life due to the limited amount of vegetation to be removed by the proposal that forms potential habitat for threatened flora, fauna and migratory bird species. Vegetation removal would be minimised following the mitigation and management measures outlined in Chapter 7. The proposal is to be constructed within a constrained corridor of limited space as it is located atop a ridgeline adjacent to residents and businesses. The proposal is also located nearby the World Heritage Listed Blue Mountains National Park that provides a vast area of protected habitat for wildlife within the locality.	Long term, minor (positive)
h) Any long-term effects on the environment? The proposal would have minor long term impacts on the environment due to removal of vegetation and the expansion of the road corridor. There would be long term visual amenity impacts on the proposal due to the changes to the road alignment and the construction of the new pedestrian bridge. The proposal would minimise any adverse impacts due to the proposal through sensitive design, and by completing progressive landscaping of the proposal area. The mitigation and management measures for the proposal are outlined in Chapter 7 to minimise environmental impacts due to the proposal.	Long term, minor (negative)
i) Any degradation of the quality of the environment? The proposed upgrade has the potential to degrade the quality of the environment through construction noise, visual impacts of the construction works, water impacts due to erosion and sedimentation, air impacts due to dust from construction works and emissions from construction plant and vehicles, as well as accidental spills during construction. These potential impacts would be managed using a suite of safeguards and mitigation measures outlined in section 7. The construction footprint would be reduced as far as practicable, and the site would be rehabilitated as work progresses to minimise impacts.	Short-term, minor (negative)
In the long-term, the project would provide a range of benefits including improved safety, traffic and transport conditions and amenity due to the construction of the new pedestrian bridge, shared path and dual carriageway of the highway as well as landscaping of the proposal area.	Long-term, major (positive)
j) Any risk to the safety of the environment? The proposal is likely to temporarily reduce safety along the road during construction due for the works being within the existing highway. This would be managed through appropriate signage and a traffic management following an appropriate traffic management plan.	Short-term, minor (negative)
The proposal would improve road safety and traffic in the long term due to the separation of road carriageways for traffic travelling in each direction along the highway, improved shared path and pedestrian bridge amenity. The proposal would improve access to local business such as the Hydro Majestic Hotel and to local roads adjacent to the highway within Medlow Bath that would also result in improvements to road safety and traffic during operation of the proposal.	Long term, major (positive)
k) Any reduction in the range of beneficial uses of the environment? The proposal would result in traffic impacts during construction which would include an increase in the volume of heavy vehicles, interruption of traffic flow and temporary reduced speeds to implement safety measures, and temporary impacts to access. These traffic impacts would reduce the beneficial use of the Great Western Highway at Medlow Bath during the construction phase.	Short-term, minor (negative)

Factor	Impact
In the long term there would be no reduction in the range of existing beneficial uses of the environment. The proposal is being design sensitive to the existing features of the locality.	Long term (neutral)
l) Any pollution of the environment? There would be some potential construction noise due to the operation of plant and machinery, visual due to the construction site within the locality, air pollution due to dust from the construction site, water pollution due to potential spills, contamination due to the location of the proposal adjacent to a petrol station and the potential for uncovering unexpected contaminated materials, erosion and sedimentation impacts associated with construction of the proposed upgrade. Construction activities would be carefully managed with numerous safeguards for the protection of the environment from pollution (refer to Chapter 7).	Short-term, minor (negative)
During operation of the proposal the proposal area would be restored and landscaped, noise impacts would be mitigated and reduced due to the completion of the construction works, minor long term benefits to air quality may occur due to the reduced vehicle emissions from improved traffic conditions.	Long term, minor (positive)
m) Any environmental problems associated with the disposal of waste? Waste would be generated across a number of waste streams during construction. These streams would be managed in accordance with Transport for NSW specification, the *Waste Avoidance and Resource Recovery Act 2001* and recycled where possible (refer to section 7 for safeguards). There is the potential for uncovering contaminated material due to the proposal from the United Petrol Station, the Mazda car dealership, stockpiled ballast and uncontrolled fill material. Material would be appropriately managed following the safeguards and mitigation measures within section 7 and any material removed from site would be taken to an appropriately licenced facility.	Short-term, minor (negative)
No impacts are proposed during the operation of the proposal.	Long term (neutral)
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? None of the resources required to construct this proposal are, or are likely to become, in short supply.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? The proposal forms part of the Great Western Highway Upgrade throughout the Blue Mountains between Katoomba and Lithgow delivering about 34 kilometres of four lane divided highway, building on the already upgraded section between Emu Plains and Katoomba. There are potential cumulative impacts due to the proposal and associated construction works within the locality such as combined traffic impacts, visual amenity for travellers along the highway, and minor air impacts from plant and vehicle emissions. The proposal is not anticipated to generate any major environmental impacts.	Short term, minor (negative)
Operation of the proposal would likely result in an overall positive cumulative impact due to the combined traffic and safety benefits of the upgraded transport corridor throughout the Blue Mountains and western Sydney.	Long term, major (positive)
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal is not located within a coastal zone.	Nil

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment.

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

Factor	Impact
a) Any impact on a World Heritage property? The proposal is not expected to impact on a World Heritage property as there are no World Heritage listed items located in the proposal area or within close proximity to the proposal area. The Greater Blue Mountains World Heritage Area is located over two kilometres from the proposal area and would not be impacted by the proposal.	Nil
b) Any impact on a National Heritage place? The proposal is not expected to impact on a National Heritage place as there are no National Heritage listed items located in or within close proximity to the proposal area. The Greater Blue Mountains National Heritage Area is located over two kilometres from the proposal area and would not be impacted by the proposal.	Nil
c) Any impact on a wetland of international importance? The proposal is not expected to impact on a wetland of international importance as there are no wetlands of international importance (as listed in the RAMSAR convention) located in or within close proximity to the proposal area.	Nil
d) Any impact on a listed threatened species or communities? The proposal would not have a significant impact on threatened or endangered species or communities. However, would have the potential to impact on habitat for threatened flora and fauna, and migratory birds due to the proposed removal of 0.34 hectares of vegetation.	Minor impact
e) Any impacts on listed migratory species? The proposal would impact on habitat for migratory birds due to the proposed removal of 0.34 hectares of vegetation. The proposal would not have a significant impact on migratory bird species.	Minor impact
f) Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine area as there are no Commonwealth marine areas located in or within close proximity to the proposal.	Nil
g) Does the proposal involve a nuclear action (including uranium mining)? The proposal related to road and rail infrastructure and does not involve a nuclear action.	Nil
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal is not located on Commonwealth land and would not result in any impact (direct or indirect) on Commonwealth land.	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by rail customers using regular bus services?	Yes	Blue Mountains City Council and the occupiers of adjoining land	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	Blue Mountains City Council and the occupiers of adjoining land	ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Blue Mountains City Council and the occupiers of adjoining land	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes / No / NA	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No	Blue Mountains City Council	ISEPP cl. 15A

Note: See interactive map here: ***https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management***. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	Yes	Blue Mountains City Council	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	Yes	Blue Mountains City Council	ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	Blue Mountains City Council	ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	Blue Mountains City Council	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	Yes	Blue Mountains City Council	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Blue Mountains City Council	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than *minor* or *inconsequential?*	Yes	Blue Mountains City Council	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No	Blue Mountains City Council	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government.

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act*?*	No	Environment, Energy and Science, DPIE	ISEPP cl.16(2)(a)
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment, Energy and Science, DPIE	ISEPP cl. 16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Planning, Industry and Environment	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998?*	No	Property NSW	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service *[Refer to the NSW Rural Fire Service publication Planning for Bush Fire Protection (2006)]*	ISEPP cl.16(2)(f)
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Appendix C

Neutral or beneficial effect on water quality assessment

Neutral or Beneficial Effect Assessment

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

Factor	Impact
1. Are there any identifiable potential impacts on water quality? What pollutants are likely? During construction and/or post construction?	Identified potential pollutants are sediments (fine and coarse), nitrogen, phosphorus, pathogens, hazardous chemicals and contaminants such as oil/fuel. These pollutants are not new to the catchment as there is no new land use proposed as part of the proposal. However the project increases the generation of these pollutants as widening facilitates more traffic movements through the area, and increased pavement areas reduce the pervious portions of the catchment which provide treatment for runoff and filtration of the pollutants. Specific water quality pollutant generation during construction result from the disturbance of soil in demolition and excavation, stockpiling and sedimentation from unfinished surfaces.
2. For each pollutant, list the safeguards needed to prevent or mitigate potential impacts on water quality (these may be WaterNSW endorsed current recommended practices and/or equally effective other practices)	Safeguards, or water quality protection measures, that need to be in place during the construction. • Perimeter sedimentation control (fence) and swale drains/bunds • Stabilised construction access including shaker pads • Wash down facilities for trucks and plant • Sedimentation basin • Spill control/oil separator at discharge locations Safeguards, or water quality protection measures, that need to be in place during operational stages of the project. • Bioretention basin to Council specification • Gross pollutant trap • Stormwater attenuation
3. Will the safeguards be adequate for the time required? How will they need to be maintained?	The Construction Environmental Management Plan (CEMP) will include the regular maintenance of the construction stage water quality improvement measures including roles and responsibilities for monitoring the quality and effectiveness of the measures at each stage of construction. This includes regular inspection and cleanout of the mitigation measures which will capture varying loads of pollutants at stages of construction dependent on the current activities on-site. Operational phases of the proposal will include maintenance regimes to the stormwater reticulation network, gross pollutant trap and bioretention/stormwater attenuation facilities. This includes the management of vegetation, removal of pollutant loads and system blockages, and replacement of any filtration media to a maintenance program dependent on the size and specification of the measures selected during detailed design stages.
4. Will all impacts on water quality be effectively contained on the site by the identified safeguards (above) and not reach any watercourse, waterbody or drainage depression? Or will impacts on water quality be transferred outside the site for treatment? How? Why?	The project drains to controlled areas for water quality and as such MUSIC modelling has been undertaken to determine the impacts and treatment required to achieve no worsening of pollutants in discharge water reaching the receiving environment. The impacts on water quality of the project will be managed on-site through collection of runoff, reticulation to the gross pollutant trap and subsequent discharge to the bio-retention basin. Bioretention to be collocated with the stormwater attenuation basin such that runoff peak volumes are not increased as a result of the proposal.
5. Is it likely that a neutral or beneficial effect on water quality will occur? Why?	When the activity has been completed, the level of pollutants will be lower than before construction. Current water quality improvement measures for the discharge of stormwater are minimal and mainly comprise treatment through informal measures such as overland flows routed through vegetation providing filtration through infiltration. The post developed treatment measures will remove gross pollutants and further reduce residual pollutants through biofiltration prior to discharge.

Appendix D

Technical Paper – Biodiversity Assessment

Appendix E

Technical Paper – Hydrology and Hydraulic Impact Assessments

Appendix F

Technical Paper – Surface and Ground Water Impact Assessments

Appendix G

Phase 1 Preliminary Site Investigation and Report

Appendix H

Technical Paper – Traffic and Transport Impact Assessment

Appendix I

Technical Paper – Noise and Vibration Impact Assessment

Appendix J

Technical Paper – Statement of Heritage Impact

Appendix K

Technical Paper – Urban Design, Landscape Character and Visual Impact Assessment

Appendix L

Technical Paper – Socio-economic Impact Assessment

Appendix M

General Arrangement Plans

Appendix N

Medlow Bath Consultation Summary Report