



Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section)

Addendum review of environmental factors

Transport for NSW

June | 2023

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Prepared by AECOM and Transport for NSW

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Executive summary

Background

Transport for NSW (Transport) proposes to upgrade the Great Western Highway between Katoomba and Lithgow (the Upgrade Program). The Upgrade Program will deliver around 34 kilometres of four lane divided highway between Katoomba and Lithgow. The program is needed to reduce congestion and provide a safer and more efficient link for those travelling in, around, and through the Blue Mountains, as well as between the Central West NSW and the Sydney Motorway Network for freight, tourists, and general traffic.

As part of the Upgrade Program, the Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) (the Little Hartley to Lithgow Upgrade), located immediately to the west of the Blue Mountains within the Lithgow local government area, has been approved (the approved project). A Review of Environmental Factors (REF) (the approved project REF) was prepared for the approved project in 2021 (Transport, 2021a), including specialist environmental investigations. The approved project was determined in April 2022, simultaneously with the finalisation of the Submissions Report (Transport, 2022a).

Transport proposes to modify the approved project following further design development and construction planning carried out since determination of the approved project.

Need for the proposed modification

When the approved project REF was written, it described and assessed impacts relating to the concept design of the Little Hartley to Lithgow Upgrade as it was in 2021, which included an indicative tie-in to the Great Western Highway Blackheath to Little Hartley Upgrade. Since this work, the design for the Great Western Highway Blackheath to Little Hartley Upgrade has been developed further. Now, this proposed modification has been proposed to provide a safer and more functional interface, with improved local connectivity, between the approved project and the Great Western Highway Blackheath to Little Hartley Upgrade.

The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the approved project, as presented in Chapter 2 (Need and options considered) of the approved project REF. It will also provide further benefits, including improved amenity, access, and local traffic flow in and around the Little Hartley area due to reduced interaction between local traffic and traffic on the Great Western Highway, making it safer and easier to move around the Little Hartley area.

The proposed modification

The proposed modification predominantly relates to the easternmost part of the approved project, between Little Hartley, at the base of Victoria Pass, to around 100 metres east of Coxs River Road. The proposed modification also includes amendments to the construction footprint and additional construction ancillary facilities which would improve construction efficiencies.

Opportunities to improve safety, connectivity, amenity, and the active transport infrastructure proposed in the approved project REF have been identified and proposed as part of the proposed modification.

The key features of the proposed modification include:

- Minor amendments to the alignment and extent of the new surface section of the Great Western Highway. The proposed modification relates to around 1.4 kilometres of the new

eastbound carriageway and around 650 metres of the new westbound carriageway and includes associated changes to cut and fill

- Realignment of the existing Great Western Highway from around 1.8 kilometres east of Coxs River Road to around 100 metres east of Coxs River Road, including realignment of the new Service Road 1 bridge over the carriageway of the new Great Western Highway
- An on-ramp (around 700 to 900 metres east of Coxs River Road) connecting the existing Great Western Highway westbound to the westbound carriageway of the new Great Western Highway
- An off-ramp and new bridge connecting the eastbound carriageway of the new Great Western Highway from around 1.1 kilometres east of Coxs River Road to the existing Great Western Highway near the Berghofers Pass car park
- A new access road connection off the realigned existing Great Western Highway to provide local property access
- Active transport infrastructure to connect the formalised Berghofers Pass car park to the existing Great Western Highway
- Formalisation of Berghofers Pass car park and entrance / exit to the existing Great Western Highway in Little Hartley
- New and relocated surface water management infrastructure, including a new water quality treatment basin at Little Hartley for use during both construction and operation
- Extended adjustment of 132 kilovolt overhead powerlines and poles at Hartley.

The proposed modification also involves minor amendments to the construction footprint to accommodate the aforementioned modifications to the project design and seven additional construction ancillary facility areas. Construction planning has developed from what was assessed in the approved project REF and two temporary diversions (side-tracks) have been identified, plus a higher velocity blasting criterion.

A full description of the proposed modification is provided in Chapter 3 (Description of the proposed modification) of this addendum REF.

Proposed modification objectives

The proposed modification has been proposed to support the objectives of the approved project and the Upgrade Program, which are:

- To improve economic development, productivity, and freight accessibility in and through the Blue Mountains, Central West, and Orana regions
- To improve the resilience of the corridor between Katoomba and Lithgow to ensure continuity and safety of transport and essential services
- To improve transport network performance and efficiency along the corridor between Katoomba and Lithgow to meet the needs of users
- To improve the overall safety of the corridor for all transport users between Katoomba and Lithgow
- To enhance the liveability and be sensitive to the unique environmental and cultural assets along the corridor between Katoomba and Lithgow.

Options considered

In developing alternatives and options for key features of the proposed modification, Transport sought to meet the approved project objectives whilst minimising potential environmental and socio-economic impacts.

The preferred option (the proposed modification) would improve environmental, operational, and technical outcomes, whilst also satisfying the proposal objectives. It would also support the relevant planning policies, objectives, and design criteria outlined in Section 2 (Need and options considered) of the approved project REF.

Statutory and planning framework

The proposed modification is subject to assessment under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). In line with Section 5.5 of the EP&A Act, this addendum REF examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the proposed modification.

State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) also applies to the proposed modification. Clause 2.109 of TISEPP 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.

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

Community and stakeholder consultation

The consultation strategy for the proposed modification remains consistent with the community and stakeholder engagement strategy for the Upgrade Program.

Consultation for the approved project has been ongoing since the NSW Government first announced an upgrade from Mount Victoria to Lithgow in May 2008, until exhibition of the approved project REF (refer to Chapter 5 (Consultation) of the approved project REF for further details).

Since determination of the approved project, consultation with the following stakeholders has occurred during design development for the approved project (including for elements of the proposed modification):

- Lithgow City Council
- NSW National Parks and Wildlife Service
- Residents and landowners
- Businesses
- Emergency services
- Hartley District Progress Association
- Local Aboriginal Community
- Freight industry representatives
- Energy and communications representatives.

Consultation with the Aboriginal community has been carried out throughout the approved project REF development process in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) process. As part of further construction planning and the assessment of potential impacts of the proposed modification on Aboriginal

heritage, additional site surveys were also carried out with participation from representatives of the following Registered Aboriginal Parties (RAPs):

- Bathurst Local Aboriginal Lands Council
- Mingaan Wiradjuri Aboriginal Corporation.

Impacts upon Aboriginal sites attributed to the construction and operation of the proposed modification have been assessed in Section 6.4 of this addendum REF.

Environmental impacts

The construction and operation of the proposed modification would result in some additional environmental impacts and benefits to the approved project. These are discussed below.

Biodiversity

Construction of the approved project would result in the clearance of 75.19 hectares of native PCT vegetation. The proposed modification would result in the additional clearance of 1.18 hectares of native vegetation, which would comprise of the following Plant Community Types (PCTs), listed under the BC Act, and Threatened Ecological Communities (TECs):

- 0.03 hectares of PCT 766: Carex Sedgeland of the slopes and tablelands (listed as Endangered under the BC Act) (low condition). This PCT is associated with the TEC, Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, Southeast Corner, South-eastern Highlands and Australian Alps bioregions (listed as Endangered within the BC Act)
- 0.21 hectares of PCT 1103: Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion (listed as Endangered under the BC Act) (moderate condition). This PCT is associated with the TEC, Tableland Basalt Forest in the Sydney Basin and South-eastern Highlands Bioregions (listed as Endangered within the BC Act)
- 0.94 hectares of PCT 1615: Monkey Gum – *Eucalyptus blaxlandii* shrubby open forest on basalt of the Sydney Basin (low to high condition).

The boundary of the proposed modification has been designed to avoid as much vegetation and habitat as possible, including Purple Copper Butterfly (*Paralucia spinifera*) habitat, eucalypts and hollow bearing trees, and Key Fish Habitat. In total, construction of the proposed modification would result in the removal of 16.04 hectares of native and non-native vegetation. The removal of additional potential threatened species habitat would be managed in accordance with additional safeguards within approved project REF, as presented in the Submissions Report, including exclusion zones to avoid these areas.

Consistent with the conclusion of the approved project REF, injury and mortality of fauna is likely during construction activities associated with the proposed modification, such as vegetation clearing, collision with work vehicles or plant, and accidental entrapment in plant, trenches, or other works. Movement of material, such as activities associated with earthworks and vegetation clearance, and increased noise and human presence, has the potential to facilitate the introduction or spread of weeds, the dispersal of pest species throughout the area. However, the risk and likelihood of these impacts upon biodiversity are consistent with the approved project REF.

Additional and/ or modified biodiversity safeguards and management measures to those for the approved project REF, as presented in the Submissions Report, have been provided in this addendum REF.

Traffic and Transport

Construction of the modified project would introduce additional light and heavy construction vehicles to the Great Western Highway and associated local road; however, the estimated daily light and heavy vehicle movements would be consistent with those identified for the approved project.

As identified in the approved project REF, a Traffic Management Plan (TMP) would be prepared for the construction area and progressively updated as the works progress. The TMP would provide details of the traffic management measures to be implemented during construction to manage and regulate traffic movements on the surrounding network, maintain vehicular, pedestrian, and cyclist access and minimise traffic congestion where possible. Specifically, the TMP would include management measures to minimise the traffic and transport impacts associated with the formalisation of the Berghofers Pass car park area and access. To manage potential additional impacts during construction, it is proposed that construction planning during detailed design would further investigate heavy earth moving haulage plant/ moxy crossings of the Great Western Highway to reduce the need for road haulage trucks to travel on the existing Great Western Highway.

The operational road network performance improvements associated with the approved project would remain the same in the modified project as no major changes to the upgraded Great Western Highway alignment and its intersections are proposed. The modified project would also offer the following benefits:

- Local traffic on the Service Road 1 would be separated from traffic on the new Great Western Highway for a longer distance, i.e. between Coxs River Road and Berghofers car park for eastbound traffic and the proposed westbound on-ramp for westbound traffic. Additionally, traffic volumes on Service Road 1 would be lower than what was anticipated with the approved project
- Eastbound and westbound vehicles on the new Great Western Highway would be physically separated for a longer distance because of the proposed divided carriageway which improves road safety, especially reducing the likelihood of head-on collisions occurring in this section
- Eastbound and westbound vehicles on the new Great Western Highway could travel at speeds of up to 80 kilometres per hour for a longer distance (instead of 60 kilometres per hour on the existing Great Western Highway and Service Road 1) which could result in slightly reduced travel times through the study area
- The revised alignment for the active transport trail would enable safe and easy access between Berghofers Pass car park and the Hartley Historic Village
- Formalising the Berghofers Pass car park would improve the operation of the car park and make it safer to use.

Noise and Vibration

Potential construction noise and vibration impacts associated with the proposed modification are generally consistent with those assessed in the approved project REF. Although, there would be additional receivers to the approved project REF due to the increased construction footprint.

The assessment uses several Noise Catchment Areas (NCAs) that reflect the land uses in the study area and the existing background noise levels and the likely impacts from the proposal. The noisiest and most intrusive activities are anticipated to be pre-construction and early works, site establishment, earthworks and utility works, bridge construction, and finishing works. The majority of residential receivers would experience either a 'clearly audible' (where noise levels exceed the Noise Management Levels (NML) by 1-10 decibels) or 'moderately intrusive' (where noise levels exceed the NML by 1-10 decibels) impact. For

receivers in proximity to construction ancillary facilities 23 to 25, activities relating to compound operations, such as rock crushing, may be experienced.

There are no material changes in construction traffic, therefore no change in construction traffic noise is anticipated relative to the approved project.

Since the determination of the approved project, construction planning has identified the need to increase the velocity of blasting for the deep cut through River Lett Hill. An increase in the blasting criterion to 15 millimetres per second has been proposed, to align with the AS2187 structure damage criterion. This increase will reduce the amount of oversize granite boulders produced, thereby reducing the amount of large excavator hammering required. The change would allow for an improved scale of blasting and ultimately provide benefits, such as improved productivity, overall reduced excavation period and cost, and an overall reduced duration of hammering and resultant noise. This would, however, exceed the human comfort criterion of 10 millimetres per second (peak particle velocity). Blasting would be managed in accordance with the measures outlined in the approved project NVIA, including development of a blast management plan, trial blasts, monitoring. Consultation and notification would be undertaken with those properties affected by blasting.

Potential noise and vibration impacts associated with the operation of the proposed modification are generally consistent with those assessed in the approved project REF. No additional receivers are expected to be impacted by operational noise, and no additional mitigation measures would be required. Any receivers that would be considered eligible for the consideration of feasible and reasonable noise mitigation measures have already been identified for consideration of noise mitigation measures.

Aboriginal Heritage

There are seven Aboriginal heritage sites within the construction footprint of the proposed modification that would be directly affected by construction. All sites were also assessed as being either directly or indirectly affected by construction of the approved project, with many requiring salvage, and therefore these sites would experience no greater impact attributed to the proposed modification than what was concluded in the approved project REF. This impact will be managed under the existing Aboriginal heritage management plan (AHMP). Where construction ancillary facilities are located on Aboriginal Heritage sites, sites would be avoided through the establishment of exclusion zones and restored to their former land use following construction. The mitigation measures presented in the approved project REF, including active protection and community collection, are considered adequate to manage the potential impacts of the proposed modification.

There is potential for one possible site, unlisted Aboriginal item ('Potential rock engraving 1 GWH'), which was recorded during surveys undertaken for the PACHCI Stage 2: Addendum Aboriginal Cultural Heritage Assessment Report (August 2022) (Appendix I), to be indirectly affected due to its proximity to the boundary of construction ancillary facility 20. This will be managed under the AHMP and fenced off to prevent accidental access during construction.

Non-Aboriginal Heritage

Consistent with the approved project, construction of the proposed modification has the potential to directly and indirectly impact on heritage items within the study area. Indirect impacts would include a decline in visual amenity due to presence of construction equipment and machinery, removal of vegetation, and increase in amount of bare earth and concrete; an increase in congestion on the Great Western Highway and local roads; and increase in noise, vibration, and air quality impacts.

The approved project would have a negligible to minor impact to 23 heritage items, a moderate impact to three heritage listed items, and a major impact to one heritage listed item and three unlisted items. Of the heritage sites affected by the approved project, the proposed modification would, either directly or indirectly, affect 11, including:

- Hartley Valley (NHL 106092)
- Hartley Historic Site (SHR 00992, LEP I030)
- Fernhill (SHR 00225, LEP I043, NT R4569)
- Little Hartley Conservation Area (LEP C8)
- Rosedale (LEP I024, RNE 834, NT R3404)
- Nioka (LEP I025)
- Billesdene Grange (LEP I023, NT R3389)
- Possible rubbish dump (archaeological, unlisted)
- Possible grace site (archaeological, unlisted)
- Possible bullock track diversion (archaeological, unlisted).

Only one additional site would be affected by the proposed modification that was not affected by the approved project: Mount Victoria Stockade Site (archaeological, unlisted), which may be indirectly affected due to the construction boundary of the proposed modification being extended eastward along the existing Great Western Highway.

The majority of sites would experience a similar impact during construction and operation to that presented in the approved project REF. Billesdene Grange would experience a greater temporary impact as Service Road 1 would be moved north, resulting in direct land take (an additional 60 metres) and additional indirect impacts in the form of visual intrusion and vibration. The existing mitigation measures set out in the approved project REF would be sufficient to manage impacts to Billesdene Grange, including undertaking archaeological investigations, archival recording, dilapidation surveys prior to construction, and landscaping prior to operation.

The three unlisted archaeological items in the north of the proposed modification would experience negligible to minor impacts from temporary land acquisition and construction activities at construction ancillary facility 25. However, the sites would already experience partial to full destruction under the approved project REF through the establishment of Service Road 8. To further understand the heritage potential of these unlisted items, additional wording to approved mitigation measures have been recommended to include the need of archaeological investigations (including ground penetration radar) of these sites of impact are to be undertaken and a comprehensive archival recording is to be produced.

The proposed additional and/ or modified non-Aboriginal heritage safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided within this addendum REF.

Groundwater

As in the approved project, the proposed modification would involve cuts which may intersect the groundwater table. Each cut between the base of Victoria Pass and 100 metres east of Coxs River Road has been assessed for potential intersection with the groundwater table. However, the assessment determined only one of the proposed cuts, 'L2R-2,' is likely to intersect the water table. The maximum groundwater drawdown within the immediate area of the L2R-2 cut is estimated to be around 3.6 metres, with the zone affected extending up to 62 metres. This is consistent with the assessment in the approved project REF.

There is no anticipated impact to groundwater users during construction as there are no registered bores located within the zone of predicted groundwater change, and GDEs that are located immediately adjacent to the modified project are outside the zone of predicted groundwater change. However, there is a risk that groundwater quality could be affected during construction and operational activities including:

- Leaks or spills of fuels, oils, and lubricating fluids used by vehicles and construction machinery (workshops, fuel, and waste storages and during fuelling operations)
- Potential acid sulfate soil or rock seepage if excavated, mobilised, and/ or stockpiled.

With the implementation of the approved project mitigation measures, the risk of these activities impacting groundwater is considered to be low. Similarly, in the context of the Sydney Drinking Water Catchment, with adoption of the recommended mitigation measures, the proposed modification is assessed as likely to have a neutral impact on groundwater quality.

No revised or additional groundwater safeguards and management measures are proposed as a result of the proposed modification.

Hydrology and Flooding

The modified project would be located in the Mid Cocks River catchment which is in the far-west section of the Hawkesbury Nepean catchment, as described in the approved project REF. Additionally, the proposed modification is located within the Mid Cocks river sub-catchment of the Sydney Drinking Water Catchment.

Potential impacts associated with surface water quality, hydrology, and flooding from construction and operation of the proposed modification are generally consistent with those presented in the approved project REF, and would include impacts such as altered flow rate and flow regime resulting in bank erosion, inundation and damage to construction sites and machinery, safety risks to construction workers, changes in peak flood level and flood hazard, increases in velocity and scour potential, hydrological changes affecting the integrity of TECs, and increased soil erosion on downstream receiving environments.

Some of the new construction ancillary facilities, such as construction ancillary facilities 20 and 23, have existing surface water features and watercourses within their extents, which were not previously assessed in the approved project REF. To minimise the risk of impact, where existing drainage lines may be impacted during construction of the proposed modification, an alternative (diversion) path of equal capacity will be established prior to commencing works. Potential impacts to areas designated as Key Fish Habitat would be managed in accordance with the approved project REF safeguards, as presented in the Submissions Report, including exclusion zones to avoid these areas.

The approved project REF was shown to be compliant with the assessment criteria of flood immunity, flood impacts, and climate change risk. The proposed modification has also been designed to comply with the flood immunity, flood impacts, and climate risk criteria for the approved REF and therefore, no impacts to flooding during operation are expected to arise due to the proposed modification.

The proposed additional hydrology and flooding safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided within this REF.

Landscape character and visual impact

Similar to the approved project REF, construction infrastructure associated with the construction of the proposed modification would be an uncharacteristic addition to the quiet, rural valley setting. The approved project REF identified that there would be temporary, negative landscape character and visual impacts during construction. These impacts would include views of large earthmoving and construction equipment, construction activities,

stored materials and stockpiles, activities in and around ancillary facilities, vegetation clearing, and excavation. Construction, particularly out of hours work, would require lighting at ancillary facilities and work areas. These locations could result in light spill impact on adjoining properties. This may result in a temporary visual impact at night, particularly near residences.

As per the approved project REF, large-scale road infrastructure, including the dual carriageway highway, new and upgraded service roads, bridges, and permanent water quality basins would be introduced into the rural environment by the proposed modification. As part of the proposed modification, the location of Service Road 1 bridge would be moved westward, and a second bridge, the eastbound off-ramp from the new to the existing Great Western Highway, would now be present. Road furniture would be substantially larger, including gantries, VMS, signage, and lighting, thereby increasing the amount of large-scale road infrastructure in the area and creating an increased sense of visual intrusion.

Changes to the alignment would result in less battering and more natural batter shapes associated with the new roads. While the size of the water quality basins would increase, the shapes of the basins have been integrated more into the landform. The repositioning of the upgraded Great Western Highway hugging edges of forested mountains on the southern side of Butlers Creek Valley would reduce overall impact of the Great Western Highway widening in the valley.

The landscape character and visual impact safeguards and management measures to those for the approved project, as presented in the Submissions Report, are applicable to the proposed modification. Some additional measures have been proposed, which will be refined during detailed design. They include measures such as refining the site levels of the two bridges to integrate with the surrounding terrain to assist with the visual assimilation of the project into the surrounding landscape. As trees matured within the planted landscape, the view along the existing Great Western Highway would narrow to along the road corridor.

Property and Land use

Potential property and land use impacts of the proposed modification would be related to property acquisition, changes to land use, and changes to property access. These impacts would be long term and occur from the commencement of construction.

Eleven privately owned properties would be permanently acquired for the operation of the proposed modification; ten of these were required for the approved project, and one additional property would also be required due to the increased construction boundary at the eastern end of the proposed modification. Two properties would be fully acquired, and the remaining would be partially acquired. For six out of the ten properties, the areas of land that would be acquired would increase from what was presented in the approved project REF. For three out of these six properties, land that was to be temporarily leased in the approved project REF would now be permanently acquired.

All acquisitions would be carried out in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, *Property Acquisition – A guide for residential owners (NSW Government, 2021a)*, and *Property Acquisition – A guide for residential tenants (NSW Government, 2021b)*. Areas acquired for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to their former land uses.

Temporary disruptions to local roads and property accesses would be expected during construction of the proposed modification. Local roads that would potentially experience some delays and changed traffic arrangements during construction include the Cocks River Road, though this would be a minor change compared to the approved project. Access to properties and businesses would be maintained for the full construction duration. As per the approved project REF, alternative access arrangements would be provided where the proposed modification would impact access to residential and commercial properties.

No changes are proposed to the land use and property safeguards and management measures as a result of the proposed modification.

Soils and contamination

General construction activities that have the potential to impact soil erosion and sedimentation are consistent with those presented in the approved project REF. While the proposed modification increases the extent of works required, the earthworks for the proposed modification would be similar to the estimates provided and assessed in the approved project REF. Potential impacts associated with soils from construction of the proposed modification are generally consistent with those presented in the approved project REF and would include impacts such as soil erosion and surface water runoff, and leaks, spills, and disturbance of potentially contaminating materials into receiving environments.

No further impacts to soils, groundwater, or existing contamination are expected during operation from what is presented in the approved project REF. During the operational phase of the modified project, the site would be completely stabilised. All roads, bridges, batters, median strips, and drainage channels would either be sealed or would have been stabilised with topsoil, hydro mulching, landscaping, or other scour protection. The potential for erosion and sedimentation during the operation stage is therefore anticipated to be negligible.

No changes are proposed to the soils and contamination safeguards and management measures as a result of the proposed modification.

Socio-economic

During construction, potential impacts on communities, businesses, visitors, and motorists in the study area would mainly be associated with disruptions for motorists and road users during construction, temporary changes to local amenity, noise and light spill during night works, and clearing of vegetation from bushland areas, rural properties, and the road reserve. Socio-economic impacts of the proposed modification are no greater than what was concluded in the approved project REF, and the existing socio-economic measures are considered adequate to manage the potential impacts of the modified project.

The socio-economic operational impacts of the proposed modification are generally consistent with what was concluded in the approved project REF, with additional opportunities to improve safety, connectivity, amenity, and the active transport infrastructure identified and proposed as part of the proposed modification.

No changes are proposed to the socio-economic safeguards and management measures as a result of the proposed modification.

Air Quality

The key air quality issue during construction of the proposed modification is expected to be dust generation and blast fumes. Construction dust emissions, primarily caused by earthworks, vegetation clearance, blasting, and use of construction machinery and vehicles, have the potential to cause nuisance and health impacts if not managed properly. However, air quality impacts associated with construction of the proposed modification would be consistent to the conclusions of the approved project REF.

Blasting would be required as part of the modified project, with a significant amount of blasting to occur through the deep cut at River Lett Hill. The same amount of blasting would be required for the modified project as was approved as part of the approved project REF with the only proposed change being the implementation of a faster program. As per the approved project REF, blasting would represent a high risk for air quality impacts. Where possible, blasting would be timed to avoid the early morning and late afternoon when meteorological conditions are typically least favourable.

The proposed modification is not expected to result in changes to the significance of potential air quality impacts identified in the approved project REF.

No changes are proposed to the air quality safeguards and management measures as a result of the proposed modification.

Other impacts

This addendum REF also assessed the potential impacts for the following environmental factors:

- Bushfire
- Waste
- Sustainability, greenhouse gas and climate change.

The impacts relating to these factors are consistent with the conclusions of the approved project REF. No changes are proposed to the other environmental safeguards and management measures as a result of the proposed modification.

Cumulative impacts

Projects were identified for consideration in the cumulative impact assessment if they met the screening criteria in Section 6.17 (Cumulative impacts) of the approved project REF. The approved project REF stated that there would be cumulative impacts (greater than negligible) upon the following receiver groups: biodiversity; traffic and transport; noise and vibration; Aboriginal heritage; non-Aboriginal heritage; soils and surface water; social; and contamination.

For the majority of environmental factors, cumulative impacts associated with the proposed modification would be consistent with the conclusions of the approved project REF. The modified project would result in additional operational impacts to non-Aboriginal heritage compared to those presented in the approved project REF. These impacts range from negligible to moderate and are considered manageable under the existing and proposed safeguards and mitigation measures. Therefore, the results are consistent with the conclusions of the approved project REF.

Justification and conclusion

The proposed modification may result in some additional, minor, adverse environmental impacts. These impacts would be managed in accordance with the mitigation and management measures provided in this addendum REF. The proposed modification would benefit the local community through improved road safety, connectivity, travel times within the locality. A shorter program is anticipated through increased productivity by increasing the number of ancillary facilities and by updating the blasting technique of hard rock. This would benefit the local community by reducing the length of time that increased noise levels are experienced.

The proposed modification is considered justified as it supports the construction and operation of the approved project and would provide additional long-term improvements for the Great Western Highway.

1 Introduction

1.1 Great Western Highway Upgrade program

Transport for NSW (Transport) proposes to upgrade the Great Western Highway between Katoomba and Lithgow (the Upgrade Program). The Upgrade Program will deliver around 34 kilometres of four lane divided highway between Katoomba and Lithgow. The program is needed to reduce congestion and provide a safer and more efficient link for those travelling in, around and through the Blue Mountains, as well as between the Central West NSW and the Sydney Motorway Network for freight, tourists, and general traffic. The program to deliver the upgrade consists of the following projects:

- Great Western Highway Upgrade – Medlow Bath (Medlow Bath Upgrade): Upgrade and duplication of the existing surface road corridor with intersection improvements and a new pedestrian bridge (approved)
- Great Western Highway East – Katoomba to Blackheath (Katoomba to Blackheath Upgrade): Upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway east of Blackheath (approved)
- Great Western Highway Blackheath to Little Hartley Upgrade: Construction and operation of a twin tunnel bypass of Blackheath and Mount Victoria and surface road works for tie-ins to the east and west of the tunnel (currently in planning)
- Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) (Little Hartley to Lithgow Upgrade): Upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway at Little Hartley (approved).

These four components are shown on Figure 1-1 and are subject to separate environmental assessment and approval in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act).

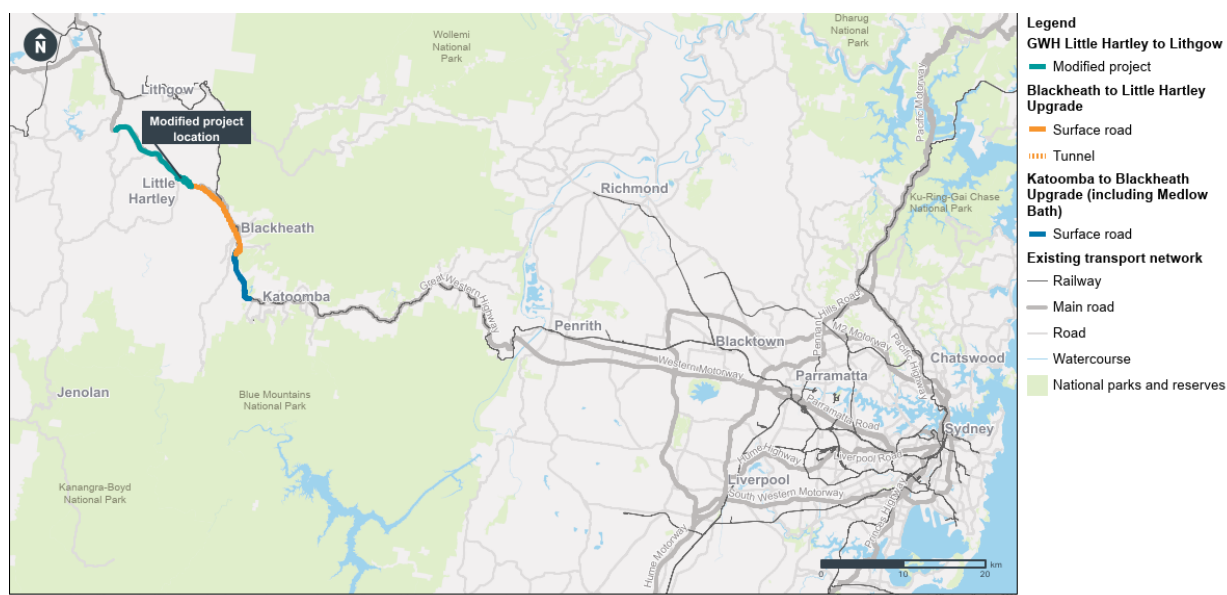


Figure 1-1 Location of the modified project

1.2 The approved project

As part of the Upgrade Program, Transport is proposing the Little Hartley to Lithgow Upgrade (the approved project), located immediately to the west of the Blue Mountains within the Lithgow local government area. The approved project aims to reduce congestion and deliver safer, more efficient and reliable journeys for those travelling in, around and through the Blue Mountains, while also better connecting communities in the Central West to Sydney.

Key features of the approved project include:

- Upgrade of about 14 kilometres of the Great Western Highway between Little Hartley and Lithgow to a four lane divided highway
- Embankment work and median adjustment in the Forty Bends section (upgraded in 2017) to provide a fourth lane
- Provision of service roads, where feasible and reasonable, to minimise direct access to the Great Western Highway from adjacent properties
- Upgrade and/or adjustment of existing intersections at local roads
- Provision of two vehicle rest areas, one eastbound and one westbound, near Mid Hartley Road and Carroll Drive
- Temporary and permanent water quality treatment basins
- Provision of five new bridges, including twin bridges over River Lett and Jenolan Caves Road
- Upgrade of the existing bridge over River Lett as part of a local service road network
- Extension of existing drainage culverts at Rosedale Creek and Boxes Creek
- Provision of three combined drainage and fauna crossing culverts
- Indicative shared path for pedestrians and cyclists between Little Hartley and Lithgow
- Establishment and use of temporary ancillary facilities during construction
- Property works including acquisition, demolition and adjustments to accesses
- Adjustment of existing utility infrastructure, including overhead powerlines, poles and underground communications cables
- Rehabilitation of disturbed areas and landscaping, where required.

A Review of Environmental Factors (REF) was prepared for the approved project in 2021 (Transport, 2021a), including specialist environmental investigations. The approved project REF was placed on public display between 23 November 2021 and 16 January 2022 for community and stakeholder comment.

A Submissions Report was subsequently prepared in April 2022 (Transport, 2022a) for the approved project, providing a response to the issues raised during public display of the approved project REF and an assessment of changes to the proposal since public display of the approved project REF. The approved project was approved in April 2022, simultaneously with the finalisation of the Submissions Report.

1.3 Proposed modification overview

Transport proposes to modify the approved project following further design development and construction planning carried out since determination of the approved project.

The proposed modification predominantly relates to the easternmost part of the approved project, between Little Hartley at the base of Victoria Pass to around 100 metres east of Coxs River Road. The proposed modification also includes amendments to the construction footprint and additional construction ancillary facilities which would improve construction efficiencies.

The key features of the proposed modification are provided below. A full description of the proposed modification is provided in Chapter 3 (Description of the proposed modification) of this addendum REF. A comparison between the approved project and proposed modification is provided in Figure 1-2.

1.3.1 New Great Western Highway realignment

- Minor amendments to the alignment and extent of the new surface section of the Great Western Highway. The proposed modification relates to around 1.4 kilometres of the new eastbound carriageway and around 650 metres of the new westbound carriageway and includes associated changes to cut and fill.

1.3.2 Connections with and upgrades to the existing Great Western Highway

- Realignment of the existing Great Western Highway from around 1.8 kilometres east of Coxs River Road to around 100 metres east of Coxs River Road
- Westward realignment of the new Service Road 1 bridge over the carriageway of the new Great Western Highway at around 1 kilometre east of Coxs River Road
- An on-ramp (around 700 to 900 metres east of Coxs River Road) connecting the existing Great Western Highway westbound to the westbound carriageway of the new Great Western Highway
- An off-ramp and new bridge connecting the eastbound carriageway of the new Great Western Highway from around 1.1 kilometres east of Coxs River Road to the existing Great Western Highway near the Berghofers Pass car park.

1.3.3 Ancillary infrastructure

- A realigned access road connection off the realigned existing Great Western Highway to provide local property access
- Formalisation of Berghofers Pass car park and entrance / exit to the existing Great Western Highway in Little Hartley
- Active transport infrastructure to connect the formalised Berghofers Pass car park to the existing Great Western Highway
- New and relocated surface water management infrastructure, including a new water quality treatment basin at Little Hartley for use during both construction and operation
- Extended adjustment of 132 kilovolt overhead powerlines and poles at Hartley
- Identification of temporary diversions following construction planning.

1.3.4 Construction activities

Construction footprint and construction ancillary facilities

- Minor amendments to the construction footprint to accommodate modifications to the project design and seven additional construction ancillary facility areas.

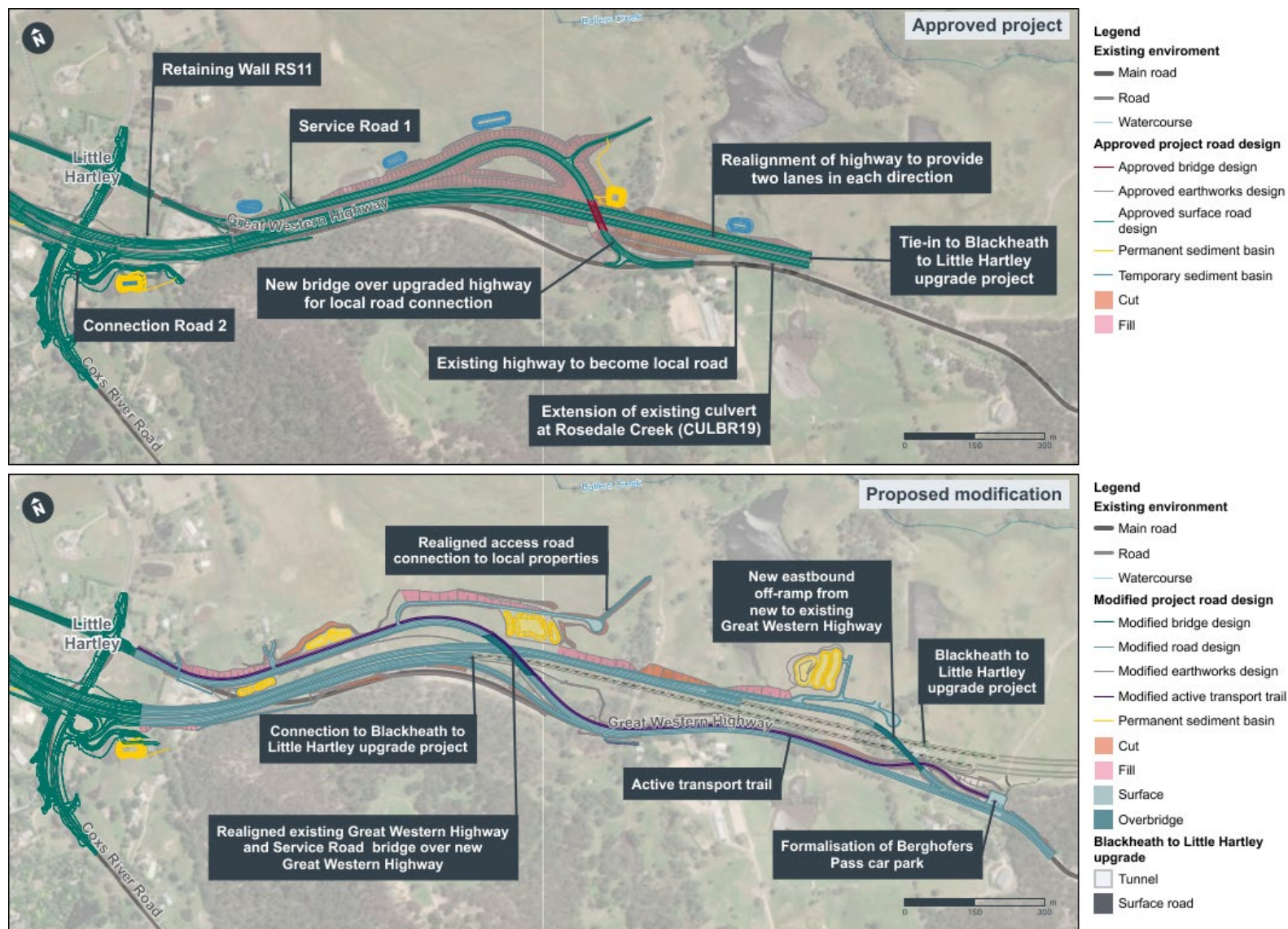


Figure 1-2 The approved project and the proposed modification alignment comparison

1.4 Purpose of the report

This addendum REF has been prepared by AECOM on behalf of Transport to assess the potential impacts of the proposed modification to the approved project. For the purposes of these works, Transport is the proponent and the determining authority under Division 5.1 of the EP&A Act.

The purpose of this addendum REF is to describe the proposed modification, to assess the likely impacts of the proposed modification on the environment, and to detail any revised or additional mitigation and management measures required to manage the likely impacts of the proposed modification. This addendum REF is to be read in conjunction with the approved project REF and Submissions Report.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in context of section 171 of the Environmental Planning and Assessment Regulation 2021, *Is an Environmental Impact Statement (EIS) Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* ('Is an EIS Required?' guidelines') (DUAP, 1995), *Roads and Road Related Facilities EIS Guideline* (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

- Section 5.5 of the EP&A Act including that Transport examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity
- The strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Transport's road activities on nationally listed threatened species, ecological communities and migratory species.

The findings of this addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the 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 proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Australian Government 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 proposed modification

Chapter 2 (Need and options considered) of the approved project REF addresses the strategic need for the approved project, the project objectives, and the options that were considered. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the approved project.

When the approved project REF was written, it described and assessed impacts relating to the concept design of the Little Hartley to Lithgow Upgrade as it was in 2021, which included indicative tie-in to the Great Western Highway Blackheath to Little Hartley Upgrade. Since this work, the design for the Great Western Highway Blackheath to Little Hartley Upgrade has been developed further. Now, this proposed modification has been proposed to provide a safer and more functional interface with improved local connectivity between the approved project and the Great Western Highway Blackheath to Little Hartley Upgrade. This involves changes to the surface road works between Little Hartley at the base of Victoria Pass to around 100 metres east of Coxs River Road to tie into the Great Western Highway Blackheath to Little Hartley Upgrade surface works and tunnel alignment.

Changes have also been made to the operational design of the approved project to improve connectivity to the existing road network and improve road safety for both active transport and motorised users. Opportunities to improve active transport infrastructure proposed in the approved project REF have been identified and proposed as part of the proposed modification.

In addition to operational changes proposed, some changes have been proposed to the construction footprint and construction activities as a result of design development and construction planning. For instance:

- Additional construction ancillary sites are proposed to facilitate efficient delivery of construction work. The location of these and activities to be undertaken within them are presented in Section 3.3.1 of Chapter 3 (Modification description)
- Blasting of hard rock will be required to facilitate construction. A shorter blasting programme is proposed, with the blasting velocity increasing to 15 millimetres per second. The higher criterion would allow for an improved scale of blasting and ultimately provide benefits in terms of reduced long term construction noise impacts, improved productivity and overall reduced excavation period and cost.

A full description of the construction activities to be undertaken are provided in Section 3.3 of Chapter 3 (Modification description).

This proposed modification is consistent with the objectives and development criteria outlined in Section 2.3 (Proposal objectives and development criteria) of the approved project REF.

2.2 Alternatives and options considered

2.2.1 Methodology for selection of preferred option

In developing alternatives and options for key features of the proposed modification, Transport sought to meet the approved project objectives while minimising potential environmental and socio-economic impacts.

The following options were considered:

- Option 1 – Do nothing
- Option 2 – Changes to the approved project, which investigated modifications such as directional changes to local roads, changes to heights of bridges and ramps, and location of overbridges:
 - Option 2A – Coxs River Road roundabout
 - Option 2B – Local road overbridge only, with no eastbound exit and westbound entry ramps
 - Option 2C – Removal of local connectivity between Little Hartley and Mt Victoria with a cul-de-sac arrangement
 - Option 2D – Bridge structure for the eastbound exit ramp and underpass for the local connection
 - Option 2E – Eastbound exit ramp shifted further east close to the tunnel portal and a T-intersection with the local access road
 - Option 2F – Existing Great Western Highway extended west to form a T-intersection with CRR
 - Option 2G – Bridge structure for the eastbound exit ramp close to the tunnel portal. A separate curved bridge would follow the alignment of the existing Great Western Highway
 - Option 2H – Proposed modification.

These options were considered during constructability, value engineering, and safety in design workshops which took place throughout 2022. The workshops were attended by representatives from Transport, council members, key utility providers, and other key stakeholders involved in the development of the detailed design.

2.2.2 Identified options

Analysis of options

The modified design and construction options were workshopped and assessed against the project objectives and key development criteria in Section 2.3 (Proposal objectives and development criteria) of the approved project REF. A review of the options in comparison to a 'do nothing' option and consideration of alternative design and construction methodology options was also carried out.

Option 1 – Do nothing

This option would not facilitate the connection between the approved project and the Great Western Highway Blackheath to Little Hartley Upgrade that were subject to design refinements following determination of the approved project. As such, the strategic need and project objectives identified in the approved project REF would no longer be met. The unfavourable implication of this option would include:

- Unrealised safety and connectivity benefits

- Insufficient space to accommodate additional ancillary infrastructure and facilities to support both the construction and operational phases of the approved project
- Insufficient space for the active transport infrastructure to fully connect Berghofers Pass car park to the indicative active transport trail provided in the approved project REF.

Option 2H – Proposed modification

Options 2A to 2H were assessed with respect to road design, urban design, environmental impacts, community expectations, and constructability. Option 2H scored the highest under these criteria; the design of this option was similar to Option 2G with the with the realigned existing Great Western Highway and service road bridge over the new Great Western Highway shifted about 150 metres west of the approved project design.

This option would result in:

- Improved safety, separation of traffic, and connectivity to Mount Victoria and the upgraded highway
- Improved safety and connectivity with the existing road network, in particular providing greater separation between local traffic movements and movements on the upgraded Great Western Highway
- Improved integration of ancillary infrastructure, including active transport connections, access arrangements for local properties, and car parking
- Improved environmental management infrastructure, particularly in relation to surface water management.

Further design refinements

Once the proposed modification was identified as the preferred option, further refinements were made based on environment considerations, as discussed below.

Amendments to address biodiversity impacts

Desktop investigations and surveys undertaken in October 2022 and February 2023 for the biodiversity assessments (see Section 6.1 (Biodiversity) and Appendix D (Addendum BDAR)) identified areas of ecological importance that would be impacted by the proposed modification.

Purple Copper Butterfly (*Paralucia spinifera*)

These areas of ecological importance included Purple Copper Butterfly (*Paralucia spinifera*) (PCB) habitat. This species is listed under both State (endangered) and Commonwealth (vulnerable) legislation. It is highly desirable that impacts on this habitat are avoided. Alternatively, there must be strong justification for any impact on this habitat and demonstration that all reasonable measures have been applied to avoid or minimise this impact.

The habitat would be directly impacted by a proposed On-Site Detention Basin (OSD-06), drainage channel, and earthworks cut batter shown in Figure 2-1. Three options to reconfigure or relocate the drainage basin was considered:

- Relocate the dam to the east of the PCB habitat. Not considered further as the topography of the area was not considered suitable and the earthworks required would still impact the PCB habitat.

- Utilise the existing farm dam to the north-east of the PCB habitat. Not considered further as the existing farm dam was located outside of Transport's ownership and the considered was unknown and potentially unsuitable
- Relocate the dam to the west of the PCB habitat. Considered the most suitable and taken forward in the design.

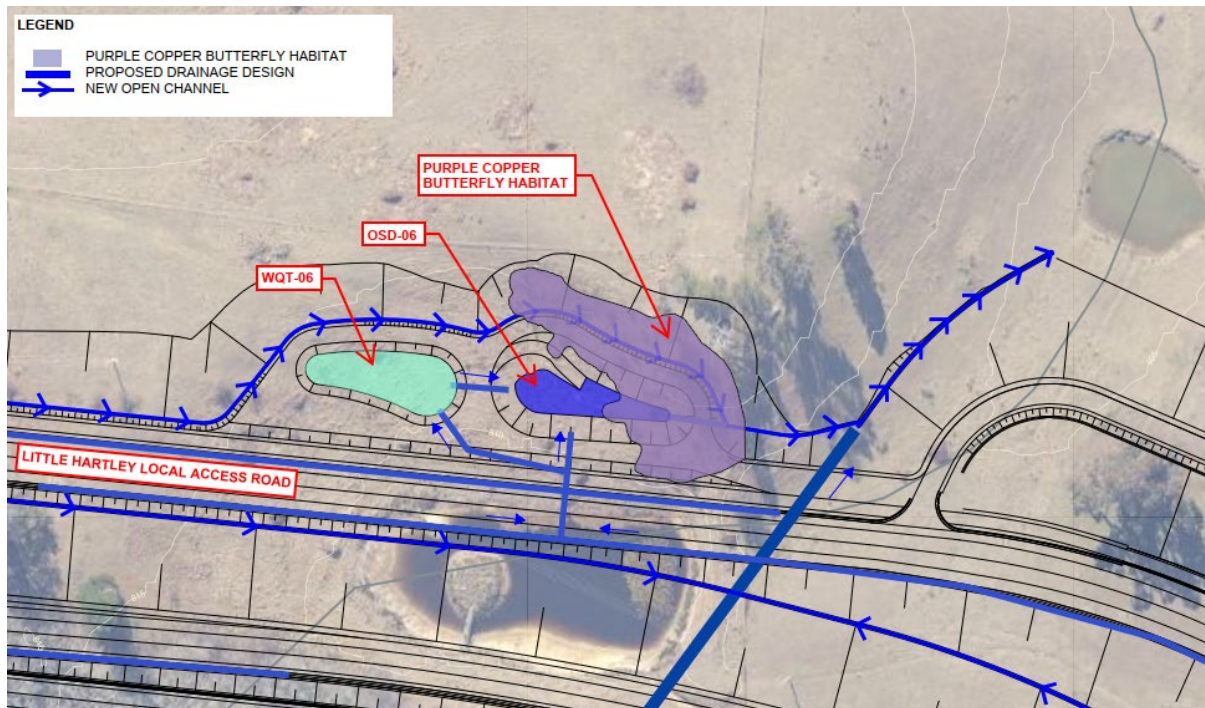


Figure 2-1 Location of Purple Copper Butterfly Habitat

Hollow bearing trees

Nine hollow bearing trees were also identified within the proposed modification design. Refinements of the surface road have been considered. Avoidance of some trees has not been possible due to their presence in areas of significant design. Measures have been proposed to protect the trees during the next phases of design. These are presented in Section 6.1 (Biodiversity) and Appendix D (Addendum BDAR).

2.3 Preferred option

The preferred option (the proposed modification) is considered to facilitate improved environmental, operational, and technical outcomes, while also providing solutions that satisfy the proposal objectives. It also supports the relevant planning policies, objectives, and design criteria outlined in Section 2 (Need and options considered) of the approved project REF.

3 Description of the proposed modification

This chapter describes the proposed modification to the approved project. The description of the proposed modification is based on the concept design and is subject to detailed design.

3.1 Overview of the proposed modification

Transport proposes to modify the approved project following further design development and construction planning carried out since determination of the approved project. Chapter 2 (Need and options) of this addendum REF outlines the need and justification for the proposed modification.

The proposed modification relates to 1.8 kilometres of the easternmost part of the approved project between the base of Victoria Pass and Coxs River Road. Key features of the proposed modification are listed in Table 3-1 and the operational layout is shown in Figure 3-1.

A comparison between the approved project and the proposed modification is shown in Figure 3-2. A more detailed description of each feature of the proposed modification is provided in Section 3.2.

Table 3-1 Key elements of the proposed modification

Project element	Description
Refinements to existing project features	
Existing Great Western Highway	Minor modifications to the realignment of the existing Great Western Highway from around 1.8 kilometres east of Coxs River Road to around 100 metres east of Coxs River Road
Service Road 1 bridge	Modified alignment and curvature of the bridge providing local road connection (the realigned existing Great Western Highway), including an westward shift of around 550 metres
New Great Western Highway	Minor amendments to the alignment and extent of the new surface section of the Great Western Highway. The proposed modification relates to around 1.4 kilometres of the new eastbound carriageway and around 650 metres of the new westbound carriageway and includes associated minor changes to cut and fill
Westbound on-ramp to the westbound carriageway of new Great Western Highway	An on-ramp (around 700 to 900 metres east of Coxs River Road) connecting the existing Great Western Highway westbound to the westbound carriageway of the new Great Western Highway
Local property access road off the realigned existing Great Western Highway	Realignment of the local property access road connection to 2200 Great Western Highway, Little Hartley

Project element	Description
Surface water management infrastructure	Relocated and new permanent surface water basins, and replacement of part of an existing drainage culvert beneath the existing Great Western Highway and eastbound off-ramp from new Great Western Highway at Little Hartley
Construction footprint and construction ancillary facilities	Additional construction footprint areas and seven additional construction ancillary facilities (refer to Section 3.3), including to accommodate modifications to project design and additional power pole adjustments at Hartley
Temporary diversions (side-tracks)	<p>Identification of temporary diversions following construction planning. These include:</p> <ul style="list-style-type: none"> • The approved westbound off-ramp to Jenolan Caves Road would be used for a side-track off the existing Great Western Highway for two to two and a half years • The approved River Lett Hill side-track along the proposed Great Western Highway for two to two and a half years. <p>As per the approved project REF, both diversions would have reduced posted speed limits of 40 to 60 kilometres per hour.</p>
Proposed modification new features	
New off-ramp and bridge connecting the eastbound carriageway of the new Great Western Highway to the existing Great Western Highway	An off-ramp and new bridge connecting the eastbound carriageway of the new Great Western Highway from around 1.1 kilometres east of Coxs River Road to the existing Great Western Highway near the Berghofers Pass car park
Formalisation of Berghofers Pass car park	Formalisation of Berghofers Pass car park and the exit and entry from the existing Great Western Highway, with generally the same footprint and capacity as the existing car park site
Revised alignment of the active transport trail	Revised alignment of the active transport trail to connect the formalised Berghofers Pass car park to the approved indicative shared path at the existing Great Western Highway at Little Hartley

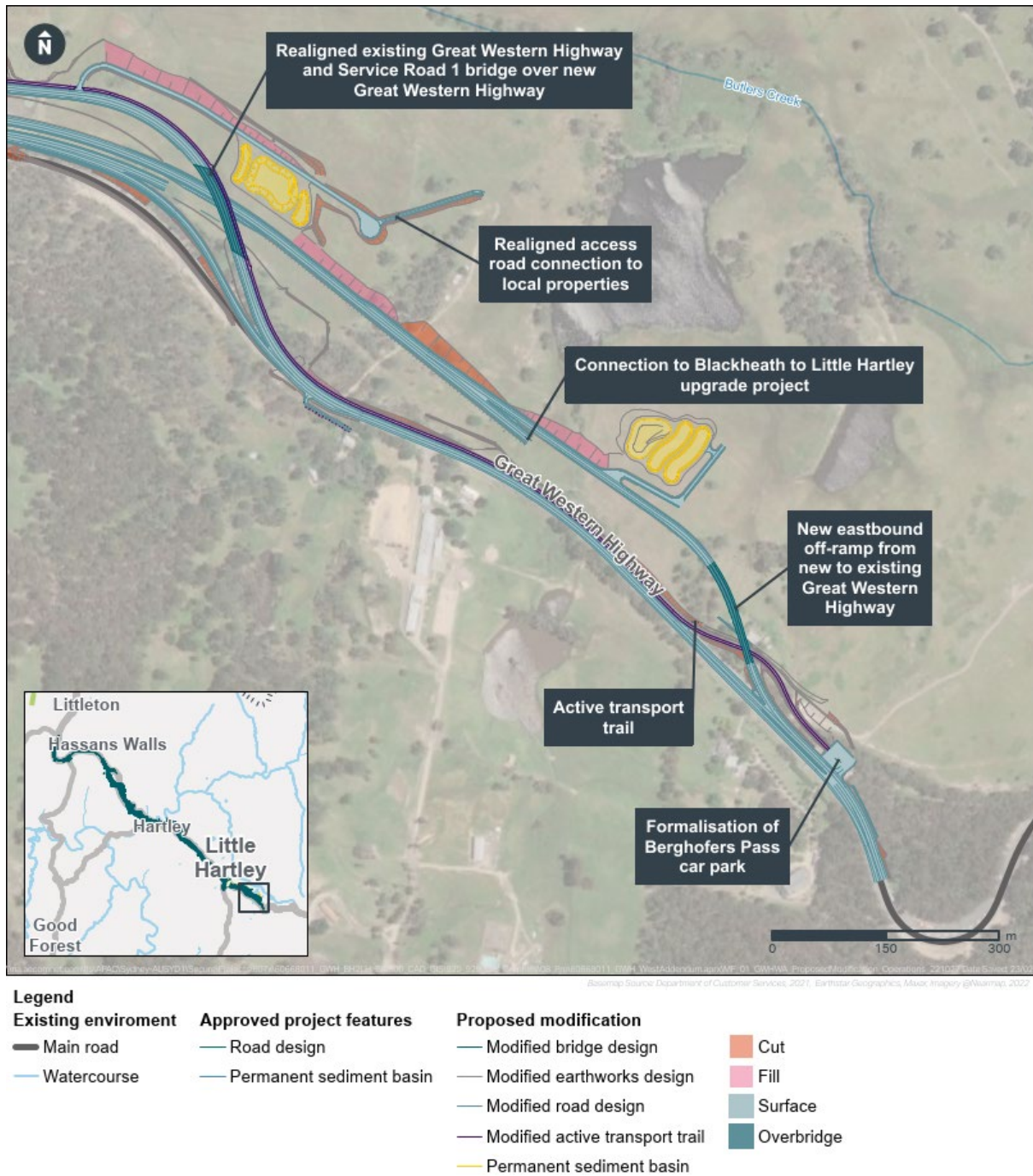


Figure 3-1a The proposed modification during operation

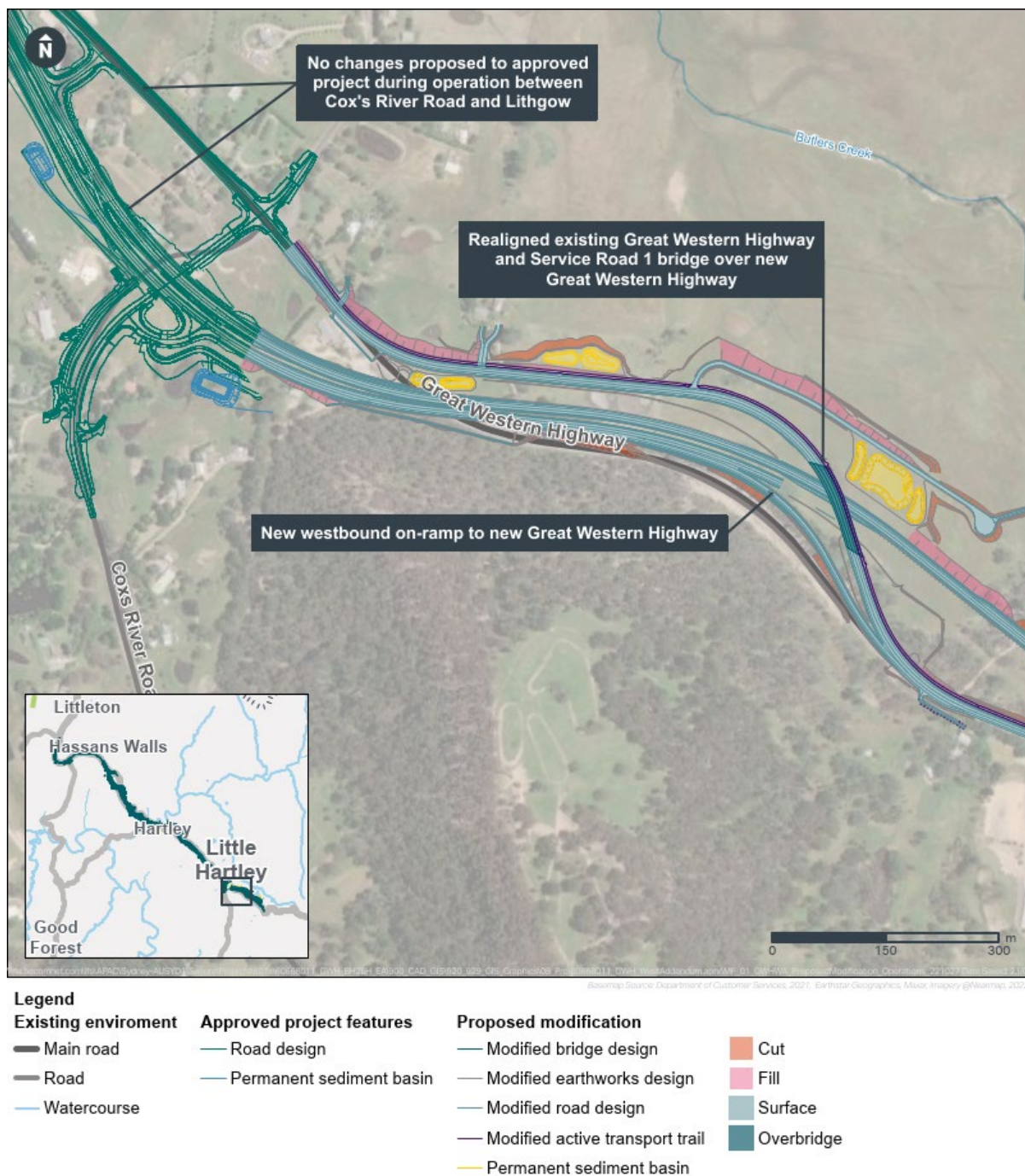


Figure 3-1b The proposed modification during operation

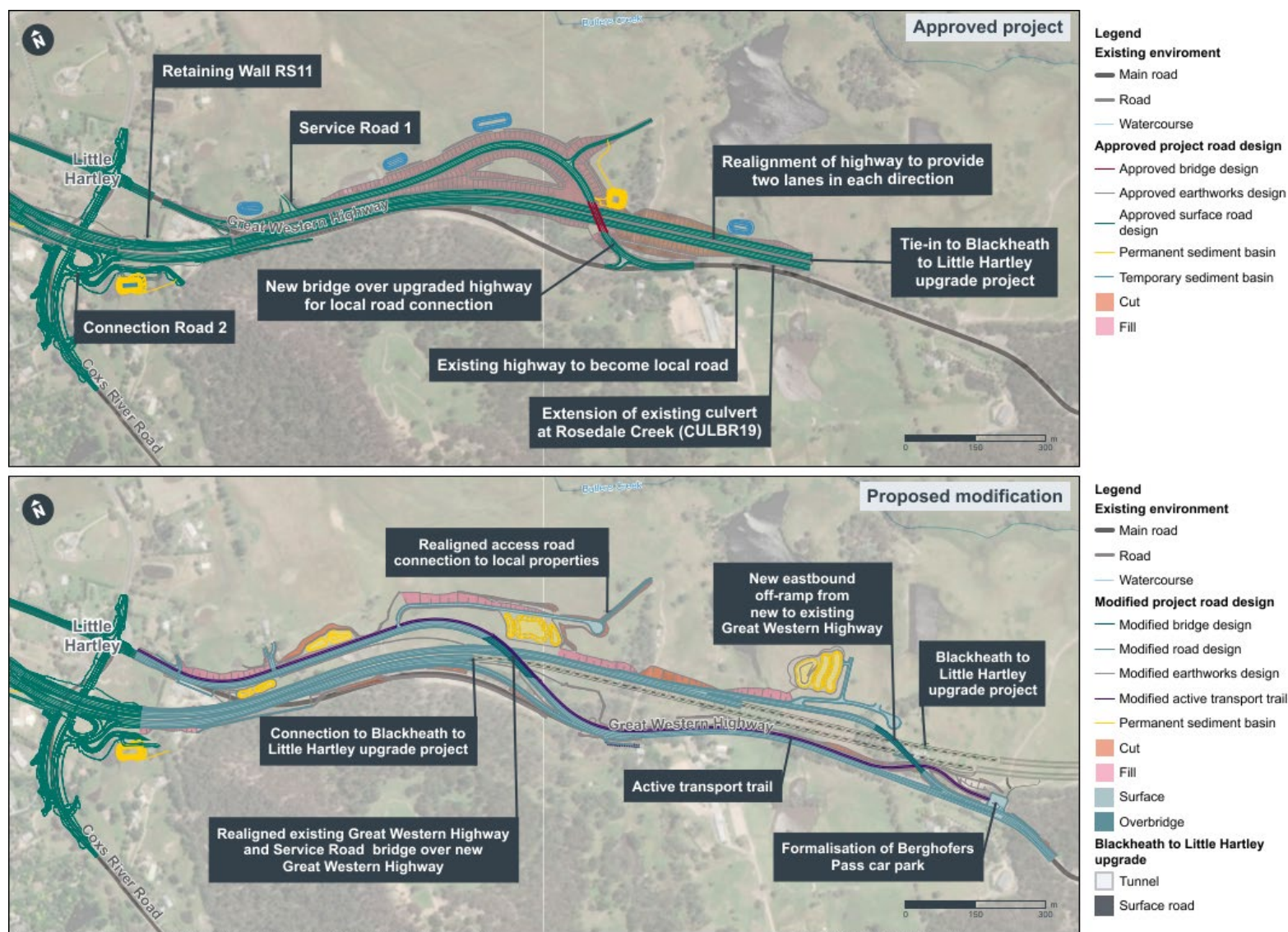


Figure 3-2 The approved project and the proposed modification alignment comparison

3.2 Design

3.2.1 Design criteria and engineering constraints

The proposed modification has been designed consistent with the design criteria, guidelines and design life outlined in Section 3.2 of the approved project REF including design speed, posted speed limit, lane and shoulder width and design vehicle for the Great Western Highway. Changes to or these criteria, or new criteria related to the proposed modification are outlined in Table 3-2.

Engineering constraints for the proposed modification are consistent with those identified in Section 3.3.2 of the approved project REF.

Table 3-2 Design criteria

Design element	Criteria
Connections with and upgrades to the existing Great Western Highway (including two new bridges and ramp connections)	
Design speed	70 kilometres per hour
Posted speed limit	60 kilometres per hour
Nearside (outside) shoulder width	2.5 metres
Offside (median) shoulder width	0.5 to 1.0 metres
Design vehicle	19 metre semi-trailer
Service roads (including property access roads)	
Posted speed limit	60 kilometres per hour
Lane width	Widths may vary depending on the road requirement (up to 10.5 metres)
Design vehicle	<ul style="list-style-type: none">Between 5.2 metre and 12.5 metre vehicles19 metre semi-trailerChecking vehicle 26 metre B-double for switching station road only.
Formalisation of Berghofers Pass car park	
Nominal car parking capacity	12 car parking spaces

3.2.2 New Great Western Highway realignment

The proposed modification would involve changes in the alignment and extent of the carriageway of the new Great Western Highway relative to the approved project (refer to Figure 3-2). The carriageway of the new Great Western Highway would continue to provide two lanes of through traffic in both directions.

A typical cross section of the carriageway (as proposed to be modified) is provided in Figure 3-3.

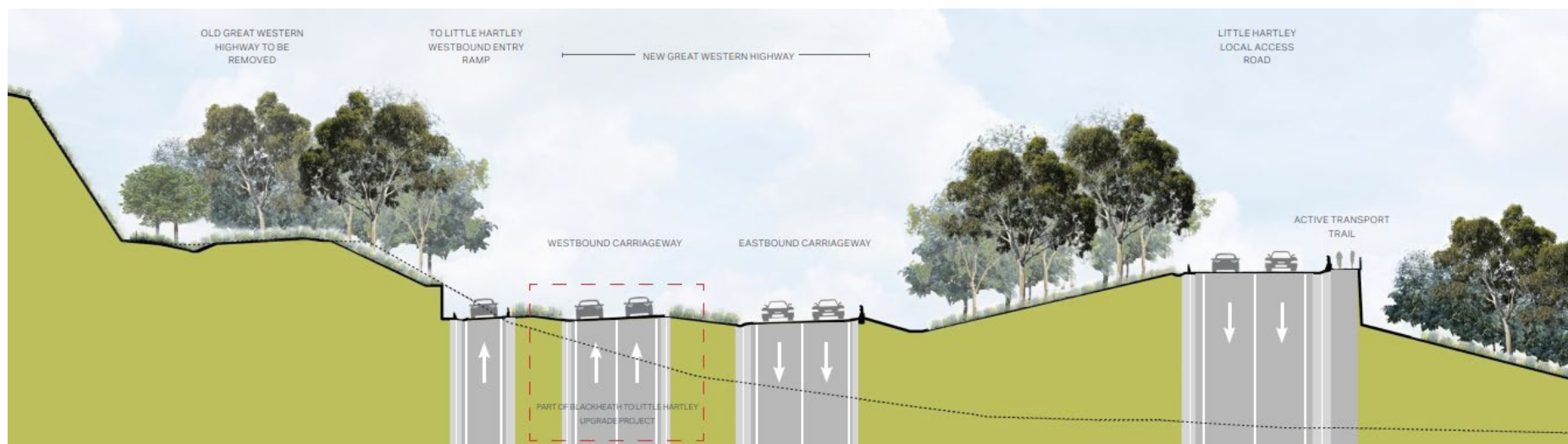


Figure 3-3 Typical cross section of carriageway of the new Great Western Highway (as modified)

3.2.3 Connections with and upgrades to the existing Great Western Highway

Connection and upgrade works affecting the existing Great Western Highway would involve three main components:

- Realignment of the existing Great Western Highway to accommodate the alignment of the new Great Western Highway, including a bridge over the new carriageway. The approved project included a similar realignment (to form Service Road 1) and new bridge, which have been subject to further design refinement as part of the proposed modification
- A westbound on-ramp connecting the existing Great Western Highway to the westbound carriageway of the new Great Western Highway. The approved project does not currently provide this connectivity
- An eastbound off-ramp including a new bridge, connecting the carriageway of the new Great Western Highway to the existing Great Western Highway. The approved project does not currently provide this connectivity.

Existing Great Western Highway realignment

The approved project includes realignment of the existing Great Western Highway, including a new bridge over the carriageway of the new Great Western Highway. The approved project REF presents the realigned Great Western Highway as a local road nominally referred to as 'Service Road 1.'

The proposed modification would affect the alignment and curvature of the realigned existing Great Western Highway, including an eastward shift of around 550 metres in the location of the Service Road 1 bridge over the carriageway of the new Great Western Highway which lessens the requirement for earthworks.

The bridge over the carriageway of the new Great Western Highway would be around 125 metres long and 20 metres wide providing one lane in each direction, comprising a two span precast Bulb T girder superstructure with a central pier located in the new Great Western Highway median. A typical cross section and a typical long section for the bridge over the carriageway of the new Great Western Highway (as proposed to be shifted west relative to where it was located as part of the approved project) are presented in Figure 3-4 and Figure 3-5 respectively.

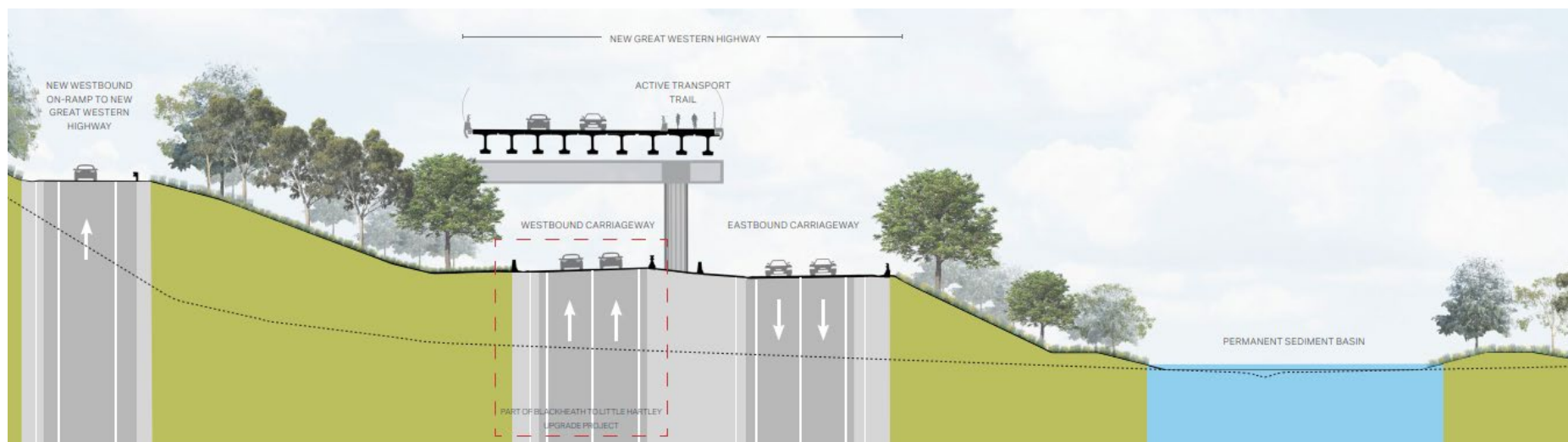


Figure 3-4 Typical cross section of the realigned bridge forming part of the realigned existing Great Western Highway

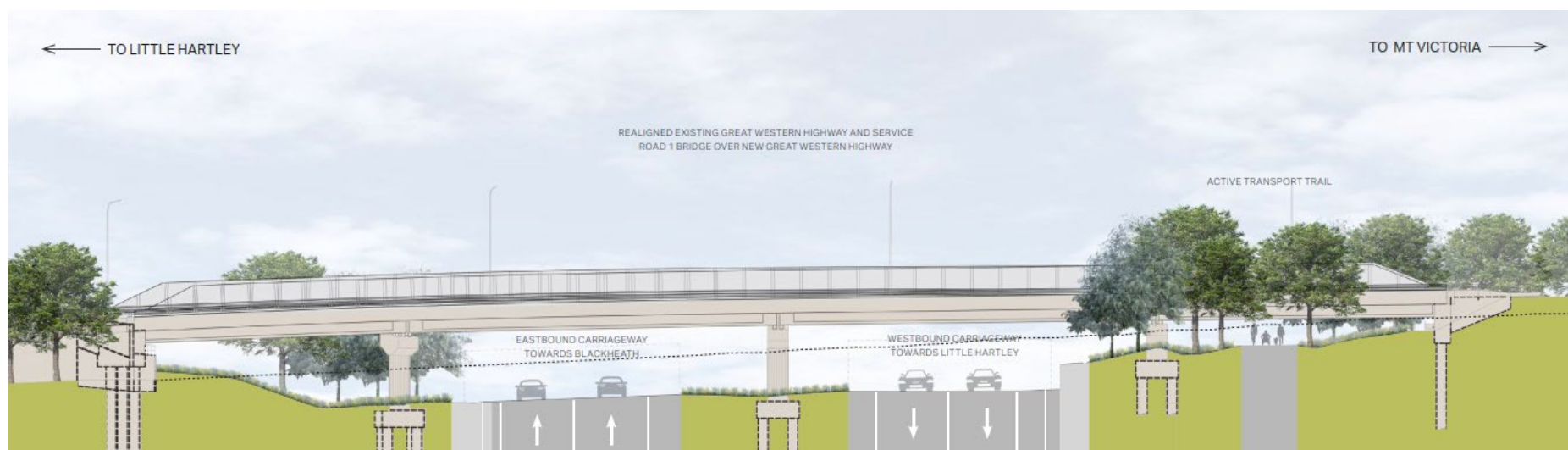


Figure 3-5 Typical long section of the realigned bridge forming part of the realigned existing Great Western Highway

Westbound on-ramp

The proposed modification would include a westbound on-ramp connection from the existing Great Western Highway (around 900 metres east of Coxs River Road) to the westbound carriageway of the new Great Western Highway (around 700 metres east of Coxs River Road). The new on-ramp would provide one lane and is shown in Figure 3-1. A westbound on-ramp connection is not currently included in the approved project.

Eastbound off-ramp

The proposed modification would include an eastbound off-ramp connection from the eastbound carriageway of the new Great Western Highway (around 1.1 kilometres east of Coxs River Road) to the existing Great Western Highway near the Berghofers Pass car park. This would include a new bridge over the carriageway of the new Great Western Highway as shown in Figure 3-1. An eastbound off-ramp connection is not currently included in the approved project.

The new bridge over the carriageway of the new Great Western Highway would be around 140 metres long and 11 metres wide. The bridge would comprise a two span precast Bulb T girder superstructure with piers located within the new Great Western Highway median. A typical cross section and a typical long section for the bridge forming part of the eastbound off-ramp connection from the eastbound carriageway of the new Great Western Highway are presented in Figure 3-6 and Figure 3-7, respectively.

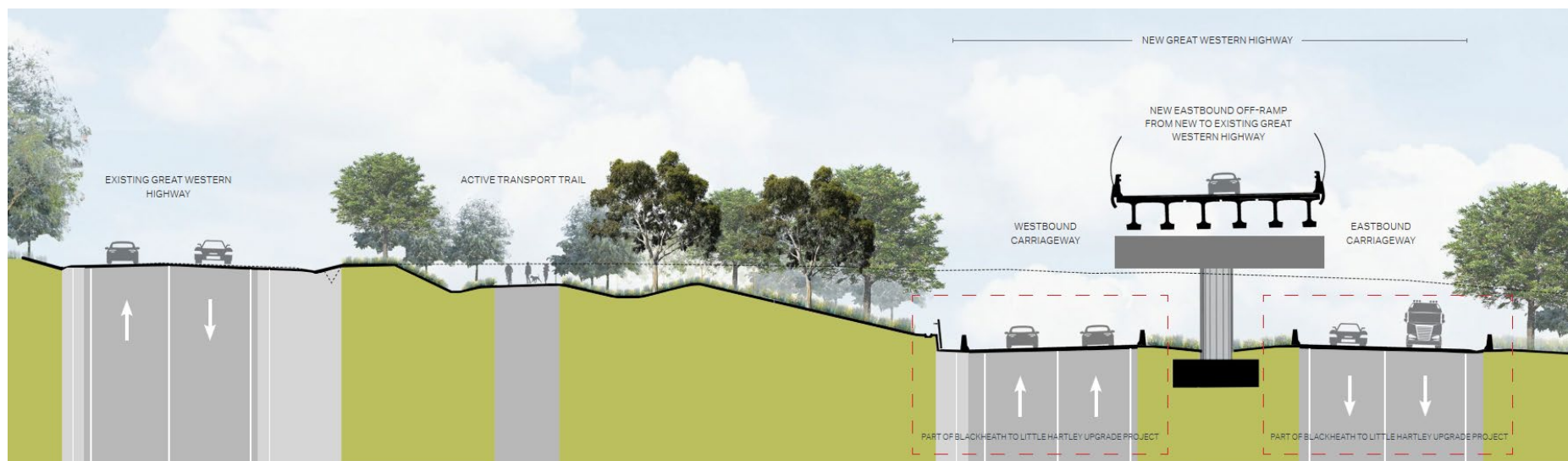


Figure 3-6 Typical cross section of the new bridge forming part of the eastbound off-ramp connection

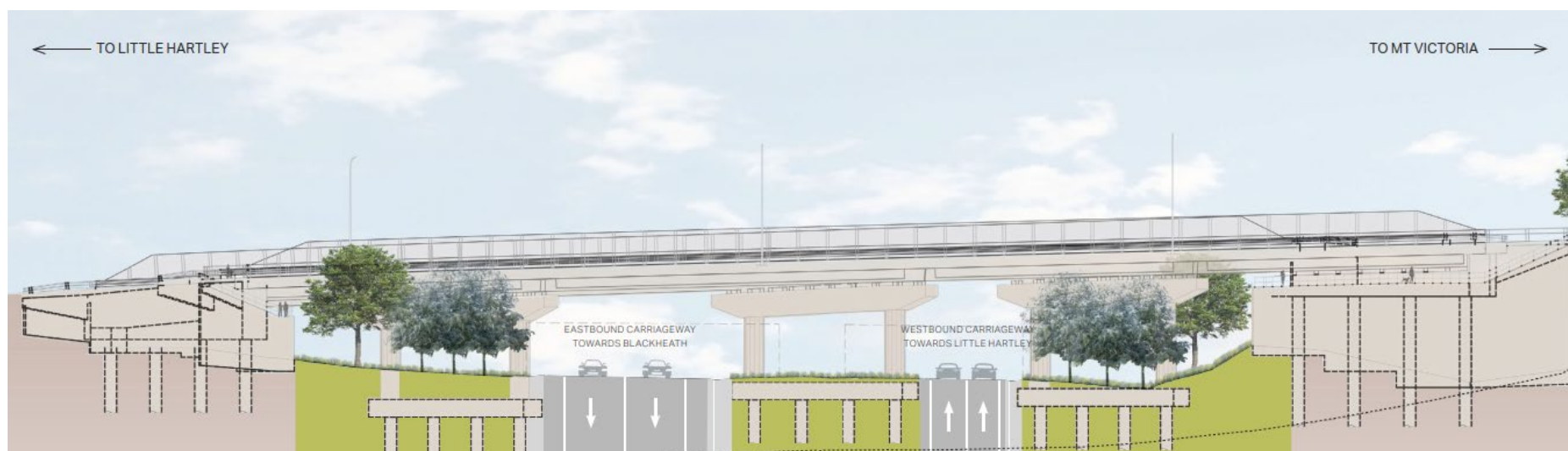


Figure 3-7 Typical long section of the new bridge forming part of the eastbound off-ramp connection

3.2.4 Ancillary infrastructure

The proposed modification involves new and amended ancillary infrastructure, as summarised in Table 3-3.

Table 3-3 Ancillary infrastructure

Ancillary infrastructure	Proposed modification
Realigned access road for local property access	The approved project currently includes an access road off the realigned existing Great Western Highway (Service Road 1) to provide local property access. As a consequence of proposed changes to the realignment of the Great Western Highway, the location and alignment of this access road has been amended. Figure 3-2 compares the access road as forming part of the approved project, and as amended by the proposed modification. The realigned access road would continue to be designed and delivered in consultation with the affected landowner(s).
Active transport infrastructure	An indicative route for the shared path between Little Hartley and Lithgow was provided in the approved project REF (see Appendix R). Based on ongoing design development for the approved project, a revised alignment for the active transport trail is proposed between the base of Victoria Pass and 300 metres east of Coxs River Road (about 2 kilometres), including a connection to the Berghofers Pass car park, as part of the proposed modification. This would be bi-directional and separated from the road by either a one metre verge or road safety barrier.
Formalisation of Berghofers Pass car park	Two informal, unpaved car parking areas are currently used by visitors to Berghofers Pass. The proposed modification would include formalisation of this car parking area and the exit and entry from the existing Great Western Highway, with generally the same footprint (around 40 metres by 30 metres) and capacity as the existing site. The formalised car park would provide 12 car parking spaces. The approved project does not currently include formalisation of the carpark.
New surface water management infrastructure	<p>Changes to the approved project as part of the proposed modification and further development of the design of water management infrastructure has raised the need for two changes to the water management infrastructure included in the approved project:</p> <ul style="list-style-type: none"> • New and relocated water quality management infrastructure, including a new water quality treatment basin at Little Hartley for use during both construction and operation of the proposed modification • Replacement of part of an existing drainage culvert for Rosedale Creek beneath the existing Great Western Highway and eastbound off-ramp from the new Great Western Highway at Little Hartley.

Ancillary infrastructure	Proposed modification
Adjustments to electricity infrastructure	The proposed modification would involve the extended adjustment of 132 kilovolt overhead powerlines and poles at Hartley (in addition to those identified in the approved project REF).

3.3 Construction activities

Transport understands that both the Federal and State Governments remain committed to the delivery of the Great Western Highway Upgrade Program. It was announced in October 2022 that the funding for this program has been deferred for a period of two years. As a result, the proposed modification is currently paused while awaiting confirmation of funding from both the Federal and State Governments. Subject to planning approval and funding, the proposed modification would be undertaken in conjunction with the approved project.

Construction activities for the proposed modification would generally be consistent with the construction work described in Section 3.3 of the approved project REF. This section describes how the proposed modification would be constructed. The methodology presented in this section would be refined during detailed design development.

3.3.1 Construction footprint and construction ancillary facilities

As a result of design development and construction planning activities, Transport have identified the need for minor extensions of the construction footprint to accommodate changes to the project design and additional construction ancillary facilities beyond those identified in the approved project REF.

The additional construction footprint and construction ancillary facilities required for the proposed modification are shown in Figure 3-8 and would include:

- Seven new construction ancillary facilities, five of which are outside of the previously approved construction footprint presented in the approved project REF
- Works area for the extension of the 132 kilovolt overhead powerlines and poles adjustments at Hartley
- Adjustments to temporary sedimentation basins.

These new construction ancillary facilities would facilitate the efficient delivery of construction work and activities listed in Section 4.3 of the approved project REF. Additionally, the construction ancillary facilities for the proposed modification would facilitate:

- Plant workshop and plant storage areas
- Construction materials laydown areas
- Rock crushing and materials processing and stockpiling.

The additional construction ancillary facilities and activities to be undertaken within them are summarised in Table 3-4.

The same selection criteria used to identify the construction ancillary facility locations for the approved project were adopted (refer to Section 3.4 of the approved project REF).

Construction ancillary facility 12, previously identified in Chapter 3 of the approved project REF, would also be used for rock crushing to support construction. This has been assessed as part of the construction noise assessment undertaken for the proposed modification, detailed in Section 6.3 (Noise and vibration) of this addendum REF.

Exclusion zones

Due to the presence of significant ecological and Aboriginal heritage values within the construction boundary, exclusion zones will be utilised to prevent damage to these areas. Exclusion zones will be delineated prior to any site disturbance and managed to avoid disturbance within the exclusion zones. The exclusion zones will be reflected in the Construction Environmental Management Plan (CEMP) and relevant sub-plans, and will be included in environmental awareness training for relevant construction workers. Exclusion zones will be established in the following areas:

- Due to presence of Key Fish Habitat along the Rosedale Creek, areas of construction ancillary facility 20 will be part of exclusion zones and fenced off. This is discussed in Sections 6.1 (Biodiversity)
- Due to presence of Key Fish Habitat and Native Blackthorn *Bursaria spinosa*, which is habitat for the Purple Copper Butterfly *Paralucia spinifera* (listed as Endangered in the BC Act and Vulnerable in the EPBC Act), vegetation removal will not occur in construction ancillary facility 23. This site will be used as site offices, amenities, and for laydown only. Any vegetation will be part of exclusions zones and fenced off. This is discussed in Section 6.1 (Biodiversity)
- Due to presence of high quality Eucalypts around the boundaries of construction ancillary facility 24, not all vegetation will be cleared on this site. Any vegetation to be retained will be part of exclusions zones and fenced off. This is discussed in Section 6.1 (Biodiversity).

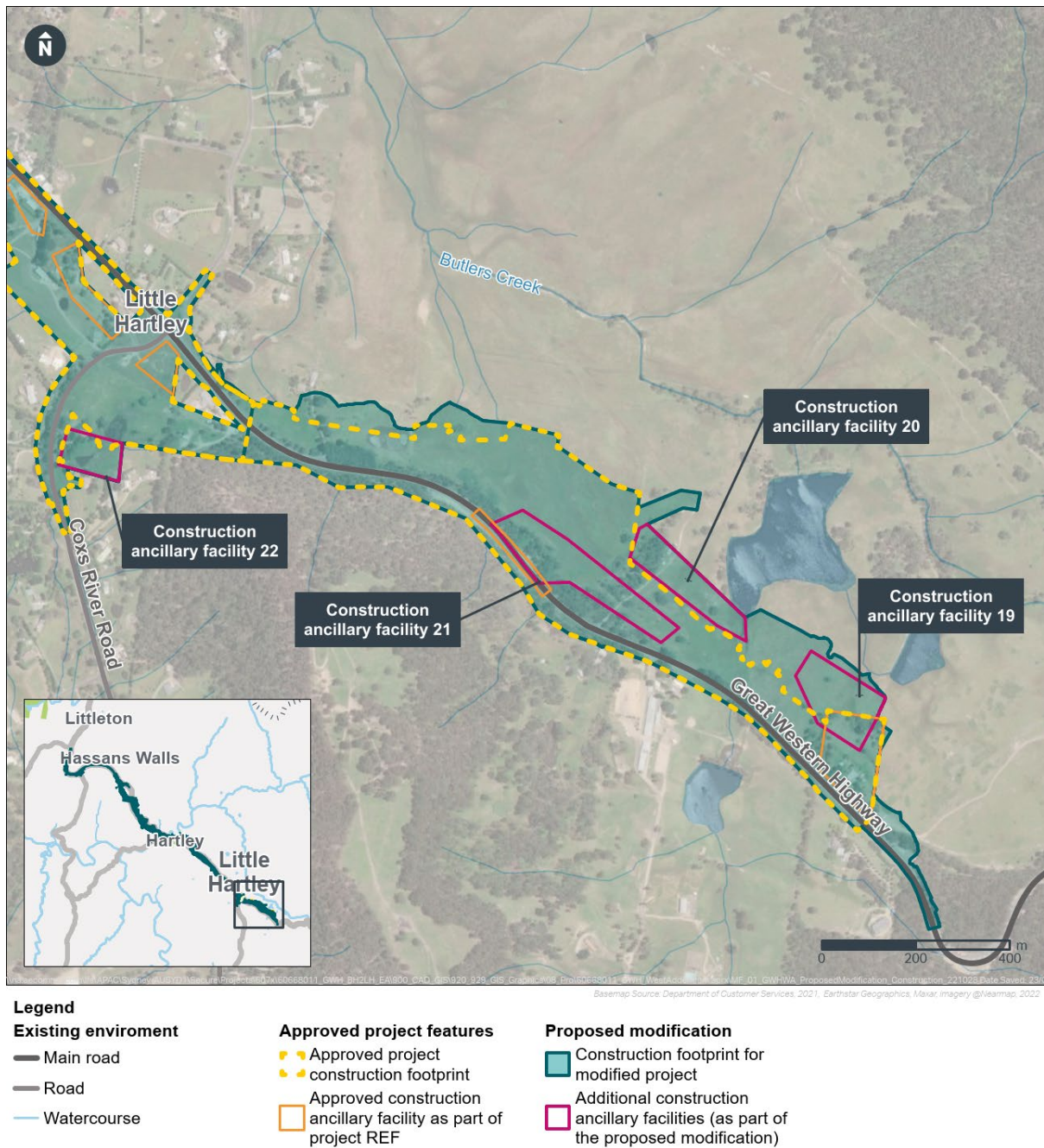


Figure 3-8a Construction footprint and ancillary facilities of the approved project and modified project

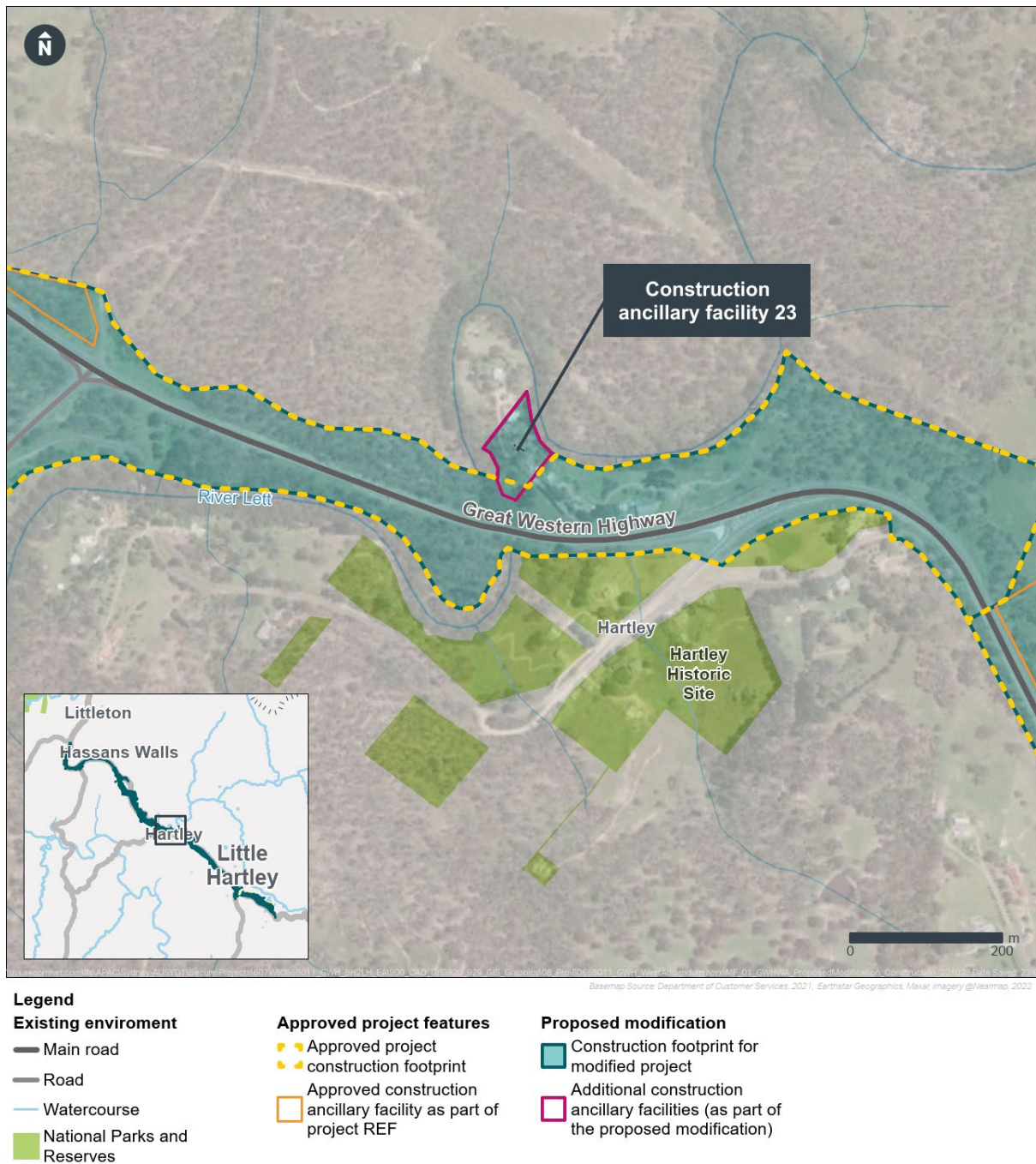


Figure 3-8b Construction footprint and ancillary facilities of the approved project and modified project

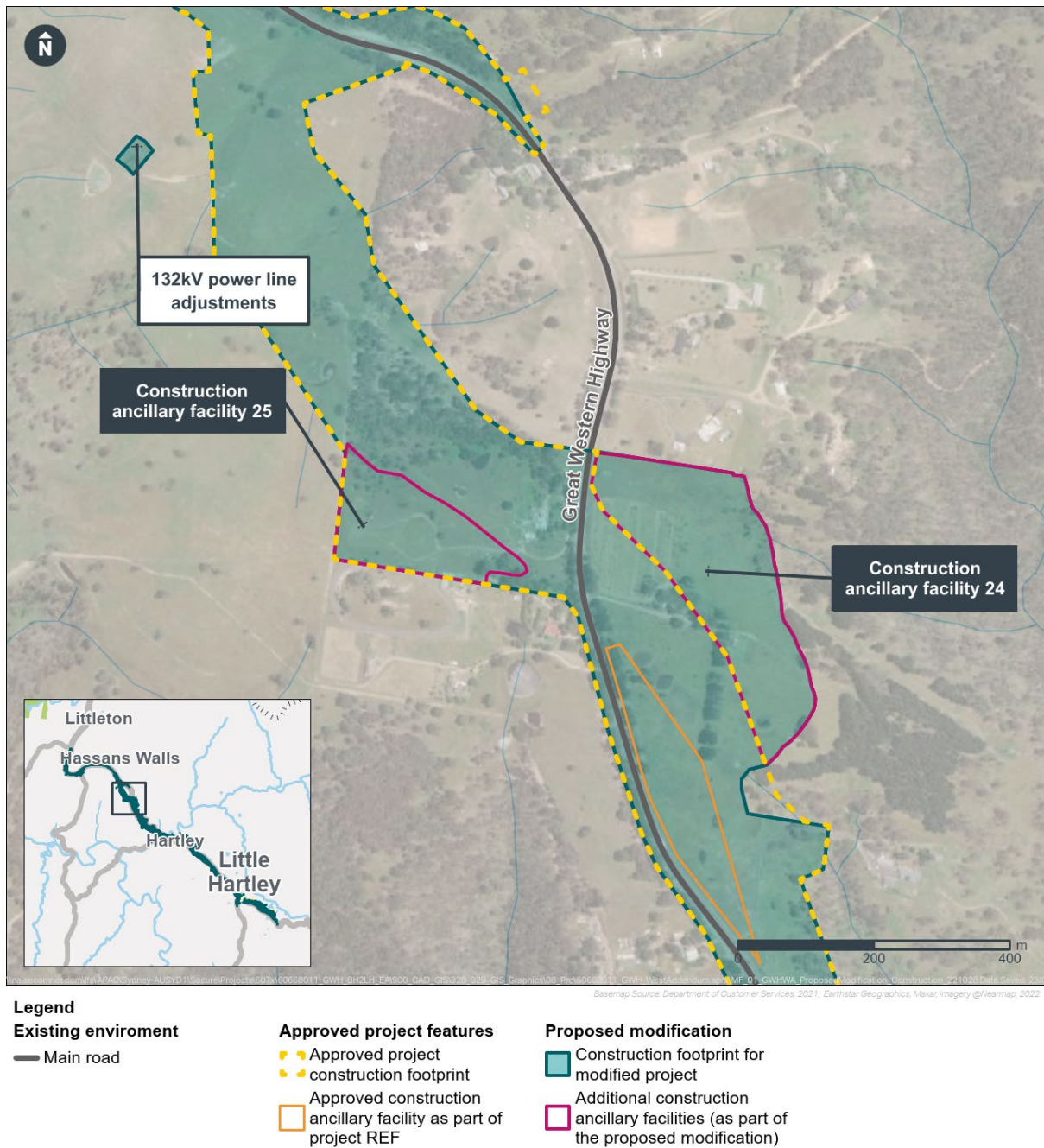


Figure 3-8c Construction footprint and ancillary facilities of the approved project and modified project

Table 3-4 Additional construction ancillary facilities

Ancillary facility #	New or modified?	Indicative area (square metres)	Lot and DP	Location	Key activities
19	New (outside approved project footprint)	20,000	Lot 1 (DP 587763) Lot 360 (DP 751644) Lot 1 (DP 840442)	2138 and 2200 Great Western Highway, Little Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Workshop • Laydown
20	New (outside approved project footprint)	22,000	Lot 1 (DP 587763)	2200 Great Western Highway, Little Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Workshop • Laydown • Stockpiling
21	New (within approved project footprint)	20,000	Lot 4 (DP 1130441) Lot 1 (DP 587763)	2200 Great Western Highway, Little Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Workshop • Laydown
22	New (outside approved project footprint)	10,000	Lot 9 (DP 712698)	41 Coss River Road, Little Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Workshop • Laydown
23	New (outside approved project footprint)	7,000	Lot 3 (DP 758503)	3 Walker Street, Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Laydown.

Ancillary facility #	New or modified?	Indicative area (square metres)	Lot and DP	Location	Key activities
24	New (outside approved project footprint)	50,000	Lot 3 (DP 1187719)	3038 Great Western Highway, Hartley	<ul style="list-style-type: none"> • Site offices • Amenities • Workshop • Laydown • Stockpiling • Borrow clean natural material • Spoil clean natural material • Temporary batch plant concrete and/ or asphalt • Rock crushing
25	New (within approved project footprint)	25,000	Lot 154 (DP 1122453)	3055 Great Western Highway, Hartley	<ul style="list-style-type: none"> • Laydown • Stockpiling <p>This ancillary facility was included in the construction footprint in the approved project REF but was not assessed as a stockpiling and ancillary site.</p>

3.3.2 Work methodology

Construction activities for the proposed modification would generally be consistent with the construction work described in Section 3.3.1 of the approved project REF. Additional construction work methodologies for the proposed modification are outlined in Table 3-5.

Detailed construction work methodologies would be identified by the construction contractor. Construction activities would be carried out in accordance with a CEMP to ensure work complies with Transport's commitments and legislative requirements.

Table 3-5 Construction activities and methodology

Construction phase	Additional activities for the proposed modification
Pre-construction and early works	Consistent with the approved project REF (Table 3-9)
Site establishment	Consistent with the approved project REF (Table 3-9)
Construction	Generally consistent with the approved project REF (Table 3-10 and 3-11), with the following additional activities: <ul style="list-style-type: none">• Environmental management measures implementation• Use of westbound off-ramp to Jenolan Caves Road as side-track of the existing Great Western Highway• Construction of side-track through Transport-owned and privately owned land at River Lett Hill• Bulk earthworks and excavation, including importing large fill volumes• Rock crushing and materials processing and stockpiling• Construction of bridges and retaining walls (realigned Service Road 1 bridge and eastbound connection bridge to existing Great Western Highway)• Drainage and pavement works.
Finishing work	Generally consistent with the approved project REF (Table 3-9), with the following additional activities: <ul style="list-style-type: none">• Final pavement markings.

3.3.3 Construction hours

Construction hours for the proposed modification would be consistent with the approved project in accordance with the standard construction hours as defined in the *Interim Construction Noise Guideline* (DECC, 2009):

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

The proposed modification may result in similar activities required to be undertaken outside standard construction hours to those considered in Table 3-15 of the approved project REF including:

- Utility adjustments

- Delivery and placement of large precast concrete components
- Construction of major drainage structures
- Completion of tie-ins, and completion of temporary diversions and traffic switches.

Consultation with the community would be carried out before any work proposed to be carried out outside of standard construction hours in accordance with the Great Western Highway Upgrade Program Stakeholder Engagement Strategy.

3.3.4 Temporary diversions

Section 3.3.1 of the approved project REF stated that there would be a need for temporary diversions (side-tracks) to allow for construction works to be completed safely. Through design progression, diversion routes have been identified. These include:

- The approved westbound off ramp to Jenolan Caves Road would be used for a side-track off the existing Great Western Highway for two to two and a half years. The speed limit would be 60 kilometres per hour for all vehicles travelling eastbound and westbound.
- The approved River Lett Hill side-track along the proposed Great Western Highway for two to two and a half years. The speed limit would be 60 kilometres per hour for all vehicles travelling westbound (uphill) and light vehicles travelling eastbound (downhill). For heavy vehicles travelling eastbound (downhill), the speed limit would be 40 kilometres per hour.

3.3.5 Plant and equipment

The plant and equipment required for the proposed modification is consistent with that needed for the approved project, as listed in Section 3.3.5 of the approved project REF. The type and number of plant and equipment for the proposed modification would be determined by the Construction Contractor.

3.3.6 Earthworks

Due to the topography of the local area, some cut and fill earthworks would be required for the proposed modification, including to establish the additional construction ancillary facilities.

The design for the proposed modification reduces the requirement for the importation of fill for the modified project. While the proposed modification increases the extent of works required, the earthworks for the proposed modification would be similar to the estimates provided and assessed in the approved project REF. The current design of the modified project would require the importation of around 726,000 cubic metres of fill. The quantity and quality of required material is available from other projects and/ or established quarries in the local area. Earthworks and imported materials requirements would be finalised during detailed design.

A Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the *Protection of the Environment Operations (Waste) Regulation 2014* for excavated natural material would be required to meet the conditions for excavated natural material that is, or is intended to be, for use in earthworks for the proposed modification.

Blasting

Section 3.3.6 of the approved project REF identified that construction of the deep cut through River Lett Hill will require a significant amount of blasting to remove the large volume of hard rock. Construction planning undertaken since approval of the project has identified the need to increase the velocity of blasting for the deep cut through River Lett Hill. This increase will reduce the amount of oversize granite boulders produced, thereby reducing the amount of large excavator hammering required. The change will result in reduced duration of hammering and resultant noise. The overall environmental impacts, including noise, vibration, and air quality, of this change has been assessed in Chapter 6 (Environmental assessment) of this addendum REF. A blasting and flyrock management plan would be prepared to mitigate and manage impacts of blasting, in accordance with the mitigation measures listed in Chapter 7 (Environmental management) of this addendum REF.

3.3.7 Source and quantity of materials

Construction of the proposed modification would require resources and materials largely consistent with those presented in Table 3-17 of the approved project REF.

The source of materials required to construct the proposal would be finalised during detailed design through the development of a construction materials and resources plan. Material sources would comply with relevant Transport material quality specifications.

3.3.8 Traffic management and access

Construction of the proposed modification would not significantly change the temporary increase in heavy vehicle movements along the Great Western Highway and nearby local roads required for the approved project.

Construction traffic associated with the proposed modification would generate a range of vehicle type movements including cars, light and heavy trucks and concrete trucks. Construction of the proposal would be subject to comprehensive traffic management measures to ensure the ongoing functionality of the Great Western Highway and local roads, and the safety of members of the public, motorists, and construction workers.

A traffic management plan (TMP) would be prepared and approved by Transport for the approved project and the proposed modification prior to implementation as part of an approved CEMP. The TMP would provide details of the traffic management measures to be implemented during construction to manage and regulate traffic movements on the surrounding network, maintain vehicular, pedestrian, and cyclist access and minimise traffic congestion where possible.

Access to local properties would be maintained for the duration of construction. Traffic control measures would be used for out of hours construction works during the night period where required. As per the approved project REF, any changes to property access arrangements would be managed in consultation with affected property owners.

Construction vehicle movements and haulage routes

The estimated daily construction light and heavy vehicle movements during construction of the modified project would be consistent with those identified for the approved project in the approved project REF. These estimates are presented in Table 3-6.

Haulage of materials would be undertaken within the construction site by off-road vehicles. Where it is not feasible to use off-road vehicles, haulage would be carried out with on-road vehicles using the existing Great Western Highway. Some haulage would take place on local roads between the ancillary facilities. Internal access roads would provide vehicle access between work sites and ancillary facilities.

Controlled construction traffic entry and exit points would be provided during construction to ensure road safety. Controlled construction traffic crossings of the existing highway would also be provided to facilitate the efficient movement of materials, including occasional temporary stoppings for blasting operations (refer to mitigation measure TT3 in Chapter 7 (Environmental management)). This may require the introduction of temporary traffic management measures, which would be determined in the construction traffic management plan for the proposal. The number of crossings of the existing highway would be minimised, and the usage would be restricted during weekends and holiday periods.

Table 3-6 Indicative estimate of daily construction vehicle movements

Construction site / Section	Estimated daily construction vehicle movements		
	Light vehicles	Heavy vehicles	Total
Little Hartley to River Lett Hill (excluding Coxs River Road)	200	320 to 420	520 to 620
Coxs River Road	200	167 to 487	367 to 687
River Lett Hill to Forty Bends	400	218 to 450	618 to 850
Forty Bends to Lithgow	200	88 to 450	288 to 650

3.4 Public utility adjustment

Transport has been consulting with public utility authorities as part of the design process to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments.

A summary of major utilities that would be impacted by the approved project was provided in Section 3.5 (Public utility adjustment) and Figure 3-4 of the approved project REF. Separate Utilities Management Plans have been prepared for each section of work that would be refined during detailed design development and by the construction contractor(s) for the modified project.

The utility adjustments identified in the approved project REF included relocation of some overhead powerlines and poles along the 132kV transmission overhead powerlines from River Lett Hill to Forty Bends. As part of this addendum REF, the area over which the powerlines and poles would be adjusted has been extended slightly (refer to Figure 3-8).

3.5 Property acquisition

Due to the increased construction footprint for the proposed modification, Transport would need to acquire and lease additional properties to facilitate construction of the proposed modification.

Properties proposed to be fully or partially acquired, or leased for the proposed modification are listed in Section 6.9 (Property and land use). The extent of property acquisition would be refined and confirmed during detailed design, and in consultation with the affected property owners. Property acquisition would be undertaken in accordance with A Guide to Property Acquisition in NSW 2022 and the *Land Acquisition (Just Terms Compensation) Act 1991*.

4 Statutory and planning framework

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

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) aims to facilitate the effective delivery of transport and infrastructure across the State.

Clause 2.109 of TISEPP 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 proposed modification relates to a road and road infrastructure facilities, and is to be carried out by Transport, it is subject to assessment under Division 5.1 of the EP&A Act. Development consent from Council is not required. A TISEPP notification was issued for the approved project on the 26 July 2021. Consultation carried out for the proposal as required by the TISEPP is detailed in Chapter 5 (Consultation) of this addendum REF. An update to this notification has been issued to the Lithgow City Council and the State Emergency Service for the proposed modification on the 27 April 2023.

The proposed modification would not be located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) and does not require development consent or approval under State Environmental Planning Policy (Resilience and Hazards) 2021 or State Environmental Planning Policy (Planning Systems) 2021.

Division 1 of TISEPP 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 the TISEPP (where applicable), is discussed in Chapter 5 (Consultation) of this addendum REF.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The proposed modification is located entirely within the outer catchment of the Sydney Drinking Water Catchment. Part 6.5 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) relates to the use of land within the Sydney drinking water catchment. The Biodiversity and Conservation SEPP requires that development consent must not be granted under Part 4 of the EP&A Act for development in any part of the Sydney Drinking Water Catchment unless the development would have a neutral or beneficial effect (NorBE) on water quality. It does not include a similar requirement for activities under Part 5, and therefore does not apply to the approved project or the proposed modification. Notwithstanding, a qualitative NorBE water quality assessment has been carried out and is included in Appendix C (Neutral or beneficial effect on water quality assessment) of this addendum REF. The modified project would be designed to meet NorBE requirements.

Chapter 3 and Chapter 4 of the Biodiversity and Conservation SEPP relate to the protection of Koala habitat. Broadly, the chapters require preparation of a koala management plan for specified areas, and for the provisions of such plans to be considered in the assessment and determination of development applications under Part 4 of the EP&A Act. Because the approved project and proposed modification are subject to assessment under Part 5 of the EP&A Act, they are not subject to the koala protection provisions of the Biodiversity and

Conservation SEPP. Notwithstanding, because the proposed modification would be located wholly within the Central and Southern Tablelands Koala Management Area, specific consideration has been given to potential impacts on the Koala (*Phascolarctos cinereus*) and its habitat as part of the biodiversity assessment (refer to Appendix D (Addendum Biodiversity Development Assessment Report (BDAR))).

4.1.2 Local Environmental Plans

Lithgow City Local Environmental Plan

Land use and development is primarily regulated by the Lithgow Local Environmental Plan 2014 (Lithgow 2014 LEP). The approved project would traverse the following land use zones:

- C1 – National Parks and Nature Reserves
- C3 – Environmental Management
- SP2 – Infrastructure
- RU1 – Primary Production
- R5 – Large Lot Residential.

The approved project REF concluded that the approved project would be consistent with the relevant zone objectives (as detailed in Table 4-1 of the approved project REF).

The proposed modification would not change this. Land in other zones would not be required, and only minor changes in the construction footprint would be required for the modified project. The approved project was approved with the exception of land reserved in the National Parks Estate; this land has since been revoked under the National Parks and Wildlife Amendment (Reservations) Bill 2022, Amendment of National Parks and Wildlife Act 1974 No 80 (Part 11) and has since been approved. Therefore no additional land reserved under NPWS Act is required for this modification.

The Lithgow City LEP 2014 also provides a listing of local heritage items and these are discussed and assessed in Section 6.5 (Non-Aboriginal Heritage) of this addendum REF.

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

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

The NSW Biodiversity Offsets Scheme is established under Part 6 of the BC Act and the Biodiversity Assessment Method (BAM) is established under Section 6.7 of the BC Act. The purpose of the BAM is to prescribe requirements for the assessment of certain impacts on listed threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

Section 7.3 of the BC Act provides a test for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Where a significant impact is likely, a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) must be prepared.

The approved project REF identified the following threatened biodiversity listed on the BC Act as known to occur or considered likely to occur in the subject land (comprising the construction footprint and operational footprint considered in the approved project REF):

- Nine threatened flora species and 18 threatened fauna species
- Two terrestrial threatened ecological communities (TECs):
 - 'Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregion,' listed as Endangered under the BC Act, and
 - 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions,' listed as Critically Endangered under the BC Act.

An addendum BDAR (Appendix D) has been prepared as part of this addendum REF to assess the potential impact of the proposed modification on threatened species, threatened ecological communities, and their habitats. A summary of this assessment is presented in Section 6.1 (Biodiversity) of this addendum REF.

4.2.2 Local Land Services Act 2013

Areas of native vegetation within the construction footprint for the modified project were identified based on the definition of native vegetation provided under Part 5A 60B of the *Local Land Services Act 2013* (LLS Act). Native vegetation includes any of the following types of plants native to NSW as defined under the LLS Act:

- *'For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:*
 - (a) *trees (including any sapling or shrub or any scrub)*
 - (b) *understorey plants*
 - (c) *groundcover (being any type of herbaceous vegetation)*
 - (d) *plants occurring in a wetland*
- *A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible*
- *For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if:*
 - a. *The plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and*
 - b. *It would be native vegetation for the purposes of this Part if it were native to New South Wales.'*

Native vegetation recorded within the construction footprint for the modified project is mapped within the addendum BDAR (Appendix D). Areas not shown as native vegetation cover are considered cleared and/ or non-native vegetation. A summary of the potential impacts of the proposed modification on native vegetation is presented in Section 6.1 (Biodiversity) of this addendum REF.

4.2.3 Heritage Act 1977

The objectives of the *Heritage Act 1977* (Heritage Act) includes the conservation of the State's heritage, the identification and registration of items of State heritage significance, and to promote an understanding of the State's heritage such as a place, building, relic, or precinct.

Under section 39, an excavation permit is required prior to the disturbance or excavation of land if a relic would or is likely to be discovered, exposed, moved, damaged or destroyed.

Approval under section 60 of the Heritage Act is required for any action that would adversely affect an item that is subject to an Interim Heritage Order or a listing on the State Heritage Register. A section 60 permit may not be required if the works are undertaken in accordance with the *Standard Exemptions for Works Requiring Heritage Council Approval* (Heritage Council of NSW 2020). The proposed modification is expected to result in minor adverse impacts to State heritage items: due to the modifications in proximity to the State listed Fernhill property (SHR 00225), a Section 60 approval will be sought.

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 makes provision for the issuing of an exception in certain prescribed circumstances. An exemption permit would be required for the proposed modification where there is archaeological potential (for example within the Billesdene Grange local heritage item). Section 6.5 (Non-Aboriginal heritage) of this addendum REF provides further details on the potential non-Aboriginal heritage impacts of the proposed modification.

If any suspected relics are found during works, the *Unexpected Heritage Items Procedure* (Transport, 2022b) would be followed.

4.2.4 Crown Lands Management Act 2016

The *Crown Land Management Act 2016* (Crown Land Act), provides the legislative framework for 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.'

No land designated as Crown Land is required to be acquired as part of the proposed modification.

4.2.5 Roads Act 1993

Part 2 of the Roads Act sets out the provisions for the opening of public roads, including notification procedures. Part 4 of the Roads Act sets out the provisions for the closing of public roads, including notification procedures.

The proposed modification would require construction work on the existing Great Western Highway, which is a classified road within the Lithgow City local government area, and temporary interruption to traffic along the proposed modification. A ROL would be required for any activity likely to impact on traffic flow, even if that activity takes place off-road. Transport is the proponent and the relevant roads authority for the proposed modification.

4.2.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) objectives include the conservation of nature and objects, places, or features of cultural value.

The NPW Act is the primary legislation protecting Aboriginal cultural heritage in NSW. Section 86 of the NPW Act provides for the protection of Aboriginal objects and places. 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 proposed modification is not located on land reserved under the NPW Act. The closest land designated as National Park estate is the Hartley Historic Village (which is located about 60 metres from the proposed modification at its closest point). The site is present within the approved project footprint and is assessed within the approved project REF.

There are ten registered Aboriginal sites within the proposed modification study area, plus one that is due to be registered. The Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) process has been followed as part of this addendum REF. If harm to Aboriginal objects or any other objects found through the PACHCI process cannot be avoided, an amendment to approved project Aboriginal Heritage Impact Permit (AHIP) would be required for the proposed modification. Section 6.4 (Aboriginal heritage) of this addendum REF provides further detail on the potential Aboriginal heritage impacts of the proposed modification.

4.2.7 Land Acquisition (Just terms Compensation) Act 1991

Details regarding property acquisition for the proposed modification are outlined in Section 3.6 (Property acquisition) of this addendum REF. All property acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and *A Guide to Property Acquisition in NSW* (NSW Government, 2022), which aim to guarantee just compensation terms for land that is acquired by an authority of the State.

Transport would continue to consult with affected landowners during the development of the proposed modification.

4.2.8 Biosecurity Act 2015

Under the *Biosecurity Act 2015* (Biosecurity Act), all plants, including weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

The Biosecurity Act and regulations provide specific legal requirements for high risk activities and State level priority weeds. The following priority weeds were recorded in the proposed modification area:

- Blackberry *Rubus fruticosus* species aggregate
- Scotch Broom *Cytisus scoparius*
- Willow *Salix sp.*

The following High Threat Weeds (under the BAM) were also recorded:

- Kikuyu Grass *Cenchrus clandestinus*
- Rambling Dock *Rumex sagittatus*
- English Ivy *Hedera helix*
- Cotoneaster *sp.*
- Buffalo Grass *Stenotaphrum secundatum*
- Umbrella Sedge *Cyperus eragrostis*.

4.2.9 Fisheries Management Act 1994

Section 220 of the *Fisheries Management Act 1994* (FM Act) requires the Minister to issue a permit for causing a barrier to fish passage.

The proposed modification lies alongside rivers designated as 'Key Fish Habitat' under the FM Act Key Fish Habitat Mapping: Rosedale Creek, which is culverted under the road in Little Hartley; and the River Lett at construction ancillary facility 23. In addition, the '132kV power line adjustments' area lies approximately 100 metres north of a tributary of Whites Creek.

The modified project would be designed in such a way that fish movement is not impeded, and carried out so that fish passage would be maintained throughout construction and a permit under the FM Act is not expected.

4.2.10 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) objects include the protection, restoration and enhancement of the quality of the environment in NSW. Part 3.2 requires an Environment Protection Licence (EPL) for scheduled development work and scheduled activities identified in Schedule 1.

Development activities require an EPL under the POEO Act if those activities meet the following assessment criteria:

Clause 35(3)(a) the extraction or processing (over the life of the construction) of more than:

- 150,000 tonnes of material in any other case.

Clause 35(3)(b) the existence of 4 or more traffic lanes (other than bicycle lanes or lanes used for entry or exit) for a continuous length of at least:

- (iii) 5 kilometres — where the road is not in a metropolitan area and is classified, or proposed to be classified, as a main road, freeway or tollway under the *Roads Act 1993*.

An EPL under Schedule 1 has already been sought for the Coxs River Road section of the approved project as it would involve substantial earthworks. The modified project is likely to require an EPL for the remaining sections.

4.2.11 Coal Mine Subsidence Compensation Act 2017

Under Section 21 of the *Coal Mine Subsidence Compensation Act 2017*, a person must not carry out work, or cause work to be done, in connection with the erection or alteration of an improvement within a mine subsidence district, except in accordance with the approval body Subsidence Advisory NSW. For the purposes of the Act 'improvement' includes infrastructure, whether above or below the surface of the land. Sections of the construction footprint for the proposed modification are directly adjacent to the boundary of the Lithgow South Mine Subsidence District.

4.2.12 Water Management Act 2000 and Water Act 1912

The proposed modification area is covered by the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011 and the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources. It is subject to the provisions of the *Water Management Act 2000*. Potentially relevant Water Management Act approval requirements are reviewed in Table 4-1.

Table 4-1 Water Management Act 2000 approvals

Provision	Application
Water access licences (s.56 & s.60A)	Exemption for roads authorities in relation to water required for road construction and road maintenance under clause 21 and Schedule 4 of the Water Management (General) Regulation 2018.
Water use approval (s.89 & s.91A)	Exemption for roads authorities in relation to water required for road construction and road maintenance under clause 34 and Schedule 5 of the Water Management (General) Regulation 2018.
Water supply work approval	Water supply works are not proposed as part of the proposed modification. Limited exemptions in clause 39 and Schedule 1 of the Water Management (General) Regulation 2018.
Controlled activity approval required for carrying out controlled activities including works on waterfront land (s.91 and s.91E).	Exemption in clause 41 of the Water Management (General) Regulation 2018.

The Water Act 1912 remains relevant for aquifer interference activities such as construction dewatering because the requirement for aquifer interference approvals under the Water Management Act 2000 has not yet commenced. Localised dewatering of construction excavations is expected to benefit from a Crown exemption under Section 112 of the Water Act 1912.

Predicted groundwater level reductions as a result of the proposed modification are less than the NSW Aquifer Interference Policy (AIP) minimal impact considerations (see Section 6.6 (Groundwater)). The beneficial use category of groundwater sources is not anticipated to be lowered beyond 40 metres of the proposal, which is an AIP water quality criterion. It is not anticipated that an AIP would be required for the proposed modification (see Section 6.6 (Groundwater)).

4.2.13 Waste Avoidance and Resource Recovery Act 2001

The purpose of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) 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 modified project. Procedures would be implemented during construction in an attempt to promote the objectives of the Act.

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 (Consideration of section 171(2) factors and MNES), Appendix d (Addendum BDAR), and Section 6.1 (Biodiversity) of this addendum REF.

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

Findings – Matters of National Environmental Significance (MNES) (other than biodiversity matters)

The assessment of the proposed modification's impact on MNES and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely to cause any additional significant impacts on MNES or the environment of Commonwealth land. A referral to the Australian Government Department of Agriculture, Water and the Environment is not required.

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 affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken, with two Native Title holders/ claimants identified within the proposed modification construction footprint (Table 4-2).

Table 4-2 Native Title search results

Type	Name	Tribunal file no.	Status
Native Title claim	Warrabinga-Wiradjuri #7	NC2018/002	Registered 22/11/18
Indigenous Land Use Agreement	Gundungurra Area Agreement	NI2014/001	Registered 27/02/15

Transport has been consulting with the traditional owners and will continue to do so as the modified project progresses.

4.4 Confirmation of statutory position

The proposed modification is categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority.

Under clause 2.109 of TISEPP the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Division 5.1 of the EP&A Act.

Transport is the determining authority for the modified project. This addendum REF fulfils Transport's obligation under section 5.5 of the EP&A Act 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 section discusses the engagement undertaken to date for the proposed modification and the ongoing and future consultation proposed for the approved project. The consultation strategy and approaches used to consult on the proposed modification are described along with results of engagement with the Aboriginal community, the wider community, and relevant government agencies and stakeholders to date.

5.1 Consultation strategy

Engagement for the approved project has been managed as part of the community and stakeholder engagement strategy for the wider program to upgrade the Great Western Highway between Katoomba and Lithgow.

The Great Western Highway Upgrade Program Stakeholder Engagement Strategy, developed by Transport (2022c), identifies key objectives, guidance for and outcomes of consultation activities with the community, stakeholders and government agencies. The Stakeholder Engagement Strategy has been and will continue to be applied to the proposed modification.

Consultation for the approved project has been ongoing since the NSW Government first announced an upgrade from Mount Victoria to Lithgow in May 2008 until exhibition of the approved project REF (refer to Chapter 5 (Consultation) of the approved project REF for further details). Public display of the approved project REF occurred between November 2021 and January 2022, and the responses to issues raised during public display were captured in Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) Submissions Report (the Submissions Report) (Transport, 2022a). The supporting consultation was summarised in the Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) Consultation Report (the June Consultation Report) (Transport, 2022d). The June Consultation Report, also available on the approved project's online portal, summarises the community engagement activities undertaken during display of the approved project REF.

Since determination of the approved project, consultation with the following stakeholders has occurred during design development for the approved project (including for elements of the proposed modification):

- Lithgow City Council
- NSW National Parks and Wildlife Service
- Residents and landowners
- Businesses
- Emergency services
- Hartley District Progress Association
- RAP representatives from:
 - Bathurst Local Aboriginal Lands Council
 - Mingaan Wiradjuri Aboriginal Corporation
- Freight industry representatives
- Utility providers:
 - Endeavor Energy

- Telstra
- NBN Co.

Community updates regarding the approved project have continued to be distributed to residents and posted on the approved project's online portal: nswroads.work/gwhwestconsult.

5.2 Consultation outcomes

This section summarises the consultation outcomes from engagement undertaken since determination of the approved project, including how relevant issues have been addressed and considered during design development.

5.2.1 Concept Design consultation

Transport displayed an updated concept design for the upgrade of the Great Western Highway between the base of Victoria Pass and Coxs River Road, Little Hartley for community feedback in 24 October and 20 November 2022. A portion of this updated design relates to the West Section and is the subject of this addendum REF.

The community was encouraged to view the updated concept design, talk to the project team and to have their say on the updated concept design. The approved project design was displayed on the online interactive map.

During the display of the updated concept design between the base of Victoria Pass and Coxs River Road, Little Hartley, the following consultation activities took place:

- Community update
- Virtual and in-person community information sessions
- Stakeholder group meetings
- Consultation with directly impacted property owners/ residents.

Table 5-1 provides a summary of these consultation activities.

The updated concept design was displayed through the following mediums:

- Poster
- Static displays
- eNewsletters
- Advertisement
- Media release
- Website and interactive web portal
- Facebook.

Table 5-2 provides a summary of these displays.

Table 5-1 Summary of consultation activities during display of the updated concept design

Activity	Summary
Community Update	<p>A six-page Community Update with two-page map of the updated concept design was developed and distributed to residences from Little Hartley to South Bowenfels.</p> <p>The Community Update was made available on the approved project interactive web portal at nswroads.work/gwhwestconsult and the approved project website at nswroads.work/gwhd</p> <p>Contacts registered to the Program database were sent an eNewsletter advising that consultation on the updated concept design was open and providing a link to the Community Update online.</p> <p>Hard copies of the Community Update were available at the static displays and at face-to-face consultation sessions. Fifty copies of the Community Update were provided to the Hartley District Progress Association for distribution to members.</p>
Community information sessions	<p>Online and a face-to-face community information sessions were held.</p> <p>Online information session</p> <p>Thursday 3 November 2022, 6.00pm–7.30pm</p> <p>Face-to-face information session</p> <p>Wednesday 9 November 2022, 6.00pm–7.30pm</p> <p>Hartley Community Hall, Corner Great Western Highway and Mid Hartley Road, Hartley</p>
Stakeholder group meetings	<p>The following stakeholder group meetings were held:</p> <ul style="list-style-type: none"> • Lithgow City Council administration, 2 November 2022 • Hartley District Progress Association, 9 November 2022
Directly impacted property owners/residents	<p>Meetings or phone consultations were held with directly impacted property owners/residents.</p>

Table 5-2 Updated concept design display mediums

Display type	Summary
Poster	<p>A poster promoting the updated concept design display and information sessions was provided at the static displays at Lithgow City Council, Lithgow Library Learning Centre and Hartley Fresh & Café.</p>
Static displays	<p>Static displays with a large map of the updated concept design and copies of the Community Update were provided at Lithgow City Council, Lithgow Library Learning Centre and Hartley Fresh & Café.</p>

Display type	Summary
eNewsletters	<p>Contacts registered to the Program database were sent eNewsletters highlighting the date of:</p> <ul style="list-style-type: none"> Opening of consultation – 24 October 2022 Close of consultation – 20 November 2022.
Advertisement	<p>An advertisement about the updated concept design display was published in:</p> <ul style="list-style-type: none"> Lithgow Mercury – 28 October 2022 Central West Village Voice – 27 October 2022.
Media release	<p>A media release was distributed via the Program website and through engagement with local media titled:</p> <ul style="list-style-type: none"> East and West sections of Great Western Highway Upgrade near final design (24 October 2022) <p>The media release is available at nswroads.work/gwhd</p>
Website and interactive web portal	<p>The Great Western Highway Upgrade Program – Little Hartley to Lithgow website, nswroads.work/gwhd, pointed to the approved project interactive web portal at nswroads.work/gwhwestconsult which provided information about consultation, including an online interactive map, booking form for consultation sessions, and online feedback form.</p>
Facebook	<p>Facebook was used to provide information about the consultation period and information sessions with 2 posts on the Transport for NSW page on 17 October 2022 and 14 November 2022</p>

Table 5-3 provides a summary of the issues raised by the community during the updated concept design exhibition, along with where these issues are addressed in this addendum REF or approved project REF.

Table 5-3 Summary of issues raised by the community during updated concept design exhibition

Issues raised	Response / where addressed in addendum REF
Residents	
Concerns for driver safety accessing the existing Great Western Highway from Baaners Lane	The proposed modification does not include any new infrastructure connecting to Baaners Lane. Concerns for driver safety and accessing the existing Great Western Highway from Baaners Lane was addressed in Section 2.3.2 of the Submissions Report (Transport, 2022a).
Concerns regarding the level of environmental assessment and impacts on the natural environment, flora and fauna in the approved project REF	The approved project REF determined that the approved project is unlikely to have a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.

Issues raised	Response / where addressed in addendum REF
	<p>Biodiversity offsets have been calculated for ecosystems, species and ecosystems credits for both direct and indirect impacts of the approved project, and offsets will be delivered by Transport in accordance with the BC Act.</p> <p>The approved project REF satisfies Transport's requirements under Section 5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity." This addendum REF will do the same.</p>
Concerns that previously raised environmental concerns in the approved project REF have not been addressed in the updated concept design	<p>The approved project REF satisfies Transport's requirements under Section 5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity."</p> <p>The proposed modification is considered to facilitate improved environmental, operational and technical outcomes, while also providing solutions that satisfy the proposal objectives. The environmental assessment for the proposed modification is summarised in Chapter 6 (Environmental assessment), and the need and justification for the proposed modification is discussed in Chapter 2 (Need and options considered).</p>
Concerns that previously raised safety concerns in the approved project REF have not been addressed in the updated concept design	<p>The proposed modification includes a second overbridge, provides improved connections to make it easier and safer for drivers to access the upgraded highway, the existing highway and local service roads. Chapter 2 (Need and options considered), Section 6.2 (Traffic and transport), and Appendix E (Traffic and transport impact assessment) provides further discussion on the need and benefits of the proposed modification.</p>
Concerns that the proposed modification encroaches into the Blackheath to Little Hartley upgrade project and should not be included as an add-on to the West Section	<p>The additional bridges, surface connections, and sediment basins as part of the proposed modification are required for the modified project to operate safely and efficiently on its own, and have therefore been assessed as part of this addendum REF. Tie-ins to the Blackheath to Little Hartley upgrade project in the approved project REF were indicative only, and the operational extent of both the Blackheath to Little Hartley upgrade project and the approved project were undergoing continuous refinement as designs developed.</p>

Issues raised	Response / where addressed in addendum REF
Concerns regarding value for money of the approved project REF and the Upgrade Program	<p>Discussion of the need and options considered for the proposed modification can be found in Chapter 2 (Need and options considered), and were addressed in Section 2.2.4 of the Submissions Report (Transport, 2022a).</p> <p>Consideration of the need and benefits of the other components of the Upgrade Program are outside of the scope of the proposed modification.</p>
Concerns that providing a new eastbound off-ramp from the new to existing Great Western Highway will compound traffic congestion issues, especially if the Blackheath to Little Hartley upgrade project is not approved	<p>The importance of the Blackheath to Little Hartley upgrade project has been recognised by infrastructure bodies in Australia, including Infrastructure Australia, which has included the Upgrade Program in the National Infrastructure Priority List.</p> <p>The traffic and transport impacts associated with the proposed modification to the existing and planned road network would mostly be the same as the approved project REF, and the additional overbridge would provide eastbound connectivity which the approved project does not currently provide. Traffic and transport impacts are further discussed in Section 6.2 (Traffic and transport) of this addendum REF.</p>
Questions regarding options considered and the option for a tunnel project between Little Hartley and Lithgow, as opposed to surface road upgrades	Options considered for the upgrade of the Great Western Highway between Little Hartley and Lithgow were discussed in Chapter 2 (Need and options considered) of the approved project REF. Provision of other potential road upgrade options between Little Hartley and Lithgow are beyond the scope of the proposed modification.
Safety concerns regarding the 100 km/h speed limit as opposed to an 80 km/h speed limit	<p>The posted speed limit for the new Great Western Highway would be 100 km/h. The posted speed limit for Coxs River Road, as outlined in the approved project REF, would be 60 km/h.</p> <p>The proposed modification, including proposed posted speed limits, has been designed considering Austroads Guides, Australian Standards, Transport supplements to Austroads Guides and Australian Standards, technical directions and quality alerts, and other current Transport publications. Chapter 3 (Description of the proposed modification) provides further discussion on design criteria.</p>
Concern regarding adverse impacts to Aboriginal and non-Aboriginal heritage in the approved project REF	Section 6 of the Submissions Report included a number of environmental safeguards which would minimise adverse impacts to Aboriginal and non-Aboriginal heritage, including test excavations, dilapidation surveys, and consideration of options to reduce construction footprints within heritage curtilages. Transport will also aim to avoid, minimise, and mitigate impacts through detailed design.

Issues raised	Response / where addressed in addendum REF
Concerns regarding the visual impact upon local residents in proximity to the rest areas	Concerns on the visual impact upon local residents in proximity to the rest areas have been noted, and investigations into visual improvements are being undertaken. The landscape design would ensure that the rest areas are fully integrated into the existing landscape whilst still providing filtered views from the new highway to acknowledge their presence. Mitigation measures such as mounding, additional screening, and dropping the base of the rest area are currently being investigated. This will be assessed during detailed design.
Concerns around the accuracy of landscape and visual impact assessment in the approved project REF	The methodology used to carry out the landscape character and visual impact assessment for the approved project REF followed the <i>Environment impact assessment practice note: Guideline for landscape character and visual impact assessment</i> (EIA-N04) (Transport, 2020a). Safeguards and management measures would be implemented to minimise potential visual impacts. A consolidated list of mitigation measures can be found in Chapter 7 (Environmental management) of this addendum REF. The proposed landscaping plan will be refined during detailed design.
Concern for potential noise and vibration impacts from the approved project, particularly from blasting, and the provision of noise mitigation measures for residents as part of the approved project REF	<p>Environmental safeguards in the approved project REF include recommendations for notification of all potential affected receivers at least 24 hours prior to blasting. Receivers eligible for 'additional noise mitigation' are outlined in Chapter 6 (Description of the proposal) of the approved project REF.</p> <p>Construction planning and detailed design undertaken since approval of the approved project has identified the need to increase the velocity of blasting for the deep cut through River Lett Hill. Refer to Section 3.3.4 of Chapter 3 (Description of the proposed modification) for further information on blasting as part of the proposed modification.</p> <p>As per mitigation measure NV10 in the Submissions Report (Transport, 2022a), impacts associated with blasting will be managed via a blast management plan. Trial blasts will be carried out when blasting is proposed to occur within the minimum working distances to monitor the vibration levels to ensure no impacts to the surrounding receivers. In addition, notification to the affected property owners will occur at least 24 hours prior to blasting, and monitoring of overpressure and vibration levels will be carried out at the potentially most affected receivers for each blast.</p>
Concern that the approved project has been overengineered and is not	Traffic modelling was completed in Section 6.2 of the approved project REF to determine the resilience of the current network under 2026 and 2036 traffic conditions.

Issues raised	Response / where addressed in addendum REF
considerate of the local landscape and community	<p>The main performance indicators for intersections are delays (measured in seconds) and level of service.</p> <p>Level of service provides a grading for the performance of the intersection from A to F with A meaning that intersection performance is considered to be operating well, with motorists are experiencing high operating speeds and free flowing conditions; and F meaning that intersection performance is unsatisfactory with excessive queuing, heavy congestion, and unstable flows. The results found that the existing network deteriorated considerably under 2026 and 2036 traffic conditions with midblock D-E gradings. Whereas, with the approved project, the midblock performance during 2026 was an A grade and a B-C grade under 2036 traffic conditions. Refer to Section 2.2.1 of the Submission Report for further information.</p> <p>Once operational, the approved project would have long term positive impacts on access and connectivity for local and regional communities, business and industry. This includes travel time improvements and a predicted reduction in total crash rates by 57 per cent between Little Hartley and Lithgow. A simplified design would not deliver the same improvements.</p> <p>The development of the approved project and its design involved substantial consultation undertaken with the community and stakeholders since announcement of an upgrade from Mount Victoria to Lithgow in 2008. The approved project REF included both a socio-economic and landscape character and visual assessment, outlined in Chapter 6 (Environmental assessment) of the approved project REF.</p> <p>The preferred option for the modified project best meets the objectives of the approved project. The objectives and how they are met are discussed in Chapter 2 (Need and options considered) of the approved project REF.</p>
Concern that the Upgrade Program will not go ahead	<p>Supporting the current needs and future growth of Sydney and Central West NSW through an efficient transport network is fundamental to the liveability, productivity and sustainability of Greater Sydney and NSW. Infrastructure Australia has included the Upgrade Program in the National Infrastructure Priority List.</p> <p>Three out of four components of the Upgrade Program have already been approved, and the Blackheath to Little Hartley upgrade project is currently responding to submissions.</p>

Issues raised	Response / where addressed in addendum REF
<p>Concerns for observed vegetation removal occurring at the end of Baaners Lane</p>	<p>Transport carried out vegetation removal and relocation of utilities over the existing power lines located near the intersections of Coxs River Road, Baaners Lane, and Browns Gap Road with the Great Western Highway at Little Hartley.</p> <p>This work was undertaken for the Coxs River Road Upgrade early works program, as part of the early works to prepare for the Great Western Highway Upgrade Program, in quarter four of 2022.</p> <p>Impacts to vegetation have been assessed in the approved project REF and biodiversity mitigation measures were applied during works. Biodiversity offsets have been calculated for ecosystems, species, and ecosystems credits for both direct and indirect impacts of the approved project, and offsets have been delivered by Transport in accordance with the BC Act.</p>
<p>Raises the need for wildlife crossings, pedestrian crossings, and active transport</p>	<p>Design development for the approved project considered the future development of active transport in the vicinity of the proposal, outlined in Chapter 3 (Description of the proposal) of the approved project REF. The proposed modification includes active transport infrastructure to connect the formalised Berghofers Pass car park to the existing Great Western Highway, described in Chapter 3 (Description of the proposed modification) of this addendum REF.</p> <p>Fauna crossing structures have been included in the design for the approved project. Given the scope and location of the proposed modification, no new fauna crossing structures are proposed as part of this addendum REF. Opportunities for fauna connectivity measures will be considered further during detailed design. For further information on potential biodiversity impacts from the proposed modification, refer to Section 6.1 (Biodiversity) and Appendix D (addendum BDAR) of this addendum REF.</p>
<p>Safety concerns and the need for improvements to the intersection of the existing Great Western Highway with Coxs River Road and Ambergere Drive</p>	<p>The approved project includes a grade separated interchange at Coxs River Road, supplemented by new sections of connecting roadway to create a local service road network. Traffic and transport impacts were assessed in Section 6.2 and Appendix E of the approved project REF.</p> <p>Works between the intersection of the existing Great Western Highway and Coxs River Road are outside of the scope of the proposed modification.</p>

Issues raised	Response / where addressed in addendum REF
Concerns that the Berghofers Pass carpark upgrade will not be used	<p>The informal carpark is currently utilised by pedestrians and cyclists who wish to travel the historic Berghofers Pass. It is also used for maintenance of the average speed camera gantry for Victoria Pass which is located adjacent to the carpark over the existing GWH.</p> <p>Formalising the Berghofers Pass car park would improve the operation of the car park, improve safety, and improve access legibility. The proposed modification would only formalise the car park and would not expand or add further parking spaces.</p>
Safety concerns during high wind speeds for vehicles travelling on the bridge	<p>The proposed modification has been designed taking into account Austroads Guides, Australian Standards, Transport supplements to Austroads Guides and Australian Standards, Technical directions and quality alerts, and other current Transport publications. Chapter 3 (Description of the proposed modification) provides further discussion on design criteria.</p>
Questions on the provision of permanent variable messaging signs on the new Great Western highway	<p>Operational infrastructure, such as variable message signs, would be required to inform motorists of the operating function of the tunnel once the Blackheath to Little Hartley upgrade project is open to traffic. Variable message signs would also provide speed limits for periods of low visibility during adverse weather. The locations of these will be confirmed through detailed design.</p>
Questions on the provision of signage to stop pedestrian access on the approaches to Victoria Pass	<p>Pedestrians would be directed up to Berghofers Pass via signs on the active transport trail. There is no pedestrian pathway up Victoria Pass to provide access for pedestrians.</p>
Businesses	
Maintain access from Hartley Valley Holiday Farm to property across the road via the culvert under the highway	<p>Part of this culvert would be replaced and upgraded for the project. The design and function of this culvert would be developed further during design development and in consultation with the property owner.</p> <p>The modified project would support safer and more reliable access to properties and destinations between the Portal and Cox's River Road, through improved road conditions and the separation of local traffic and through traffic, including freight vehicles for much of this section of the modified project. Potential access and connectivity impacts are further discussed in Chapter 6 (Environmental assessment).</p>

5.2.2 Government agency and stakeholder consultation

As outlined in Section 5.2.1, various government agencies and other key stakeholders have been consulted about the proposed modification including:

- Lithgow City Council
- Hartley District Progress Association
- Businesses
- Utility providers (Endeavor Energy, Telstra, and NBN)
- Emergency services.

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined in Table 5-4.

Table 5-4 Issues raised through stakeholder consultation

Issue raised	Response / where addressed in REF addendum
Lithgow City Council	
Opposition towards the inclusion of truck stops in the Hartley Valley	Heavy vehicle checking stations or rest areas are not included as part of the proposed modification. The approved project includes two rest areas that will have provisions for both light and heavy vehicles. Rest areas are a crucial road safety measure and must remain in the upgrade design. The location of these rest areas were chosen due to their distance from other heavy vehicle rest areas, the availability of suitable land and the lack of locations in the built-up area of the blue mountains. See Section 2.3.4 of the Submissions Report for further information.
Support for a design speed of 80 km/h to reduce the need for intersection works	<p>The proposed modification does not include changes to intersections. However, intersection upgrades delivered as part of the approved project would help to provide the opportunity to reduce crashes along the Great Western Highway.</p> <p>Traffic modelling was completed in Section 6.2 of the approved project REF to determine the resilience of the current network under 2026 and 2036 traffic conditions. The main performance indicators for intersections are delays (measured in seconds) and level of service. Level of service provides a grading for the performance of the intersection from A to F with A meaning that intersection performance is considered to be operating well, with motorists are experiencing high operating speeds and free flowing conditions; and F meaning that intersection performance is unsatisfactory with excessive queuing, heavy congestion, and unstable flows. The results found that the existing network deteriorated considerably under 2026 and 2036 traffic conditions with midblock D-E gradings. Whereas, with the approved project, the midblock performance during 2026 was an A grade and a B-C grade under 2036 traffic conditions.</p>

Issue raised	Response / where addressed in REF addendum
	<p>The posted speed for the Great Western Highway as part of the modified project would be between 80 to 100 km/h, which is considered suitable based on the modified design. Refer to Appendix E (Traffic and transport impact assessment) for further information)</p>
<p>Support for exceptional design outcomes which reflect the council's indigenous, cultural and industrial heritage, including a high standard of active transport outcomes</p>	<p>The proposed modification has been designed taking into account Austroads Guides, Australian Standards, Transport supplements to Austroads Guides and Australian Standards, Technical directions and quality alerts, and other current Transport publications.</p> <p>The approved project REF includes a number of urban design objectives for the project including:</p> <ul style="list-style-type: none"> • Develop an integrated design that fits with the existing high visual qualities, ecology and character of the Hartley Valley and its setting • Minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal • Create a road corridor that responds to the natural and cultural environment, enhancing local and regional connectivity to evoke the underlying character of the Hartley Valley and surrounds • Apply the principles stipulated in Transport's urban design and other policies, and design principles outlined in Beyond the Pavement. <p>An indicative route for the shared path between Little Hartley and Lithgow was provided in the approved project REF. Based on ongoing design development for the approved project, a revised alignment for the active transport trail is proposed between the base of Victoria Pass and 100 metres east of Coxs River Road (about 2 kilometres), including a connection to the Berghofers Pass car park, as part of the proposed modification. This would be bi-directional, and separated from the road by either a one metre verge or road safety barrier.</p>
<p>Support for greater integration of both road and rail opportunities to increase transport opportunities throughout the region</p>	<p>The approved project aligns with a number of strategic planning policies which outline the need to ensure safe, efficient and sustainable freight access to places, whilst balancing the movement and place functions of corridors such as the Great Western Highway. The strategic context and need for the approved project are discussed in Chapter 2 (Need and options considered) of the approved project REF.</p>

Issue raised	Response / where addressed in REF addendum
Requests for greater clarity regarding the detail of asset transfer post-completion	Transport will continue to discuss the transfer of assets post-construction with council. In accordance with mitigation measure PL01, areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard in consultation with the landowner.
Hartley District Progress Association	
Concerns that the updated concept design will result in further adverse landscape character and visual impacts, particularly from Mount York lookout, where a viewpoint was not provided in the approved project REF	<p>A viewpoint assessment of the approved project from Mount York lookout was not provided in the approved project REF and it was considered that more notable impacts would be felt from Bardens lookout, for which a viewpoint assessment was undertaken. Due to community concerns, visualisations of the modified project from Mount York and Bardens lookouts have been prepared and can be found in Figure 5-1 and Figure 5-2 respectively.</p> <p>A landscape character and visual impact assessment has been prepared for the proposed modification (refer to Section 6.8 and Appendix H of this addendum REF). Landscaping and other measures, presented in Chapter 7 (Environmental management) of this addendum REF, would be considered as part of the proposed modification to reduce potential landscape character and visual impacts.</p>
Concerns that the updated concept design is focussed on supporting through traffic at the expense of local traffic	<p>Once operational, the modified project would have long term positive impacts on access and connectivity for local and regional communities, business, and industry with separation of local and through traffic.</p> <p>Further discussion on the need and options considered for the proposed modification can be found in Chapter 2 (Need and options considered).</p>
Concerns that the updated concept design will adversely impact local businesses due to the through traffic nature of the design	A socio-economic assessment has been undertaken for the proposed modification (refer to Section 6.11). The operational socio-economic impacts are generally consistent with what was concluded in the approved project REF. A suite of safeguards are provided in Chapter 7 (Environmental management) of the approved project REF and in the submissions report for the approved project, which would mitigate potential impacts to businesses.
Concerns that residents of Mt Victoria and Rosedale will experience unfavourable road conditions along Victoria Pass when accessing the tunnel between Blackheath and Little Hartley	Improvements to Victoria Pass are outside of the scope of the proposed modification. The Upgrade Program is expected to divert a substantial volume of heavy vehicles from the existing Great Western Highway to the new Great Western Highway, which would help prevent further damage to this section of road.

Issue raised	Response / where addressed in REF addendum
Concerns that residents at the base of Victoria Pass will experience cumulative impacts from the formalisation of the Berghofers Pass carpark, and options to move the carpark should be explored	<p>Construction and operational impacts for the proposed modification, including the formalisation of Berghofers Pass, have been assessed in Chapter 6 (Environmental assessment). The proposed modification is not anticipated to have a significant impact on nearby residents.</p> <p>Formalising the Berghofers Pass car park would improve the operation of the car park, improve safety and improve access legibility. The proposed modification would only formalise the car park and would not expand or add further parking spaces.</p>
Concerns that the REF addendum should be put on public display	<p>Announcement of the updated concept design provided the public with opportunities to have their say on the key features of the revised design and issues raised have been considered as part of preparation of this REF addendum.</p> <p>This REF addendum will be published on the Great Western Highway Upgrade Program's website (https://caportal.com.au/tfnsw/great-western-highway/west) and Transport will respond to any questions raised.</p>
Questions regarding the expected daily traffic volumes on the existing Great Western Highway between Victoria Pass to Cocks River Road, and the proposed modification	<p>A traffic and transport assessment has been conducted as part of the REF addendum (refer to Chapter 6 (Environmental assessment)). The traffic and transport impacts associated with the proposed modification to the existing and planned road network, as well as local property during operation would mostly be the same as the determined REF.</p>
Questions regarding the height of new bridge across the carriageway of the new Great Western Highway, and potential visual impacts	<p>The height of new bridge across the carriageway of the new Great Western Highway (referred to as the Service Road 1 bridge in this addendum REF) would be about 15 metres above the ground level.</p> <p>A landscape character and visual impact assessment has been prepared for the proposed modification (refer to Section 6.8 and Appendix H of this addendum REF). It recognises that there would be an increase in large structural elements within the landscape, with the introduction of an additional bridge (the east bound off-ramp) and changes to the location of the approved bridge (Service Road 1 bridge).</p> <p>As per Section 2.14 of the Submissions Report, measures have been incorporated into the design of the Service Road 1 bridge, such as minimising the amount of fill to ensure that the bridges are not as tall, landscaping, and additional screening via vegetation. These measures will be refined during detailed design. The landscape character and visual impact assessment states that as trees matured within the planted</p>

Issue raised	Response / where addressed in REF addendum
	landscape, the view along the existing Great Western Highway would narrow to along the road corridor.
Questions regarding the speed limit for slip roads leading to the eastbound bridge	The design speed for connections with and upgrades to the existing Great Western Highway (including two new bridges and ramp connections) would be 70 km/h. The posted speed limit would be 60 km/h.
Questions regarding the High Performance Vehicle access in the event of tunnel closure and dangerous goods using the tunnel	The tunnel provided as part of the Blackheath to Little Hartley upgrade project is outside of the scope of the approved project and the proposed modification.

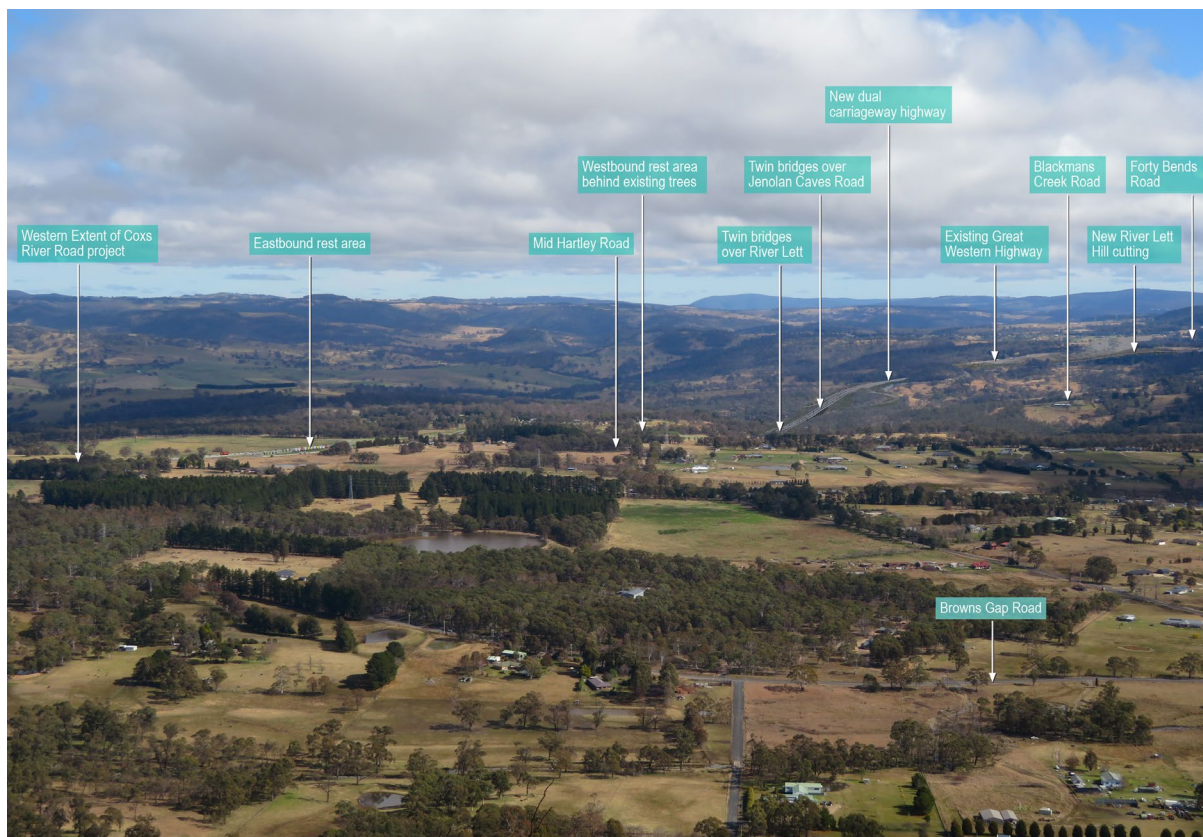


Figure 5-1 Artist's impression of the modified project from Mount York lookout (looking west)

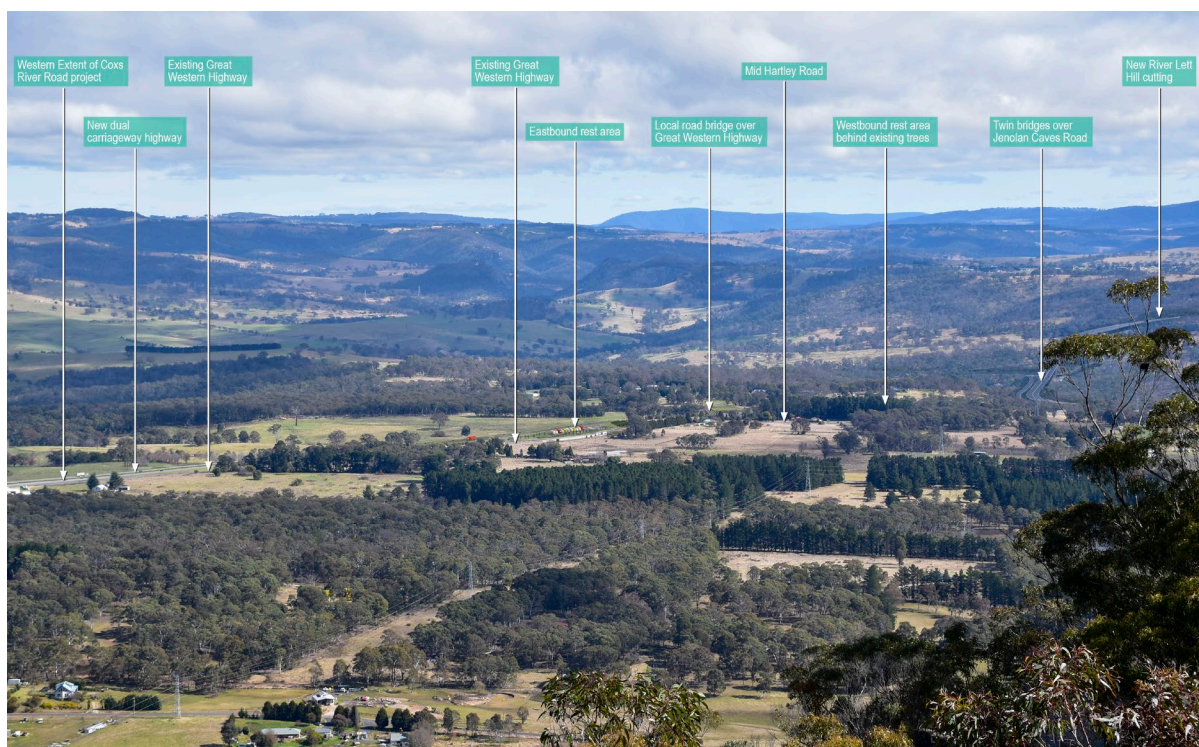


Figure 5-2 Artist's impression of the modified project from Bardens lookout (looking west)

5.2.3 Aboriginal community consultation

Consultation with the Aboriginal community has been carried out throughout the approved project REF development process in accordance with the PACHCI process. This section outlines consultation carried out following the Submissions Report for the approved project (Transport, 2022a) was published.

Additional archaeological surveys for three areas identified as part of the Worst case Scenario Study Area, including part of the proposed modification at Little Hartley, were undertaken in May 2022 and are outlined in the PACHCI Stage 2 addendum report (Appendix I (addendum Aboriginal Cultural Heritage Assessment Report) of this addendum REF). During the survey, Registered Aboriginal Parties (RAPs) were given the opportunity to provide Transport with any relevant information on the proposal area and the surrounding region, including information on cultural heritage values. These RAPs included representatives from:

- Bathurst Local Aboriginal Lands Council
- Mingaan Wiradjuri Aboriginal Corporation.

As part of further construction planning and the assessment of potential impacts of the proposed modification on Aboriginal heritage, additional site surveys were also carried out in October 2022 and January 2023 with participation from RAPs. This included a meeting with RAPs after the fieldwork was completed to discuss Aboriginal heritage management.

Impacts upon Aboriginal sites attributed to the construction and operation of the proposed modification have been assessed in Section 6.4 of this addendum REF.

5.2.4 Consultation under SEPP

Section 2.10 to 2.16 of the TISEPP specify the requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority. Appendix B (Statutory consultation checklist) contains a consultation checklist that documents how consultation requirements under the TISEPP have been considered as part of this REF addendum.

Transport has consulted with the following agencies about the proposed modification, in accordance with the TISEPP:

- Lithgow City Council in accordance with the requirements of Sections 2.10 to 2.12
- State Emergency Services (SES) in accordance with the requirements of Section 2.13.

5.3 Ongoing or future consultation

Ongoing consultation for the modified project would be undertaken by the construction contractor and Transport in accordance with the Great Western Highway Upgrade Program Stakeholder Engagement Strategy, in order to update local property owners, road users and RAPs of the modified project.

Should the proposal proceed, the construction contractor would develop a Community and Stakeholder Engagement Plan to keep residents and road users up to date about construction progress. Consultation activities will include:

- Production of a community consultation and general issues response summary report
- Provision of information via print, online and face-to-face means
- Provision of regular information updates via the approved project web page and interactive website portal
- Provision of information updates via media releases and advertisements in local media
- Face-to-face and online consultation/drop-in sessions
- Engagement with affected landowners and community stakeholder groups about the approved project and key design decisions that may impact them
- Targeted engagement with local stakeholder groups, Lithgow City Council, utility providers and other government agencies
- Engagement and coordination with transport and other infrastructure providers, particularly around project interfaces and in relation to cumulative impacts
- Provision of information and project updates at key stages during design finalisation
- Engagement with the local community about construction timing, impacts and mitigation
- Follow-up meetings to discuss and agree access arrangements with directly affected landowners prior to and during construction
- Consultation with community stakeholders to help manage impacts during construction
- Notifying residents when work is proposed to start
- Notifying residents of night work
- Notifying residents of access issues.

6 Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section). All aspects of the environment potentially impacted by the proposed modification are considered. This includes consideration of the guidelines *Roads and Related Facilities EIS Guideline* (DUAP, 1996) and *Is an EIS required?* (DUAP, 1999). The factors specified in section 171(2) of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A of this addendum REF.

Site-specific safeguards and management measures are provided to ameliorate the identified potential impacts.

6.1 Biodiversity

This section provides an assessment of the potential impacts of the proposal on biodiversity and identifies revised or additional safeguards and management measures to avoid or minimise these impacts. A detailed assessment of biodiversity impacts is presented in a Biodiversity Development Assessment Report (BDAR) (Appendix E).

6.1.1 Methodology

Desktop assessment

An initial habitat assessment was undertaken through desktop assessment to support the biodiversity assessment of the proposed modification, including:

- A review of relevant data bases, spatial data, literature, and previous site reports, including:
 - Biodiversity Development Assessment Report (referred to as the ‘approved BDAR’) (Transport, 2021b)
 - Biodiversity Addendum Report (Transport, 2022e), submitted as part of the Submissions Report (Transport, 2022a)
- Identification and mapping, using third-party sources, of threatened species and community records within five kilometres of the proposed modification, including (but not limited to):
 - Commonwealth Department of Climate Change, Environment, Energy and Water (DCCEEW) Protected Matters Search Tool (DCCEEW, 2023)
 - BioNet – the website for the Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC) (DPE, 2023a)
 - Biodiversity values map (DPE, 2023b)
 - Biodiversity Assessment Areas (BAM) Important Areas maps (DPE, 2023c)
 - Groundwater Dependent Ecosystems Atlas (BOM, 2023).

Habitat suitability assessment

To determine the likelihood of occurrence for threatened species, incidental observations for habitat values and constraints such as vegetation formations and type, waterways, wet areas, and rocky outcrops were identified during the field investigations.

Field surveys

A field investigation of the study area was carried out in October 2022 by two qualified ecologists to identify biodiversity values in the study area (as defined below):

- The identification and mapping of plant community types (PCTs) according to the structural definitions held in the BioNet Vegetation Classification database (DPE 2022), with reference to information provided in reference mapping for the study area (DPE, 2010; DPE 2018)
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the Biodiversity Assessment Method (BAM) (DPIE, 2020), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges
- The identification of native and exotic plant species, according to the Flora of NSW (Harden, 1992; 1993; 2000; 2002) with reference to recent taxonomic changes
- Incidental observations using the “random meander” method (Cropper, 1993)
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site
- An assessment of the natural resilience of the vegetation of the site.

It is noted that no targeted surveys for threatened fauna have been undertaken as part of this BDAR addendum, and as such, presence is assumed for all flora species credit species.

Impact assessment

Potential impacts to biodiversity as a result of the proposed modifications were identified and assessed. This included an assessment of direct and indirect construction and operational impacts.

Existing mitigation measures for the approved project to avoid, minimise, and manage impacts to biodiversity values, were reviewed and revised where relevant to manage the potential biodiversity impacts of the proposed modification.

Study area

As the majority of changes in the construction and operational design would be located between the base of Victoria Pass and around 100 metres to the east of Coss River Road, with construction ancillary facility 23 located in Hartley, and construction ancillary facilities 24 and 25 located at River Lett Hill, only these areas have been considered as part of the biodiversity assessment within this addendum REF. This assessment specifically considers the areas within the construction footprint for the modified project that are outside the approved project construction footprint (referred to as the ‘proposed modification area’), plus a 20 metre buffer (the ‘study area’).

6.1.2 Existing Environment

The existing environment surrounding the proposed modification is consistent with the description in the approved project REF. Key biodiversity values and environmental features relevant to the proposed modification area are summarised below and is presented in Figure 6-1a to Figure 6-1c.

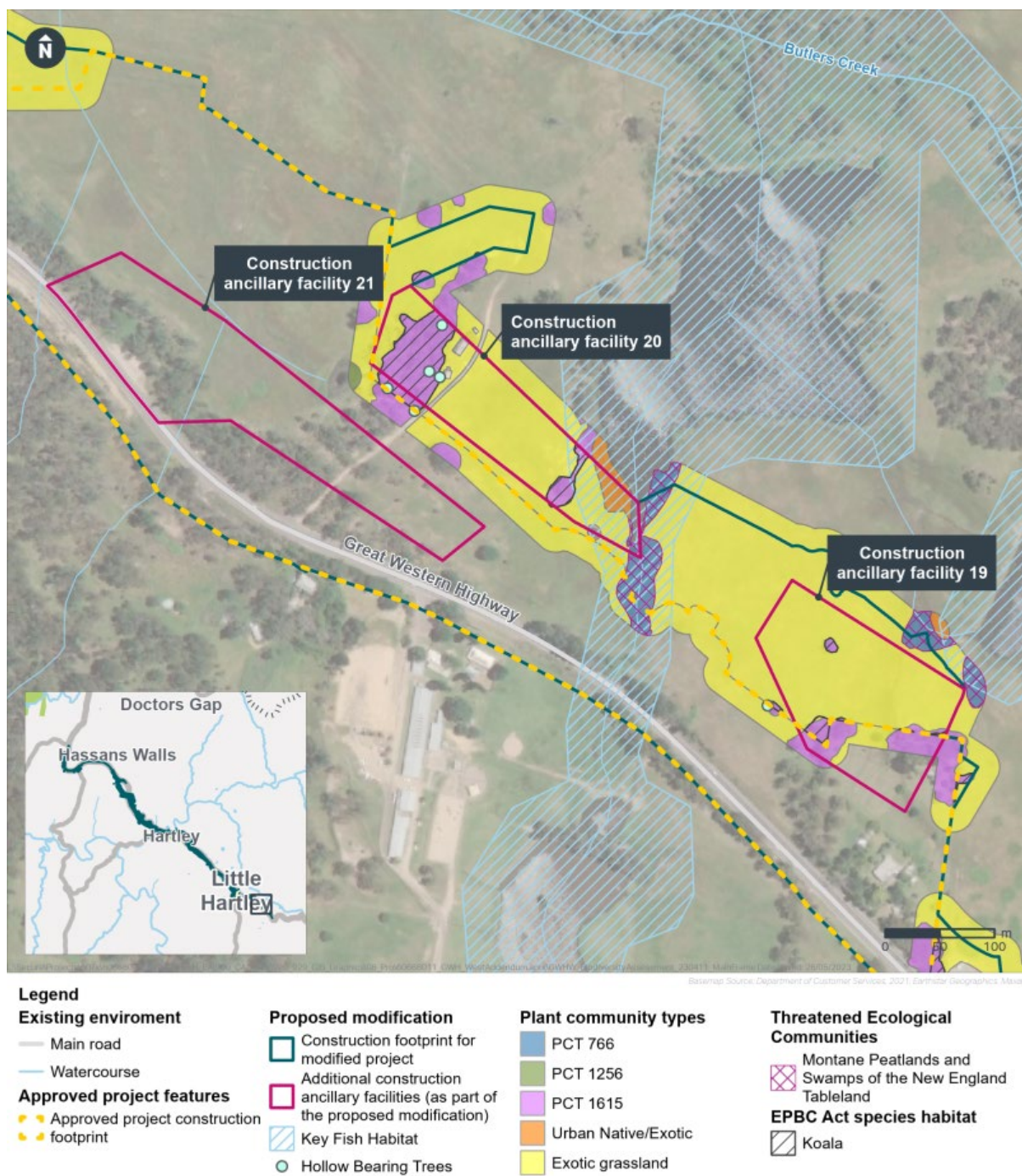


Figure 6-1a Key biodiversity values for the modified project

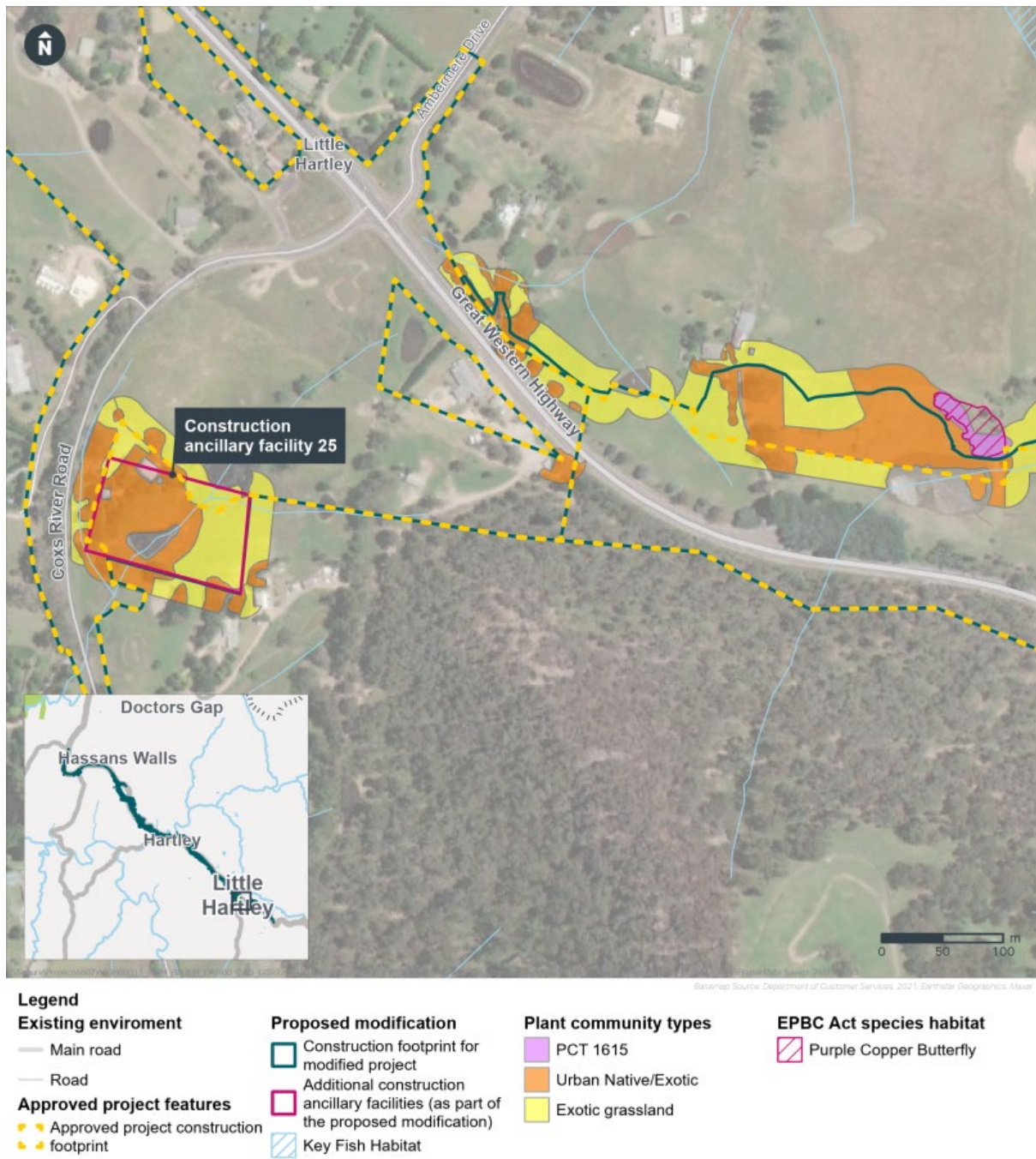


Figure 6-1b Key biodiversity values for the modified project

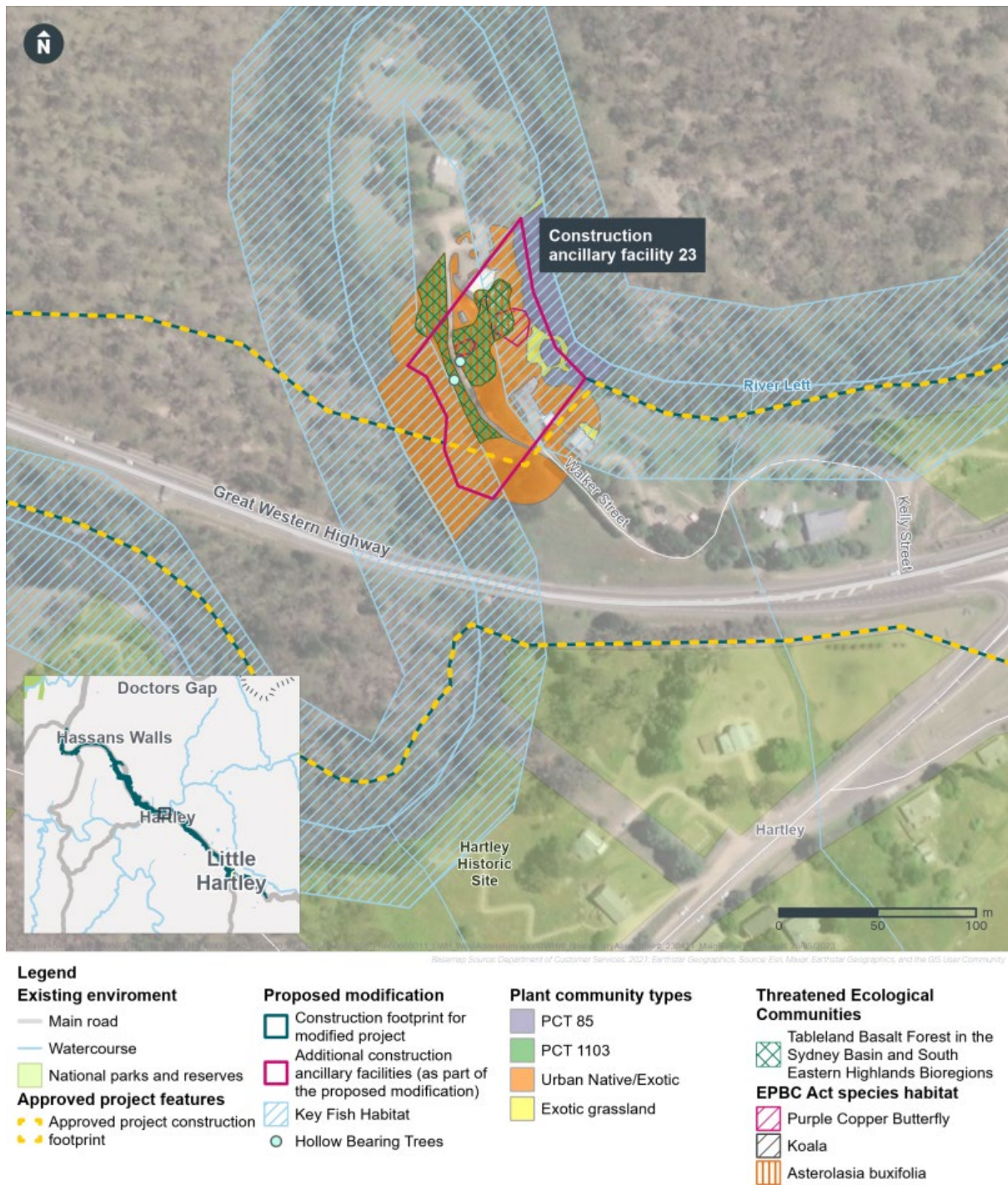


Figure 6-1c Key biodiversity values for the modified project

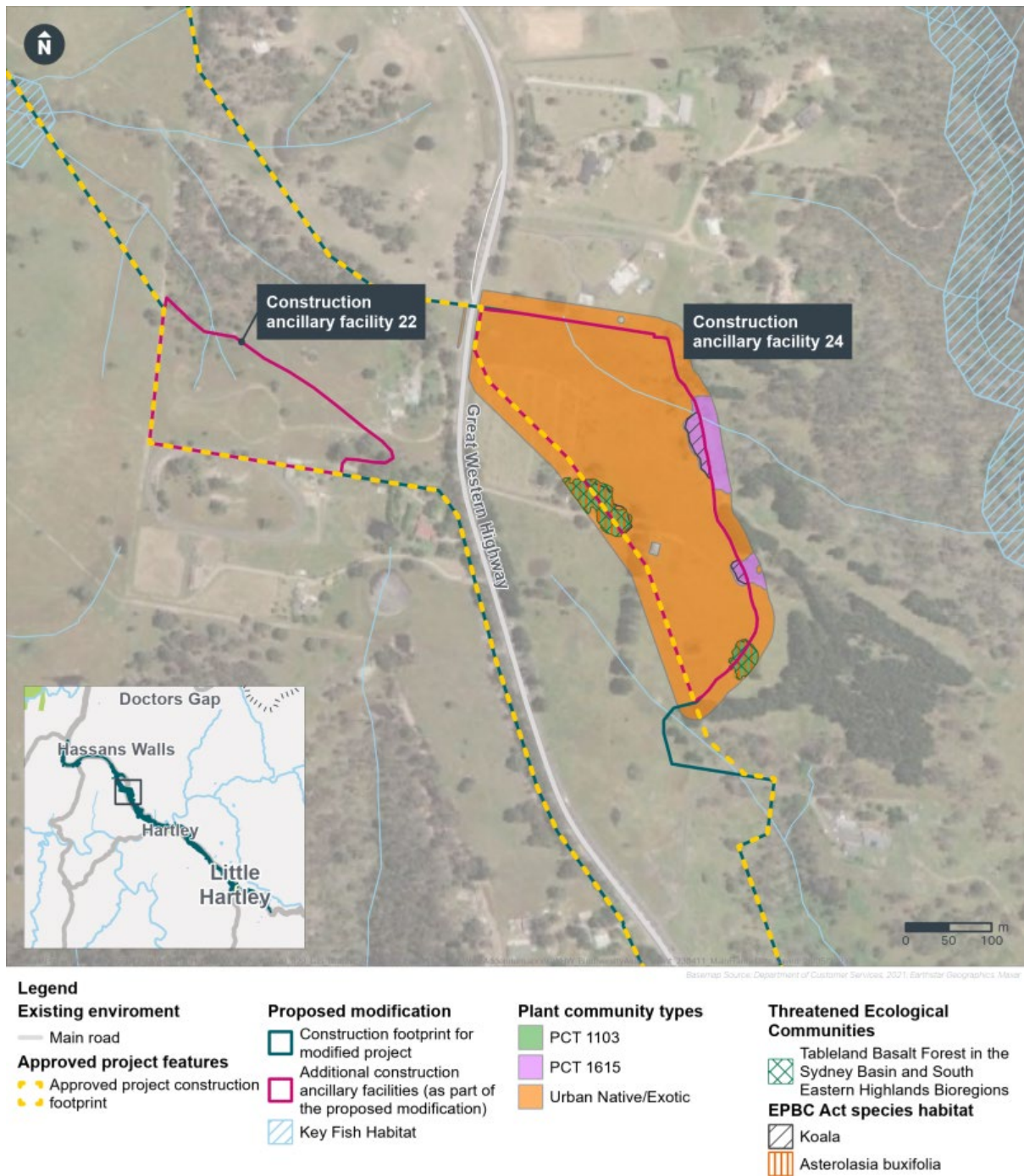


Figure 6-1d Key biodiversity values for the modified project

Table 6-1 PCTs identified within the study area

PCT ID	PCT name	Status *		Condition	Study area (ha)	Area within proposed modification construction boundary (ha) [†]	Hollow bearing trees present
		BC Act	EPBC Act				
85	River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion	-	-	Low	0.18	-	-
766	Carex sedgeland of the slopes and tablelands	E	-	Low	0.49	0.03	-
1103	Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion	E	-	Moderate	0.53	0.21	2
1256	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	-	E	Moderate	0.02	-	-
1615	Monkey Gum – Eucalyptus blaxlandii shrubby open forest on basalt of the Sydney Basin	-	-	Low, moderate, high	3.03	0.94	6
N/A	Urban/ Native Exotic	-	-	-	11.4	7.70	1
N/A	Exotic Grassland	-	-	-	13.94	7.16	-
Total					29.59	16.04	9
Notes:	* Status definitions include Endangered (E), Critically Endangered (CE), Vulnerable (V), Migratory (M) † Exclusive of exclusions zones (refer to Figure 6-3)						

Landscape features

The biodiversity landscape features located within the proposed modification area include:

- Sydney Basin and South Eastern Highlands Interim Biogeographically Regionalisation of Australia (IBRA) Bioregions
- Rivers, streams, estuaries, and wetlands
- Burrangorang and Bathurst IBRA subregions
- Sydney Basin Western Escarpment
- Bathurst Granites.

Flora

Vegetation types

Vegetation identified within the study area as aligning with the BioNet Vegetation Classification PCTs is shown within Table 6-1.

The following sections provide further detail on each PCT.

PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion

PCT 85 is classed as a tall to very tall open forest or woodland dominated by River Oak *Casuarina cunninghamiana subsp. cunninghamiana*, often in conjunction with other Eucalypt species, over a shrubby mid story and a groundcover of grasses, forbs and sedges varying from sparse to dense. This PCT was identified in one patch adjacent to the construction ancillary facility 23 in low condition based on the high abundance of exotic species within the understory (Figure 6-2a); it is not found within the construction boundary for the proposed modification.

PCT 766 Carex sedgeland of the slopes and tablelands

PCT 766 is classed as montane bogs and fens and considered freshwater wetland. This community is present in the study area in a low condition state due to a high exotic species richness and cover. Within the study area, PCT 766 exhibits a lack of *Carex spp.*, and is instead dominated by Tussock Grass and *Juncus spp.* Therefore, this PCT has been classified as of low condition within the study area (Figure 6-2b).

PCT 1103 Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion

PCT 1103 is classed as grassy woodlands. This community is present in a moderate condition state. Patches of this PCT are present as scattered isolated trees (predominantly Ribbon Gum *Eucalyptus viminalis*) with low land cover and abundance within the understory. The understory of this PCT was dominated by exotics. Therefore, this PCT has been classified as of moderate condition within the study area (Figure 6-2c).

PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

PCT 1256 is classed as Montane Bogs and Fens. This community is present within the study area as low condition vegetation containing characteristic species such as Blackwood, Prickly Tea Tree and River Tea Tree *Leptospermum obovatum*, over a ground cover of Tussock Grass, Weeping Grass, Wiry Panic *Entolasia stricta* and *Juncus spp.*; it is not found within the construction boundary for the proposed modification. This is shown in Figure 6-2d. Vegetation structure and species composition of this PCT is dependent on the water table gradient.

PCT 1615 Monkey Gum – *Eucalyptus blaxlandii* shrubby open forest on basalt of the Sydney Basin

PCT 1615 is classed as Southern Escarpment Wet Sclerophyll Forests and consists of open forests dominated by Monkey Gum *Eucalyptus cypellocarpa*. This community is present in the study area in low (Figure 6-2e), moderate (Figure 6-2f) and high (Figure 6-2g) condition. Areas of low quality vegetation have a low cover and abundance of native species and tend to occur as scattered isolated trees over an understorey dominated by exotics. Areas of high moderate condition vegetation in the study area are abundant in native species but tend to be under-scrubbed, occurring as more isolated smaller patches of vegetation.



Figure 6-2a PCT 85 (low condition)



Figure 6-2c PCT 1103 (moderate condition)



Figure 6-2b PCT 766 (low condition)



Figure 6-2d PCT 1256 (moderate condition)



Figure 6-2e PCT 1615 (low condition)



Figure 6-2f PCT 1615 (moderate condition)



Figure 6-2g PCT 1615 (high condition)

Threatened ecological communities

The following threatened ecological communities (TEC) were assessed under the approved REF:

- 19.64 hectares of PCT 1103 with associated TEC: Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregion, listed as endangered under the BC Act
- 9.50 hectares of PCT 1103 with associated TEC: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions, listed as critically endangered under the BC Act.¹ Of this area, 4.51 hectares met the size and condition threshold criteria for the TEC listed as critically endangered under the EPBC Act.²

A total of 1.05 hectares of threatened ecological communities (TECs) are present within the study area for the addendum assessment, including:

- 0.49 hectares of PCT 766 associated with the following TEC: Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, Southeast Corner, South-eastern Highlands and Australian Alps bioregions (listed as Endangered within the BC Act)
- 0.53 hectares of PCT 1103, associated with the following TEC: Tableland Basalt Forest in the Sydney Basin and South-eastern Highlands Bioregions (listed as Endangered within the BC Act)
- 0.02 hectares of PCT 1256, associated with the following TEC: Temperate Highland Peat Swamps on Sandstone.

Non-native flora species

A total of 25.34 ha of non-native or exotic vegetation is present within the study area.

¹ 7.72 hectares after exclusion zones applied.

² 3.90 hectares after exclusion zones applied.

Threatened flora species

No threatened flora species were recorded during the field investigation. This is consistent with the approved project REF.

One threatened flora species, *Asterolasia buxifolia*, is only known to occur along the River Lett and has been found approximately 1.5 kilometres north of the proposed modification area. This species is listed as a species at risk of Serious and Irreversible Impact (SAII) under Clause 6.7 of the BC Regulation. There is a moderate or higher likelihood of occurrence of this species within the construction boundary for the modified project, as it is associated with PCT 1103, which is present within the study area and therefore assumed present within the construction boundary for the modified project. No other threatened flora species were determined to have a moderate or higher likelihood of occurring within the construction boundary for the modified project, due to habitat degradation associated with road-based infrastructure, and rural and rural-residential development.

Groundwater dependent ecosystems

The approved project REF outlines that about 42.85 hectares of groundwater dependant ecosystems (GDEs) may be impacted by the approved project. The proposed modification area does not contain any additional aquatic GDEs compared with the approved project REF (BOM, 2023). It does, however, include an additional 1.92 ha of terrestrial GDEs, consisting of 1.28 ha of low potential GDEs associated with PCTs 1256 and 1615, and 0.64 hectares of high potential GDE's, associated with PCTs 85 and 1103. PCT 766 does not have any potential for GDEs.

Weeds

There are three exotic species recorded within the study area:

- Blackberry *Rubus fruticosus* species aggregate
- Scotch Broom *Cytisus scoparius*
- Willow *Salix* sp.

There are six High Threat Weeds (under BAM) also recorded, including:

- Kikuyu Grass *Cenchrus clandestinus*
- Rambling Dock *Rumex sagittatus*
- English Ivy *Hedera helix*
- Cotoneaster sp.
- Buffalo Grass *Stenotaphrum secundatum*
- Umbrella Sedge *Cyperus eragrostis*.

Fauna

Threatened fauna species

No threatened fauna species were identified during field surveys, though habitat for several threatened fauna species was found. This included foraging and breeding habitat for Purple Copper Butterfly *Paralucia spinifera* (listed as Endangered in the BC Act and Vulnerable in the EPBC Act), which is present within patches of Native Blackthorn *Bursaria spinosa*. In particular, Native Blackthorn was found within the footprint of construction ancillary facility 23 and adjacent to proposed On-Site Detention Basin (OSD-06). Amendments to the design and construction boundary for the modified project to address Purple Copper Butterfly habitat are presented in Chapter 2 (Need and options considered).

A total of nine hollow-bearing trees, containing 18 hollows in total, were found within the study area, comprising four small (4-10 cm), eight medium (10-15 cm), and six large (15-30 cm) hollows. These hollows may provide potential roosting and breeding habitat for a number of species that occur within a five kilometre radius of the proposed modification, such as threatened microbat species, Large forest owls (Powerful Owl *Ninox strenua* and Barking Owl *Ninox connivens*), and the threatened hollow-dwelling bird, Gang-gang Cockatoo *Callocephalon fimbriatum*.

In addition, native vegetation comprising PCTs 1103 and 1615 provide key potential habitat for Koala, such as Monkey Gum *Eucalyptus cypellocarpa*, Ribbon Gum *Eucalyptus viminalis*, and Yellow Box *Eucalyptus melliodora*. Other potential habitat species including Grey Gum *Eucalyptus punctata*, Silvertop Ash *Eucalyptus sieberi*, and Mountain Gum *Eucalyptus dalrympleana*, were also found within the study area. Whilst Koalas were not recorded during the field investigation, four records were found within five kilometres, with the closest being approximately 800 metres from the proposed modification area.

A list of ecosystems credit species and species candidate species was generated using the BAM-C. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been assumed present within areas identified as potential habitat. Candidate fauna species credit species assessed to be present within the study area are outlined below.

Table 6-2 Fauna species assumed present in the study area

Common name	Scientific name	Status *		PCT ID association
		BC Act	EPBC Act	
Barking Owl	<i>Ninox connivens</i>	V	-	PCTs 1103 (moderate), 1615 (low), 1615 (moderate), and 1615 (high)
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	E	PCT 1103
Koala	<i>Phascolarctos cinereus</i>	E	E	PCTs 1103 and 1615
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	PCT 1103
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	PCT 1103
Powerful Owl	<i>Ninox strenua</i>	V	-	PCT 1103
Purple Copper Butterfly	<i>Paralucia spinifera</i>	E	V	PCT 1103
Southern Myotis	<i>Myotis macropus</i>	V	-	PCTs 85, 1103, and 1256
Notes	* Status definitions include Endangered (E), Critically Endangered (CE), Vulnerable (V), Migratory (M)			

Aquatic habitat and species

Waterways and aquatic habitat values within the construction footprint of the proposed modification include: three artificial farm dams; a third order tributary of Butlers Creek between construction ancillary facility 19 and 20, named Rosedale Creek; unnamed first and second order tributaries of Moynes Creek, and two first order tributaries of Butlers Creek within construction ancillary facility 22, and an unnamed first order tributary of Boxes Creek within construction ancillary facility 24. Farm dams within the subject land are degraded and contain a high level of ingress by exotic weeds. Natural waterways are also in relatively poor condition, likely due to long term land management.

Key fish habitat (KFH), as mapped by DPI, occurs within and adjacent to the construction footprint of the proposed modification in construction ancillary facility 20, along Rosedale Creek, and construction ancillary facility 23, along the River Lett. Aquatic habitats associated with freshwater fish in the River Lett and Butlers Creek are considered to be in poor to very poor condition.

There is no mapped habitat for threatened fish species under the *Fisheries Management Act 1994* (FM Act) within the proposed modification area.

Aquatic habitat values are consistent with those assessed in the approved project REF.

6.1.3 Potential impacts

Construction

During construction of the proposed modification, impacts to biodiversity are likely through the clearing of vegetation, earthworks, operation of machinery and other construction activities. The main impacts likely include:

- Removal of native vegetation and TECs
- Removal of threatened fauna habitat
- Disturbance of aquatic habitat
- Fauna injury and mortality
- Invasion of weeds, pests, and pathogens
- Noise, light, and vibration
- Removal of potential GDEs.

These impacts are discussed in more detail within this section below.

Removal of native vegetation

Vegetation removal would be required for the establishment of construction ancillary facilities and construction activities. The approved project requires the removal of 75.19 hectares of native vegetation that occurs within the approved project construction footprint. This includes a total of 142 hollow bearing trees. Construction of the proposed modification would result in removal of an additional 1.18 hectares of native vegetation and nine hollow bearing trees.

Vegetation to be removed as part of the proposed modification would constitute vegetation from PCT 766 (0.03 hectares), PCT 1103 (0.21 hectares), and PCT 1615 (0.94 hectares). The impacts associated with vegetation removal would be consistent those identified in the approved project REF and would be managed with the implementation of the safeguards from the approved project REF.

Removal of threatened ecological communities

The approved project would remove 27.36 hectares of vegetation that meets the criteria for a TEC under the BC Act; Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregion (listed as endangered under the BC Act) and White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (listed as critically endangered under the BC Act). The modified project would involve the additional removal of 1.05 hectares of TEC vegetation, including 0.49 hectares of Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, Southeast Corner, South-eastern Highlands and Australian Alps bioregions (listed as endangered under the BC Act), 0.53 hectares of Tableland Basalt Forest in the Sydney Basin and South-eastern Highlands Bioregions (listed as endangered under the BC Act), and 0.03 hectares of Temperate Highland Peat Swamps on Sandstone (listed as endangered under the EPBC Act).

Removal of threatened fauna habitat

A total of 1.18 hectares of native vegetation would be cleared during construction of the proposed modification, which may remove potential breeding and foraging resources and sheltering habitat for a range of threatened fauna. Potential breeding habitat for threatened species including the Purple Copper Butterfly, large Forest Owls, Gang-gang Cockatoo and Southern Myotis habitats, is present within the study area. Mapped habitat for Large-eared Pied Bat is associated with foraging habitat.

The area of potential habitat removal would be similar or lesser in value to the habitat that is readily available in the surrounding locality and broader bioregion, and as such, the additional 1.18 hectares of habitat removal would likely be negligible.

The loss of hollow-bearing trees is a Key Threatening Process (KTP) listed under the BC Act. The proposed modification will require the removal of nine hollow-bearing trees, containing 18 hollows in total, comprising four small (4-10 cm), eight medium (10-15 cm), and six large (15-30 cm) hollows. These hollows provide habitat for various threatened birds and microbat species. The approved project committed to replacing removed hollow bearing trees with artificial hollows to minimise the impact of removing hollow bearing trees. The cumulative removal of an additional nine hollow bearing trees would be insignificant with respect to the availability of quality habitat within the surrounding locality and the addition of artificial hollows.

Whilst the locality is already subject to habitat fragmentation through the existing highway, the modified project would further increase fragmentation of habitats within the region through additional vegetation clearing. This may impede the ability of threatened fauna to continue to move around in their usual patterns. The implementation of fauna crossings and underpasses, as committed by the approved project, would reduce the modified project's impact on habitat fragmentation.

Human-made structures, such as culverts, beneath surface roads and bridges, offer potential roosting habitat to locally occurring threatened microbat species, such as Southern Myotis, Large Bent-winged Bat, and Little Bent-winged. Direct impacts, such modifications to culvert structures and removal of potential roosting sites, and indirect impacts, such as localised increases in light and noise pollution as well as increases in vibrations and dust from machinery and equipment may occur.

Additional impacts to Purple Copper Butterfly habitat have been largely avoided through changes to the design of the proposed modification at OSD-06 and establishment of exclusion zones, as recommended in the approved project REF, resulting in the avoidance of 0.13 hectares of potential foraging and breeding habitat. For instance, exclusion zones will be applied within construction ancillary facility 23, to prevent any destruction of Native Blackthorn. Additional mitigation measures have been provided for the application of exclusion zones.

Removal or disturbance of threatened flora species

Only one threatened flora species was mapped as having a moderate or higher likelihood of occurring within the construction footprint for the proposed modification, *Asterolasia buxifolia*. There are currently no records of this species in the study area, and therefore there is a low likelihood of disturbance.

Aquatic habitat impacts

Part of an existing drainage culvert along the Rosedale Creek beneath the existing Great Western Highway at Little Hartley will be replaced; which is the only direct impact within a waterway proposed as part of the proposed modification. The extension of the existing culvert would result in instream impacts, including alteration to flow and removal of areas of riparian vegetation. As such, impacts to aquatic habitats are consistent with the conclusions of the approved REF.

There may also be vegetation clearing in areas surrounding Key Fish Habitat, which has the potential to result in indirect changes to water quality, water bodies, and hydrological processes that may impact upon threatened ecological communities. These indirect impacts will be mitigated through the implementation of exclusion zones on land designated Key Fish Habitat (Figure 6-3). With the implementation of this measure, it is unlikely that the modified project would result in impacts to key fish habitat listed under the FM Act.

Fauna injury and mortality

During construction of the proposed modification, injury and mortality of fauna is possible during activities such as vegetation clearing, collision with work vehicles or plant, and accidental entrapment in plant, trenches, or other works. The risk and likelihood of impact is consistent with the approved project REF and as such, the implementation of measures outlined in Section 6.1.4 of the approved project REF would mitigate potential impacts.

The proposed modification would not result in an increased risk of starvation, exposure, and loss of shade or shelter to native species. The area of habitat to be impacted is small, and the vegetation within the subject land is already fragmented and somewhat degraded in the understory, therefore is unlikely to represent critical habitat for candidate species. In addition, there is substantial intact vegetation east of the subject land which likely supports higher quality habitat and would remain unaffected by the proposed modification.

Invasion and spread of weeds, pests and predatory species, and pathogens

The approved project REF assessed the likelihood of the invasion and spread of weeds, pests, pathogens, and predatory species populations during construction. Activities such as vegetation clearing, habitat removal, and poor waste management and biocontrol have the potential to facilitate the introduction or spread of weeds, the dispersal and establishment of pest and predatory species into different areas, or to increase the spread of pathogens.

Pathogens may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Pathogens may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers, and movement of soil.

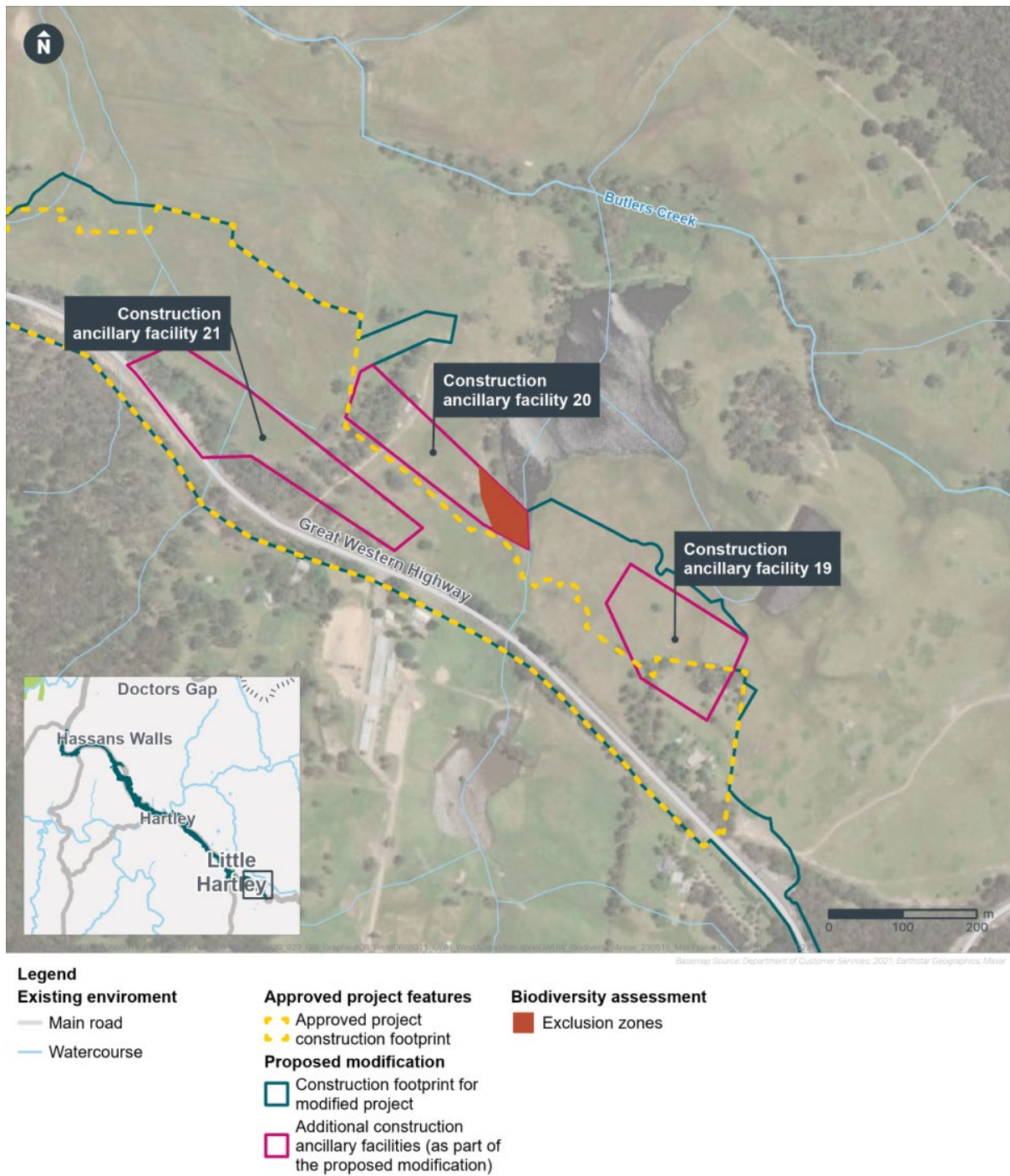


Figure 6-3a Exclusion zones to avoid biodiversity values within the construction footprint for the modified project



Figure 6-3b Exclusion zones to avoid biodiversity values within the construction footprint for the modified project

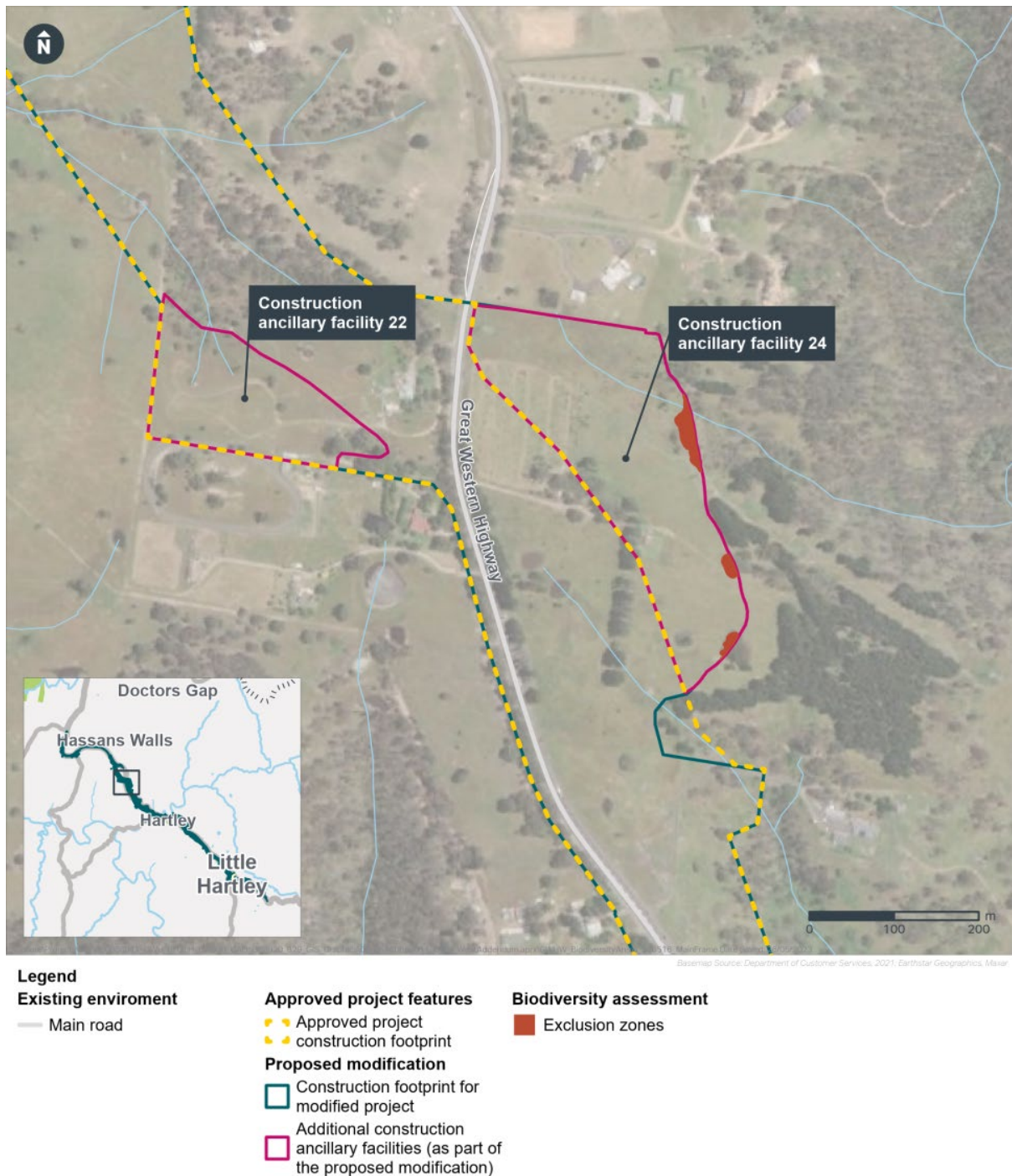


Figure 6-3c Exclusion zones to avoid biodiversity values within the construction footprint for the modified project

The local area is already semi-urbanised and there is potential for predatory species to already exist. The vegetation clearance for the proposed modification, particularly given past and current land use, is unlikely to exacerbate predatory species populations in the area. There is potential for lighting during construction of the proposed modification to attract predators and/ or prey; however, it is not expected that this will be substantial.

This risk of invasion and spread of weeds, pests and predatory species, and pathogens is consistent with what was concluded in the approved project REF and would be minimised with the implementation of the approved project REF safeguards.

Noise, vibration, light, and dust

The construction of the proposed modification would result in temporary localised disturbance from noise and vibration, temporary increase in artificial lighting, resulting in displacement of animals, and temporary increase of construction-associated dust, resulting in smothering of flora. However, areas surrounding the proposed modification currently experience light and noise exposure associated with the Great Western Highway, adjacent roads, and residential areas. As such, the additional construction impacts from noise, light and vibration are unlikely to substantially affect local fauna. This is consistent with the approved project REF.

If an unknown population of threatened fauna species do occur within the proposed modification area, individuals would be able to relocate from areas adjacent to the highway to a more suitable area of habitat within the locality.

Groundwater dependent ecosystems

Construction of the proposed modification would result in the removal of 1.92 hectares of potential terrestrial mapped GDEs, in addition to the 42.85 hectares stated in the approved project REF.

Only one cut (L2R-2) has been identified as likely to intersect with the groundwater table in both the approved project and the proposed modification (also refer to Section 6.6 (Groundwater)). However, it is not expected to impact any GDEs as there are no GDEs located within the draw down zone of the cut (L2R-2) required for the proposed modification. Consistent with the approved project REF, there is not expected to be an impact on any GDEs for the proposed modification.

Aquatic impacts

The proposed modification would result in direct and indirect impacts to waterways during construction activities, including the replacement of part of an existing drainage culvert, along Rosedale Creek, beneath the existing Great Western Highway and vegetation clearing surrounding areas of Key Fish Habitat. The proposed modification would also require the relocation and installation of new permanent surface water basins, including a new water quality treatment basin at Little Hartley. These activities have the potential to result in changes to water quality, water bodies, and hydrological processes that may impact upon threatened ecological communities and habitat for threatened species.

Any impacts upon aquatic habitats are consistent with the approved project REF. Measures to mitigate the impacts associated with changes to hydrology and water quality are outlined approved project REF. Shading impacts as a result of this modification are expected to be minor, given no structures will be permanently installed instream.

Operation

During operation of the proposed modification, impacts to biodiversity are likely through operation of the new highway. The main impacts likely include:

- Wildlife connectivity and habitat fragmentation
- Edge effects on adjacent native vegetation and habitat
- Aquatic impacts
- Fauna injury and mortality.

These impacts are discussed in more detail within this section below.

Wildlife connectivity and habitat fragmentation

No mapped wildlife connectivity corridors occur within the proposed modification area, as the habitat within the study area is already fragmented due to the current road and past land clearing. It is however noted that large areas of intact vegetation outside of the construction footprint of the modified project extend into the Wollemi National Park to the east and within riparian corridors of small watercourses and major river systems, including the River Lett.

Vegetation clearance during construction of the proposed modification is unlikely to cause habitat fragmentation at any larger scale than the approved project. With the implementation of the approved project REF safeguards, impacts upon fauna would be minimised. The approved project has committed to providing fauna exclusion fencing at targeted locations along the highway and underpasses (concrete box culverts) underneath the highway to facilitate the safe movement of fauna.

Edge effects on adjacent native vegetation and habitat

All vegetation adjacent to the Great Western Highway within the proposed modification area is currently subject to edge effects, including weed ingress, soil disturbance, and trampling from adjacent agricultural land use. Edge effects are likely to occur surrounding newly created edges, including those around the River Lett and surrounding patches of moderate condition vegetation, and around the proposed realignment of the existing Great Western Highway.

Impacts associated with the modified project are consistent with the approved project REF, and the vegetation clearance and land-take required for the modified project may result in indirect impacts on some areas of native vegetation adjoining the construction footprint. As recommended in the approved project REF, the modified project would minimise the removal of vegetation where possible and maximise revegetation with appropriate species along the road corridor and within medians and verges to minimise the impacts of vegetation clearance on adjacent vegetation.

Fauna injury and mortality

During the operation of the modified project, fauna injury and mortality would primarily occur from vehicle collisions, though this is not expected to be any greater than the current level. Currently, fauna vehicle strikes have a moderate to high likelihood of occurrence in the area as the existing Great Western Highway runs adjacent to remnant vegetation on the edges of the Blue Mountains National Park, which is characterised by an extensive area of native vegetation, rocky ridges, watercourses, and other habitat features for locally occurring fauna.

The inclusion of several underpasses (concrete box culverts) which double as fauna crossing and installation of exclusion fencing would prevent and minimise fauna injury and mortality. The risk of fauna injury and mortality is consistent with what was concluded in the approved project REF. With the implementation of the approved project REF safeguards, the risk of this would be minimised.

Conclusion on significance of impacts

Two threatened entities were determined to be at risk of SAIL under the Clause 6.7 of the BC Regulation within the proposed modification³:

- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (listed as endangered under the BC Act)
- *Asterolasia buxifoli* (listed as endangered under the BC Act).

Therefore, an addendum BDAR has been prepared (Appendix D).

The proposed modification is unlikely to significantly impact threatened species, populations, or ecological communities or their habitats, within the meaning of FM Act, and therefore a Species Impact Statement is not required.

The proposed modification is unlikely to significantly impact additional threatened species, populations, ecological communities, or migratory species, within the meaning of the EPBC Act. This is consistent with the approved project REF.

6.1.4 Safeguards and management measures

The proposed revised and additional biodiversity safeguards and management measures relative to those for the approved project, as presented in the Submissions Report, are provided in Table 6-3. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Table 6-3 Safeguards and management measures – Biodiversity

No.	Impact	Environmental safeguards	Responsibility	Timing
BI34	Vehicle strike	Fauna fencing <u>and crossings</u> will be installed at targeted locations along the highway <u>and around construction ancillary facilities</u> to minimise vehicle strike where reasonable and feasible. Fauna fencing <u>and crossings</u> would be designed to minimise impacts to threatened fauna species and species subject to vehicle strike. Locations selected would consider connectivity requirements of fauna and proposed structures.	Contractor Transport project manager	Detailed design Construction Operation

³ Large-eared Pied Bat is also considered at risk of SAIL, but only in the context of breeding habitat. As there are no rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings within 100 metres of associated PCTs within the study area, there are no mapped areas of potential breeding habitat for this species within the study area and therefore no mapped areas of potential SAIL for this species.

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Early installation of fauna fencing <u>and crossings</u> will be considered to minimise impacts to threatened fauna species during construction.</p> <p><u>Appropriate warning signage of potential fauna crossing and slow speed will be installed.</u></p> <p>A monitoring strategy would be developed to detect efficacy of fauna fencing and maintenance requirements would be detailed as part of the Flora and Fauna Management Sub-plan of the CEMP.</p>		
BI39	Loss of individuals from habitat removal in unassessed areas	<p>Following acquisition of the following properties targeted surveys for Purple Copper Butterfly in areas of suitable habitat should be conducted:</p> <ul style="list-style-type: none"> Lot 10 DP 1134053 'Fernhill' 3109 Great Western Highway, South Bowenfels NSW 2790 Lot 154 DP 1122453 'Misty View' 3055 Great Western Highway, Hartley NSW 2790 <u>Lot 1 and 2 DP 540599 'Billesdene Grange' 2272 Great Western Highway, Little Hartley, 2790.</u> <p>Surveys should be conducted during detectable periods (DPIE (EES), 2021a).</p>	Transport project manager <u>Contractor</u>	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<u>BI40</u>	<u>Impacts to native flora and fauna</u>	<p><u>Exclusion zones will be established in the following areas:</u></p> <ul style="list-style-type: none"> • <u>Within and adjacent to ancillary facility 20 surrounding Rosedale Creek</u> • <u>Construction ancillary facility 23</u> • <u>Construction ancillary facility 24.</u> <p><u>Specifically, this will be to minimise impacts to the following biodiversity values:</u></p> <ul style="list-style-type: none"> • <u>Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (EEC, BC Act)</u> • <u>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions (EEC, BC Act)</u> • <u>PCT 1615, Monkey Gum - <i>Eucalyptus blaxlandii</i> shrubby open forest on basalt of the Sydney Basin</u> • <u>Purple Copper Butterfly</u> • <u>Key Fish Habitat.</u> 	<u>Transport</u>	<u>Prior to construction</u>
<u>BI41</u>	<u>Impacts to native flora and fauna</u>	<u>Development and implementation of a Biodiversity Offset Strategy in accordance with the No Net Loss Guidelines (Transport for NSW, 2022f).</u>	<u>Transport</u>	<u>Prior to construction</u>

No.	Impact	Environmental safeguards	Responsibility	Timing
<u>BI42</u>	<u>Impacts to native flora and fauna</u>	<u>Standard wash-down procedures as per the RTA Biodiversity Guidelines (RTA, 2011a) should be implemented to reduce the likelihood of introduction or spread of <i>Phytophthora cinnamomi</i>.</u>	<u>Contractor</u>	<u>During construction</u>
<u>BI43</u>	<u>Key fish habitat</u>	<u>Works within key fish habitat to be undertaken must be in consultation with DPI in accordance with the FM Act.</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Prior to construction</u>

Other safeguards and management measures that would address biodiversity impacts are identified in the approved Project REF.

6.1.5 Biodiversity offsets

Ecosystem and species credits

A biodiversity offset strategy (BOS) will be prepared in accordance with the *No Net Loss Guidelines* (Transport for NSW, 2022f).

To determine the likely biodiversity credit requirements for the impacts of the proposal, the data collected in the proposal construction footprint was entered into the BAM Calculator. The biodiversity credit values of the native vegetation and threatened species habitat within the proposal construction footprint are presented in Table 6-4 and Table 6-5.

Table 6-4 Ecosystem credits required for the proposed modification

Vegetation zone	PCT name	Associated TEC	Impact area (ha)	Number of ecosystem credits required
<i>Burraborang sub bioregion</i>				
Low	PCT 766 Carex sedgeland of the slopes and tablelands	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	0.03	1
Moderate	PCT 1103 Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions *	0.11	3

Vegetation zone	PCT name	Associated TEC	Impact area (ha)	Number of ecosystem credits required
	Eastern Highlands Bioregion			
Low	PCT 1615 Monkey Gum – Eucalyptus blaxlandii shrubby open forest on basalt of the Sydney Basin	Not a TEC	0.07	1
Moderate		Not a TEC	0.75	16
High		Not a TEC	0.12	4
Bathurst sub bioregion				
Moderate	Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions *	0.21	3
Total				28
Notes	* Entities at risk of an SAIL			

Table 6-5 Species credits required for the proposed modification

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of ecosystem credits required
Burrangor sub bioregion			
-	<i>Asterolasia buxifolia</i> *	0.11	5
Barking Owl	<i>Ninox connivens</i>	0.45	13
Koala	<i>Phascolarctos cinereus</i>	1.05	30
Large-eared Pied Bat *	<i>Chalinolobus dwyeri</i>	0.11	5
Southern Myotis	<i>Myotis macropus</i>	0.11	3
Total			56

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of ecosystem credits required
Bathurst sub bioregion			
-	<i>Asterolasia buxifolia</i> *	0.1	5
Barking Owl	<i>Ninox connivens</i>	0.1	3
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	0.1	3
Koala	<i>Phascolarctos cinereus</i>	0.1	3
Masked Owl	<i>Tyto novaehollandiae</i>	0.1	3
Powerful Owl	<i>Ninox strenua</i>	0.1	3
Purple copper Butterfly	<i>Paralucia spinifera</i>	0.1	3
Southern Myotis	<i>Myotis macropus</i>	0.1	3
Total			26
Notes	* Entities at risk of an SAI		

6.2 Traffic and transport

This section provides a summary of the assessment of potential traffic and transport impacts during construction and operation of the proposed modification and identifies mitigation measures to address these impacts. A Technical Working Paper Addendum – Traffic and Transport is presented in Appendix E.

6.2.1 Methodology

The traffic and transport assessment of the proposed modification comprised of the following:

- A review of the qualitative assessment of construction traffic and transport impacts from the approved project REF and assessment of any changes as a result of the proposed modification, including for construction traffic
- A quantitative assessment of the travel time impacts of proposed construction traffic management measures, using the Great Western Highway Upgrade Project's Operational Traffic Model (OTM)
- A qualitative assessment of potential changes to the operational traffic and transport impacts and benefits in the approved project REF as a result of the proposed modification. A quantitative assessment has not been undertaken as there are no changes proposed to intersections or broader access arrangements that would affect traffic distribution as part of the proposed modification
- A qualitative review of the proposed modification's impact to the cumulative traffic and transport impact assessments included in the approved project REF, as well as the Katoomba to Blackheath Upgrade REF (Transport, 2022h) and the Great Western Highway Blackheath to Little Hartley EIS (Transport, 2023a)
- Review of traffic and transport mitigation measures from the approved project REF and Submissions Report to identify any revised or additional measures required to manage the impacts of the proposed modification.

Study area

The study area used for the assessment is the same as presented in the approved project REF: between Victoria Pass, Little Hartley to the east and Magpie Hollow Road, South Bowenfels to the west. The assessment focused on key areas related to the proposed modification, namely between the base of Victoria Pass and Coss River Road in Little Hartley.

6.2.2 Existing environment

The existing environment of the proposed modification remains as described in Section 6.2 in the approved project REF and is summarised below.

Existing road network

The Great Western Highway is the major arterial road through the proposed modification area, carrying local, intra-regional, and inter-regional travel. The general alignment of the Great Western Highway between Little Hartley and Lithgow is mostly a two-way undivided carriageway with one lane in each direction with limited overtaking lanes. The speed limit along this section of the Great Western Highway is mostly 80 kilometres per hour, with speeds reduced to 40 kilometres per hour for trucks and buses in some locations.

Local roads connections to the Great Western Highway between Little Hartley and Lithgow include (east to west):

- Coxs River Road/ Ambermere Drive
- Baaners Lane
- Browns Gap Road
- Mid Hartley Road
- Carroll Drive
- Kelly Street
- Old Great Western Highway
- Jenolan Caves Road/ Blackmans Creek Road
- Forty Bends Road
- Daintree Close
- McKanes Falls Road
- Old Bathurst Road
- Mudgee Street
- Quarry Place.

Of these, Coxs River Road and Ambermere Drive in Little Hartley, and Kelly Street in Hartley lie in closest proximity to the proposed modification. These roads are generally two-way undivided roads with one lane in each direction providing connections to local residential roads. The posted speed limits range is between 40 and 80 kilometres per hour.

Public Transport

There are currently no regular public transport bus services (including the local Lithgow Buslines services) that connect Mount Victoria and Lithgow. Residents rely on private vehicles for business, leisure, or school or travel within the proposed modification area (see Section 6.9 (Property and land use)).

Active transport

Active transport movement along and across the Great Western Highway in the proposed modification area is restricted by a lack of dedicated bicycle or pedestrian paths. An on-road cycleway along the Great Western Highway between McKanes Falls Road and Lithgow has narrow shoulder lanes presenting a safety challenge for cyclists.

Freight and heavy vehicles

Great Western Highway is currently restricted to general access vehicles only, which includes 19 metre long B-double heavy vehicles. Traffic volume data recorded between Little Hartley and Lithgow shows that between 1,900 and 2,400 heavy vehicles travelled along the road corridor on an average weekday in 2021. This equates to between 18 per cent and 22 percent of total traffic during the 24-hour period. Recent online sources (Transport, 2023b) show that the number of heavy vehicles travelling through the proposed modification area in 2022 and 2023, measured at the four closest sites to the proposed modification, has slightly increased from the 2021 average daily traffic count, whilst the percentage of heavy vehicles relative to the total number of vehicles has slightly decreased (refer to Table 6-6). This is likely due to the impact that the COVID pandemic response had on vehicle use, with the volumes of heavy and light vehicles increasing from 2021 onwards.

Table 6-6 Average daily traffic and heavy vehicle volumes on the Great Western Highway between Little Hartley and Lithgow

Location	Average daily traffic count			Heavy vehicles as a percentage of total vehicles		
	2021	2022	2023	2021	2022	2023
West of Berghofer Drive	9,760	11,700	11,170	22%	20%	21%
East of Coxs River Road	9,710	11,650	11,390	23%	21%	21%
West of Walker Street	8,640	11,180	11,600	24%	21%	20%
South of Forty Bends Road	8,180	10,500	10,780	24%	21%	19%

Source: Transport, 2023b

Traffic volumes

A summary of daily traffic volumes on weekdays and weekends in 2021 and 2022 between Little Hartley and Lithgow is provided in Table 6-7 (Transport, 2023b).

Table 6-7 Average daily traffic volumes on the Great Western Highway between Little Hartley and Lithgow

Location	Average daily traffic count (weekdays)		Average daily traffic count (weekends)	
	2021	2022	2021	2022
West of Berghofer Drive	9,640	11,330	9,280	11,900
East of Coxs River Road	9,740	11,170	9,560	11,910
West of Walker Street	8,460	10,730	9,040	11,240
South of Forty Bends Road	8,100	10,080	7,970	10,420

Source: Transport, 2023b

Weekday AM and PM peak hour directional and total traffic volumes between Little Hartley and Lithgow are shown in Table 6-8 (Transport, 2023b).

Table 6-8 AM and PM peak hour traffic volumes on the Great Western Highway between Little Hartley to Lithgow in 2022

Location	AM peak one hour (vehicles/ hour)			PM peak one hour (vehicles/ hour)		
	West	East	Two-way	West	East	Two-way
West of Berghofer Drive	1,340	1,220	2,560	1,490	1,520	3,000
East of Coxs River Road	1,330	1,210	2,540	1,480	1,460	2,940
West of Walker Street	1,260	1,100	2,360	1,360	1,460	2,820
South of Forty Bends Road	1,180	1,040	2,220	1,320	1,380	2,700

Source: Transport, 2023b

Traffic crash history

Of the traffic crash history recorded in the approved project REF, two crashes were recorded between the base of Victoria Pass and Coxs River Road in Little Hartley between 2014 and 2020. One resulted in serious injury and the other did not result in any casualties (vehicles were towed away). Online sources (Transport, 2021c) show that an additional two were recorded (non-casualties; towaways) between 2020 and 2021.

6.2.3 Potential impacts

Construction

Traffic volumes and road network performance

While the proposed modification includes an additional seven construction ancillary facilities, the estimated daily construction light and heavy vehicle movements during construction of the modified project would remain consistent with the movements identified for the approved project in the approved project REF. These estimates are presented in Table 6-9.

Table 6-9 Indicative estimate of daily construction vehicle movements

Construction site / section	Estimated daily construction vehicle movements		
	Light vehicles	Heavy vehicles	Total
Little Hartley to River Lett Hill	200	320 to 420	520 to 620
Coxs River Road	200	167 to 487	367 to 687
River Lett Hill to Forty Bends	400	218 to 450	618 to 850
Forty Bends to Lithgow	200	88 to 450	288 to 650

The construction vehicle movements generated by the modified project's construction works would be distributed across the combined construction ancillary facilities (i.e. those in the approved project and additional construction ancillary facilities included in the proposed modification). Similarly, vehicle haulage to and from the proposed additional construction ancillary facilities would be via the Great Western Highway, which is also consistent with the approved project.

The approved project REF indicates that impacts associated with additional traffic volumes generated by construction of the approved project would be minor and would not impact the operational performance of the Great Western Highway.

Access and egress to the proposed additional construction ancillary facilities 19 to 25 would be designed to provide safe access, with turn lane provisions as required in accordance with Transport and Austroads guidelines. As identified in the approved project REF, a Traffic Management Plan (TMP) would be prepared for the construction area and progressively updated as the works progress (see mitigation measures TT01 and TT02 in Section 7.2 of this addendum REF).

Temporary road network changes

The modified project's realigned new Service Road 1, the westbound on-ramp, and the eastbound off-ramp (see Figure 3-1) would provide an opportunity to minimise disruptions to existing traffic during construction in the following ways:

- The construction traffic stages would likely use these project features to stage traffic around the construction works, potentially providing up to two traffic lanes in each direction (instead of one) for some of the construction stages within the study area, with two-way traffic flow potentially accommodated on both the eastbound new Great Western Highway carriageway and eastbound off-ramp
- The construction traffic staging could result in the separation of local traffic from through traffic (i.e. traffic that continues on a road or highway rather than crossing onto a different road), and enable through traffic to use the new Great Western Highway earlier in the construction staging.

Notwithstanding the above, as construction planning has progressed, the following additional construction traffic management measures have been identified as critical to the works being carried out efficiently:

- Heavy earthmoving haulage plant and earthworks vehicle crossings of the Great Western Highway (also referred to as a moxy crossings) at two locations with the limits of the modified project. The moxy crossings would operate similar to a temporary intersection, with Great Western Highway traffic stopped for a brief time (around one minute at each location) to allow construction vehicles to cross the Great Western Highway and move between construction areas on either side of the highway
- Blasting stoppages, where Great Western Highway traffic would be stopped in both directions for around 15 minutes to allow earthworks blastings to occur at River Lett Hill. The 15 minute stoppages would occur once per hour and would be limited to the weekday interpeak traffic period, between 10am and 2pm
- Night time (typically 8pm-5am) lane closures and contraflows for traffic switching and utility relocation cut overs. Contraflow refers to when a carriageway of a divided road is closed to traffic and the traffic is transferred to the other carriageway which then operates as a two-way road. This process is managed by portable traffic signal or 'stop' or 'slow' signage.

The travel time impacts and benefits of these proposed traffic management measures are summarised in Table 6-10. The travel time impacts have been assessed using the Great Western Highway Upgrade Program's Operational Traffic Model (OTM).

Table 6-10 Assessment of proposed construction traffic management measures

Measure	Time period	Average travel time increases in study area	Key benefits
Moxy crossings	Monday to Saturday 7am-5pm	Up to 5 minutes in each direction	Minimises the associated construction vehicle movements on the Great Western Highway
Blasting stoppages	10am-2pm	Up to 8 minutes in each direction	Allows for efficient blasting activity which minimises construction program
Contraflows	Monday to Thursday 8pm-5am Friday 9pm-5am	Up to 5 minutes in each direction	Allows for construction works to occur efficiently

These measures would be included in the traffic management plans that would be prepared for the construction area and progressively updated as the works progress (refer to mitigation measure TT02). The plans would seek to minimise the travel time impacts as much as practical.

Active transport

The traffic and transport impacts associated with the proposed extension of the active transport trail to Berghofers Pass car park during construction would generally be the same as the approved project. Specifically, construction of the active transport trail would not generate additional construction traffic volumes beyond those identified in the approved project REF, i.e. between 200 and 850 vehicle movements per day, and it is unlikely that any additional temporary road closures or changes would be required to complete the works.

Construction of the proposed modification would not result in any other impacts to pedestrians or cyclists, noting that there are currently no dedicated active transport facilities within the construction footprint. Cyclists could continue to use the existing Great Western Highway during the construction works and would be considered as part of any construction traffic staging.

Car parking

The existing Berghofers Pass car park area would be either closed or partially closed during construction works in the car park. This may restrict visitors accessing Berghofers Pass during this period. However, the car park area closure would be temporary, and the duration would be minimised as much as practical.

Similarly, construction of the formalised car park access would require partial closures of the existing Great Western Highway adjacent to the proposed car park site. Works to the formalised Berghofers Pass car park access are expected to occur at night to minimise disruption to road users.

As identified in the approved project REF, a TMP (see mitigation measure TT01) would be prepared and approved by Transport for the modified project prior to implementation as part of an approved CEMP (see mitigation measure GEN01). The TMP would provide details of the traffic management measures to be implemented during construction to manage and regulate traffic movements on the surrounding network, maintain vehicular, pedestrian and cyclist access and minimise traffic congestion where possible. Specifically, the TMP would

include management measures to minimise the traffic and transport impacts associated with the formalisation of the Berghofers Pass car park area and access.

Operation

Road network performance

The road network performance improvements associated with the approved project would remain the same with the modified project because no major changes to the upgraded Great Western Highway alignment and its intersections are proposed.

Local access and connectivity

The eastbound off-ramp and westbound on-ramp included in the modified project would provide additional connectivity between the proposed Great Western Highway and the existing Great Western Highway which did not form part of the approved project. Westbound vehicles using the existing Great Western Highway could conveniently connect with the new Great Western Highway via the new on-ramp, rather than travelling through Little Hartley via Service Road 1 as per the approved project. Similarly, the new eastbound off-ramp would improve connectivity between the new Great Western Highway and Victoria Pass.

Eastbound vehicles would exit the new Great Western Highway further east, avoiding Service Road 1.

The full extent of the new Great Western Highway provided by the proposed modification could also be used by traffic once construction of the modified project is complete. This would represent a benefit to users in comparison to the approved project, where the section of the new Great Western Highway east of Coxs River Road was proposed to tie-in with the Blackheath to Little Hartley Upgrade Project and could not be used until the Blackheath to Little Hartley Upgrade Project was completed. In the approved project, all vehicles would need to enter or exit the new Great Western Highway via Connecting Road 2 and Connecting Road 3 near Coxs River Road (see Figure 6-4).

The modified project would also offer the following benefits:

- Local traffic on the Service Road 1 would be separated from traffic on the new Great Western Highway for a longer distance, i.e. between Coxs River Road and Berghofers car park for eastbound traffic and the proposed westbound on-ramp for westbound traffic. Additionally, traffic volumes on Service Road 1 would be lower than what was anticipated with the approved project
- Eastbound and westbound vehicles on the new Great Western Highway would be physically separated for a longer distance because of the proposed divided carriageway which improves road safety, especially reducing the likelihood of head-on collisions occurring in this section
- Eastbound and westbound vehicles on the new Great Western Highway could travel at speeds of up to 80 kilometres per hour for a longer distance (instead of 60 kilometres per hour on the existing Great Western Highway and Service Road 1) which could result in slightly reduced travel times through the study area
- Improved amenity, access, and local traffic flow in and around the Little Hartley area due to reduced interaction between local traffic and traffic on the Great Western Highway.

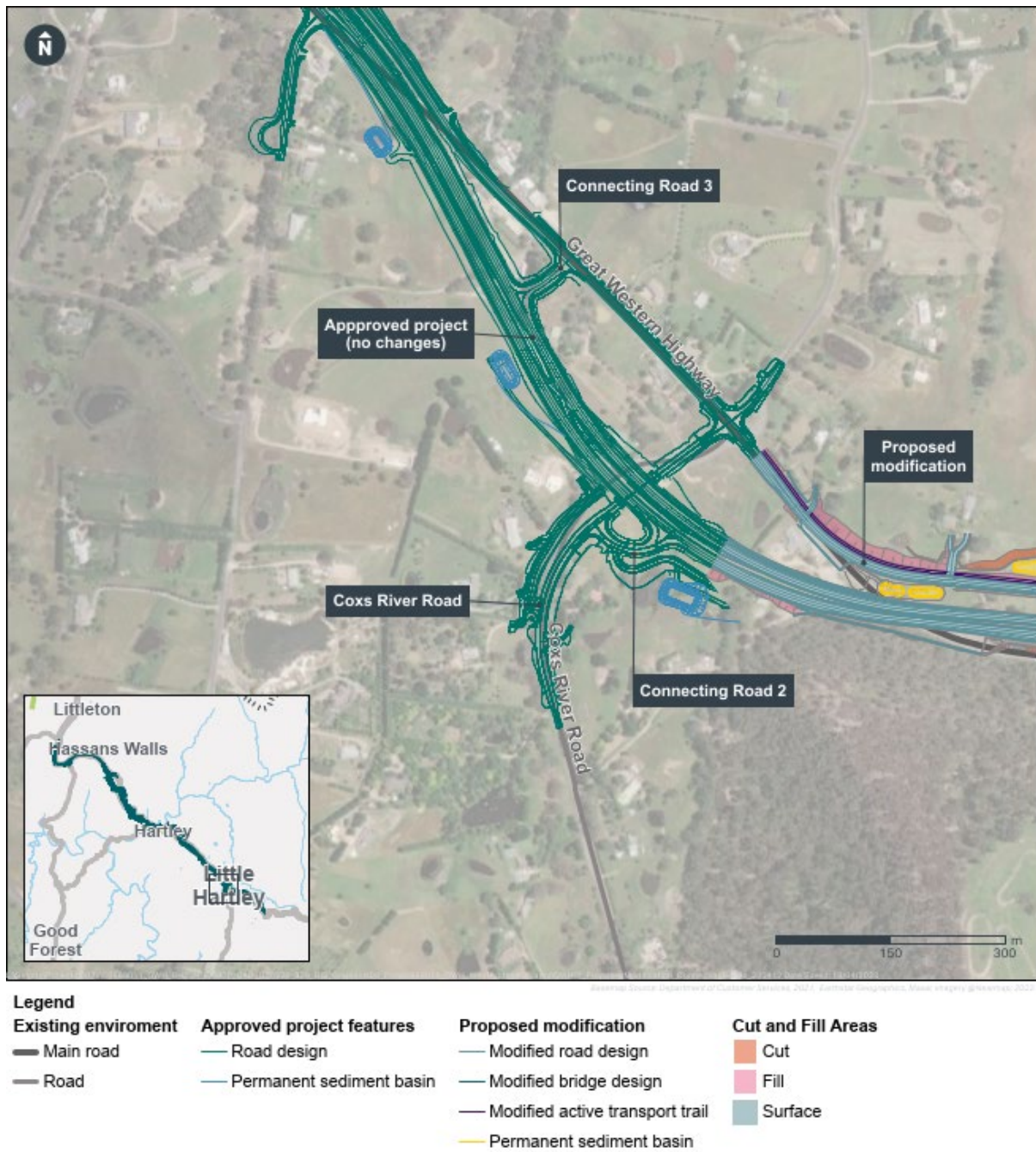


Figure 6-4 Connecting Roads 2 and 3

Active transport

An indicative route for the shared path between Little Hartley and Lithgow was provided in the approved project REF (see Appendix R). The extent and location of this shared path will be subject to further consultation and engagement with stakeholders during the detail design phase. Based on ongoing design development for the approved project, a revised alignment for the active transport trail is proposed between the base of Victoria Pass and 100 metres east of Coxs River Road (about two kilometres), including a connection to the Berghofers Pass car park, as part of the proposed modification. This would be bi-directional and separated from the road by either a one metre verge or road safety barrier. The active transport trail would improve pedestrian and cyclist connectivity within the study area and encourage more walking and cycling between Lithgow and Berghofers Pass.

Car parking

The formalised Berghofers Pass car park would include 12 parking spaces which is estimated to be the same as the existing capacity of the parking area. Therefore, the proposed modification would not result in any loss of existing parking spaces.

Formalising the Berghofers Pass car park would improve the operation of the car park and make it safer to use. In addition, formalising the access to and from the car park would improve legibility of the access, which would reduce the risk of crashes occurring at this location.

6.2.4 Safeguards and management measures

The proposed additional and/ or modified traffic and transport safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided in Table 6-11. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Table 6-11 Additional safeguards and management measures – Traffic and transport

No.	Impact	Environmental safeguards	Responsibility	Timing
TT01	Construction traffic	A Traffic Management Plan (TMP) will be prepared for the construction phase of the proposal <u>modified project</u> . This will adhere to Traffic Control at Worksites, Technical Manual, Issue No. 6, Transport, September 2020 and QA Specification G10 Traffic Management (Transport, August 2020). This will include details on: <ul style="list-style-type: none">• Measures to maintain access to properties and local roads• Site specific traffic control measures to manage and regulate traffic movement• Requirement and methods to consult and	Contractor	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>inform the local community of impacts on the local road network</p> <ul style="list-style-type: none"> • Measures to maintain pedestrian and cyclist access • Access to ancillary sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction road traffic incident • Consideration of other developments which 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. • <u>Construction planning during detailed design will further develop the required construction traffic management measures and ways to minimise their impacts. This includes development into heavy earth moving haulage plant/ moxy crossings of the Great Western Highway to reduce the need for road haulage trucks to travel on the existing Great Western Highway. Additionally, lane closures, contra flows for traffic switches or utility relocation cut and covers will occur at night.</u> 		

6.3 Noise and vibration

This section provides a summary of the assessment of potential noise and vibration impacts during construction and operation of the proposed modification and identifies mitigation measures to address these impacts. A Technical Working Paper Addendum – Noise and Vibration is presented in Appendix F (referred to as the NVIA addendum).

6.3.1 Methodology

The noise and vibration assessment of the proposed modification involved the following:

- Quantitative assessment of the noise catchment areas (NCAs) considered in the approved project Noise and Vibration Impact Assessment (NVIA) that would potentially be affected by the modified construction footprint and additional construction ancillary facilities
- Qualitative reassessment of construction footprint areas and construction activities not impacted by the proposed modification
- Quantitative assessment of two new proposed temporary road diversions (side-tracks of existing Great Western Highway) during construction
- Quantitative assessment of the operational noise impacts as a result of the proposed modification using the existing SoundPLAN model used in the approved project NVIA.

Study area

The study area is consistent with the study area for the approved project NVIA (Jacobs Arcadis, 2021), with the assessment focusing on the key areas related to the proposed modification, namely in Butlers Creek Valley and River Lett Hill.

Noise and vibration criteria

Construction noise management levels and vibration criteria are presented in Section 3.1 of the approved project NVIA and remain relevant for the NVIA addendum.

Operational traffic noise criteria are presented in Section 3.2 of the approved project NVIA and remain relevant for the NVIA addendum.

Operational fixed facilities noise criteria have been determined for the NVIA addendum. The criteria are based on the *Noise Policy for Industry* (EPA, 2017) which provides noise criteria for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures. The *Noise Policy for Industry* applies to all noise emissions from the permanent operational ancillary facilities ('fixed' facilities) for the proposed modification. The noise criteria for fixed facilities for the proposed modification are presented in Table 5-2 of the NVIA addendum (refer to Appendix F).

6.3.2 Existing environment

A description of the existing acoustic environment around the approved project is presented in Chapter 2 of the approved project NVIA. This description remains relevant for the proposed modification.

Existing noise levels in the study area are generally influenced by road traffic noise from the Great Western Highway, along with general rural and environmental noise.

Receivers in the study area are typically sparsely distributed rural residential properties with a small number of commercial properties at various points along the alignment. Receivers are relatively close to the alignment along the length of the proposal although they are generally few in number. The NCAs assessed as part of this addendum REF are shown in Figure 6-7 of the approved project REF.

6.3.3 Potential impacts

Construction

The construction scenarios assessed for the proposed modification are predominantly consistent with the phases and activities identified in Table 18 of the approved project NVIA. However, an additional construction scenario was considered for rock crushing.

Potential construction noise and vibration impacts associated with the proposed modification are generally consistent with those assessed in the approved project REF. However, additional receivers are anticipated to be impacted by construction noise from:

- Realignment of the existing Great Western Highway from around 1.1 kilometres east of Coxs River Road to around 100 metres east of Coxs River Road
- Minor amendments to the alignment and extent of the new surface section of the Great Western Highway
- New and relocated permanent water quality basins, including a new water quality treatment basin at Little Hartley, and replacement of part of an existing drainage culvert beneath the existing Great Western Highway and eastbound off-ramp from new Great Western Highway at Little Hartley
- Additional construction footprint areas and seven additional construction ancillary facilities, including to accommodate modifications to project design and additional power pole adjustments at Hartley.

Residential receivers

The number of residential receivers where the noise management levels (NMLs) are likely to be exceeded during the day and night-time for airborne construction noise is presented in Table 4-2 of Appendix F. These results are summarised by construction scenario in Table 6-12.

Table 6-12 Summary of worst-case airborne noise impacts on residential receivers by construction scenario

Construction scenario	Approximate number of receivers impacted
Pre-construction and early works (W.01)	<ul style="list-style-type: none"> • 25 receivers may experience noise levels above NMLs during standard construction hours (during the day), including four highly noise affected receivers • Moderately intrusive impacts at up to 12 receivers and highly intrusive at up to five receivers during the day.
Site establishment – Peak (W.02)	<ul style="list-style-type: none"> • 23 receivers may experience noise levels above NMLs during the day, including three highly noise affected receivers • Moderately intrusive impacts at up to ten receivers and highly intrusive at up to three receivers during the day.

Construction scenario	Approximate number of receivers impacted
Earthworks and utility works – Peak (W.04)	<ul style="list-style-type: none"> 86 receivers may experience noise levels above NMLs during the day, including 21 highly noise affected receivers Moderately intrusive impacts at up to 20 receivers and highly intrusive at up to 23 receivers during the day.
Earthworks and utility works – Typical (W.05)	<ul style="list-style-type: none"> 24 receivers may experience noise levels above NMLs during the day 65 receivers may experience noise levels above NMLs outside of standard construction hours, including four highly noise affected receivers Moderately intrusive impacts at up to nine receivers and highly intrusive at up to five receivers and highly intrusive at up to five receivers during the day Night-time mitigation measures would be required for around 50 receivers with perceptions ranging from ‘clearly audible’ to ‘highly intrusive’.
Bridge construction – Peak (W.06)	<ul style="list-style-type: none"> 11 receivers may experience noise levels above NMLs during the day, none being highly noise affected 101 receivers may experience noise levels above NMLs outside of standard construction hours Moderately intrusive impacts at up to three receivers during the day Night-time mitigation measures would be required for around 72 receivers with the impact perceptions potentially being ‘highly intrusive’.
Bridge construction – Typical (W.07)	<ul style="list-style-type: none"> 11 receivers may experience noise levels above NMLs during the day, none being highly noise affected 43 receivers may experience noise levels above NMLs outside of standard construction hours Moderately intrusive impacts at up to two receivers during the day Night-time mitigation measures would be required for around 33 receivers with the impact perceptions potentially being ‘highly intrusive’.
Road works – Peak (W.08)	<ul style="list-style-type: none"> 44 receivers may experience noise levels above NMLs during the day, including four highly noise affected receivers Moderately intrusive impacts at up to 16 receivers and highly intrusive impacts at up to four receivers during the day.
Road works – Typical (W.09)	<ul style="list-style-type: none"> Nine receivers may experience noise levels above NMLs during the day, none being highly noise affected.
Road works – Out of standard	<ul style="list-style-type: none"> 121 receivers may experience noise levels above NMLs during peak road works outside of standard construction hours

Construction scenario	Approximate number of receivers impacted
construction hours peak (W.10)	<ul style="list-style-type: none"> Night-time mitigation measures would be required for around 113 receivers with impact perceptions potentially ranging from 'clearly audible' to 'highly intrusive'.
Road works – Out of standard construction hours typical (W.11)	<ul style="list-style-type: none"> 43 receivers may experience noise levels above NMLs during typical road works outside of standard construction hours Night-time mitigation measures would be required for around 33 receivers with impact perceptions potentially ranging from 'clearly audible' to 'highly intrusive'.
Finishing works/ Traffic Staging works (W.12)	<ul style="list-style-type: none"> 25 receivers may experience noise levels above NMLs during the day, including four highly noise affected receivers Moderately intrusive impacts at up to 12 receivers and highly intrusive at up to five receivers during the day 77 receivers may experience noise levels above NMLs during works outside of standard construction house, four of which may be highly noise affected Night-time mitigation measures would be required for approximately 51 receivers with impact perceptions potentially ranging from 'clearly audible' to 'highly intrusive'
Compounds – operations – Typical (W.13)	<ul style="list-style-type: none"> 27 receivers may experience noise levels above NMLs during the day, and 59 receivers outside of standard construction hours, including two highly noise affected receivers Moderately intrusive impacts at up to six receivers and highly intrusive at up to three receivers during the day Night-time mitigation measures would be required for around 42 receivers with impact perceptions potentially ranging from 'clearly audible' to 'highly intrusive'.
Compounds – rock crushing operations – Peak (W.14)	<ul style="list-style-type: none"> 24 receivers may experience noise levels above NMLs during the day, including one highly noise affected receiver Moderately intrusive impacts at up to four receivers and highly intrusive at up to one receiver during the day.

As the majority of changes in the construction and operational design of the project would be located between the base of Victoria Pass and around 100 metres to the east of Coxs River Road, there would be impacts from all construction scenarios in NCA 01 to NCA 04. The noisiest and most intrusive activities are anticipated to be pre-construction and early works, site establishment, earthworks and utility works, bridge construction, and finishing works. The majority of residential receivers would experience either a 'clearly audible' (where noise levels exceed the NML by 1-10 decibels) or 'moderately intrusive' (where noise levels exceed the NML by 1-10 decibels) impact.

For receivers in proximity to construction ancillary facilities 23 to 25, noise from activities relating to compound operations, such as rock crushing, may be experienced; however, receiver numbers are lower than in NCA 01 to NCA 04.

Receivers which are further away from the works and/ or shielded from view would experience lower construction noise levels. Particularly noisy activities, such as rock hammering and the use of concrete saws, are likely to persist for only a small part of the overall construction period. For linear works (works that move along the road alignment, rather than works located at a discrete location), noise exposure at each receiver would reduce due to increases in distance as the works progress along the alignment. For the prediction of noise impacts from construction activities, consideration has been given to reasonable worst case construction activities, as required by the *Interim Construction Noise Guideline* (DECC, 2009). The reasonable worst-case scenario is considered conservative because it assumes all equipment expected to be used at a given site would be operating simultaneously, at a worst-case intensity, and with a worst-case orientation during a 15-minute period. The planning of work activities would mitigate this risk and ensure the reasonable worst-case scenario would be unlikely to occur in practice. Therefore, the actual construction noise impacts would likely be lower than modelled.

Mitigation measures outlined in the approved project REF would manage potential construction noise impacts associated with these activities, and no additional mitigation measures would be required.

Sleep disturbance

The following construction activities would require some works to be undertaken outside of standard working hours (i.e. out of hours work⁴): earthworks and utility works, bridge construction, roadworks, and compound operations. These activities will be undertaken to facilitate speedy delivery of the upgrade works, therefore reducing the time that receivers will be affected, and ensure construction worker safety.

The number of residential buildings where noise levels are predicted to exceed the sleep disturbance screening criteria and the awakening reaction criteria are presented in Table 6-13.

Table 6-13 Number of residential buildings where noise levels may exceed sleep disturbance criteria by NCA

Location	Number of residential buildings	
	Sleep disturbance screening level L _{A1(1 minute)} , dB(A)	Awakening reaction level L _{A1(1 minute)} , dB(A)
NCA 01	30	18
NCA 02	18	10
NCA 03	243	41

⁴ The ICNG lists five categories of work that might need to be undertaken outside of Standard Construction Hours:

- The delivery of oversized equipment or structures that require special arrangements to transport on public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services or considerations of worker safety do not allow work within standard hours
- Public infrastructure work that shortens the length of the project and is supported by the affected community
- Work where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

Location	Number of residential buildings	
	Sleep disturbance screening level L _{A1} (1 minute), dB(A)	Awakening reaction level L _{A1} (1 minute), dB(A)
NCA 04	154	24
NCA 05	9	0
NCA 06	5	1
NCA 07	12	0
NCA 08	2	2
NCA 09	1	0
NCA 10	9	3

The activities associated with sleep disturbance are expected during earthworks and utilities, bridge construction, and roadworks. The exceedances are due to the close proximity of the works and the high L_{A1} sound power level of excavator movement and hammering.

Noise levels at up to 121 residential receivers in total for the proposed modification are predicted to exceed the sleep disturbance screening level for night-time works during the construction period. Awakening reactions may occur at up to 33 residential receivers. Generally, the number of receivers likely to experience sleep disturbance in NCA 01, NCA 02 and NCA 05 through to NCA 10 would be similar in both the approved and modified projects. In NCA 03 and NCA 04, the number of receivers likely to experience sleep disturbance would reduce slightly from the approved project to the modified project.

Other receivers

The noise impact on non-residential properties during construction has been assessed, based on the worst case 15-minute period of construction activity, while the construction equipment is at the nearest location to each receiver location. The activities associated with the construction of the proposed modification are expected to exceed the NMLs by up to 20 decibels at two non-residential receivers during the day ('moderately intrusive' to 'highly intrusive'); these would be St Bernard's Presbytery and Saint John's Anglican Church, both located in NCA 07. This is consistent with the approved project.

Overlapping construction activities

While most construction activities for the proposed modification are expected to occur at distinct scheduled times and at different locations, it is possible that noisy construction activities for the project may occur at the same time in close proximity to each other. In these cases, it is possible that an increase of up to 3 dB(A) of the highest noise level predicted for any construction stage may occur (assuming that at any one location equal noise levels from two stages of works are experienced).

Construction road traffic noise

There are no substantial changes to construction traffic movements of vehicle numbers assessed in the approved project REF and therefore there are no proposed changes to the construction road traffic assessment presented in Section 5.9 of the approved project NVIA.

Noise levels were predicted for the two temporary road diversions proposed during construction of the modified project (to have reduced speed limits of 40 to 60 kilometres per hour), including:

- The approved westbound off-ramp to Jenolan Caves Road would be used for a side-track off the existing Great Western Highway for two to two and a half years
- The approved River Lett Hill side-track along the proposed Great Western Highway for two to two and a half years.

Road traffic noise levels are not predicted to exceed the L_{Aeq} controlling noise criterion at any sensitive receivers as a result of both diversions and therefore no receivers are required to be considered for further noise mitigation.

Construction vibration

Construction vibration may be generated due to the use of vibration intensive equipment during some stages of work. The minimum working distances for these items of equipment from off-site receivers are shown in Table 12 of the approved project NVIA.

Where these minimum working distances are complied with, no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. Equipment size would be selected by the construction contractor and would consider the minimum working distances and the distance between the area of construction and the nearest receiver.

These impacts are presented based on distances to receivers from the closest point of the construction site based on use of a particular piece of plant/equipment. During detailed construction planning, the contractor would be required to select appropriate equipment based on the works location, nature of the required work and proximity to sensitive receivers to meet required vibration thresholds at receivers.

Blasting

Since the determination of the approved project, construction planning has identified the need to increase the velocity of blasting for the deep cut through River Lett Hill. An increase in the blasting criterion to 15 mm/s has been proposed, to align with the AS2187 structure damage criterion. This increase will reduce the amount of oversize granite boulders produced, thereby reducing the amount of large excavator hammering required. The change would allow for an improved scale of blasting and ultimately provide benefits, such as improved productivity, overall reduced excavation period and cost, and an overall reduced duration of hammering and resultant noise.

This would exceed the human comfort criterion of 10 millimetres per second (peak particle velocity) and require community consultation with potentially affected sensitive receivers to agree the human comfort criteria.

presents the proposed blasting criteria and Figure 6-5 present associated minimum working distances to satisfy blasting criteria for human comfort, protection of structures and protection of sensitive structures (such as heritage buildings).

Blasting would be managed in accordance with the measures outlined in the approved project NVIA, including development of a blast management plan, trial blasts, monitoring, and notification.

A full assessment can be found in Annexure E (Blasting contours) of Appendix F (Noise and vibration impact assessment).

Mitigation measures outlined in the approved project REF would manage potential noise and vibration impacts associated with these activities, and no additional mitigation measures would be required.

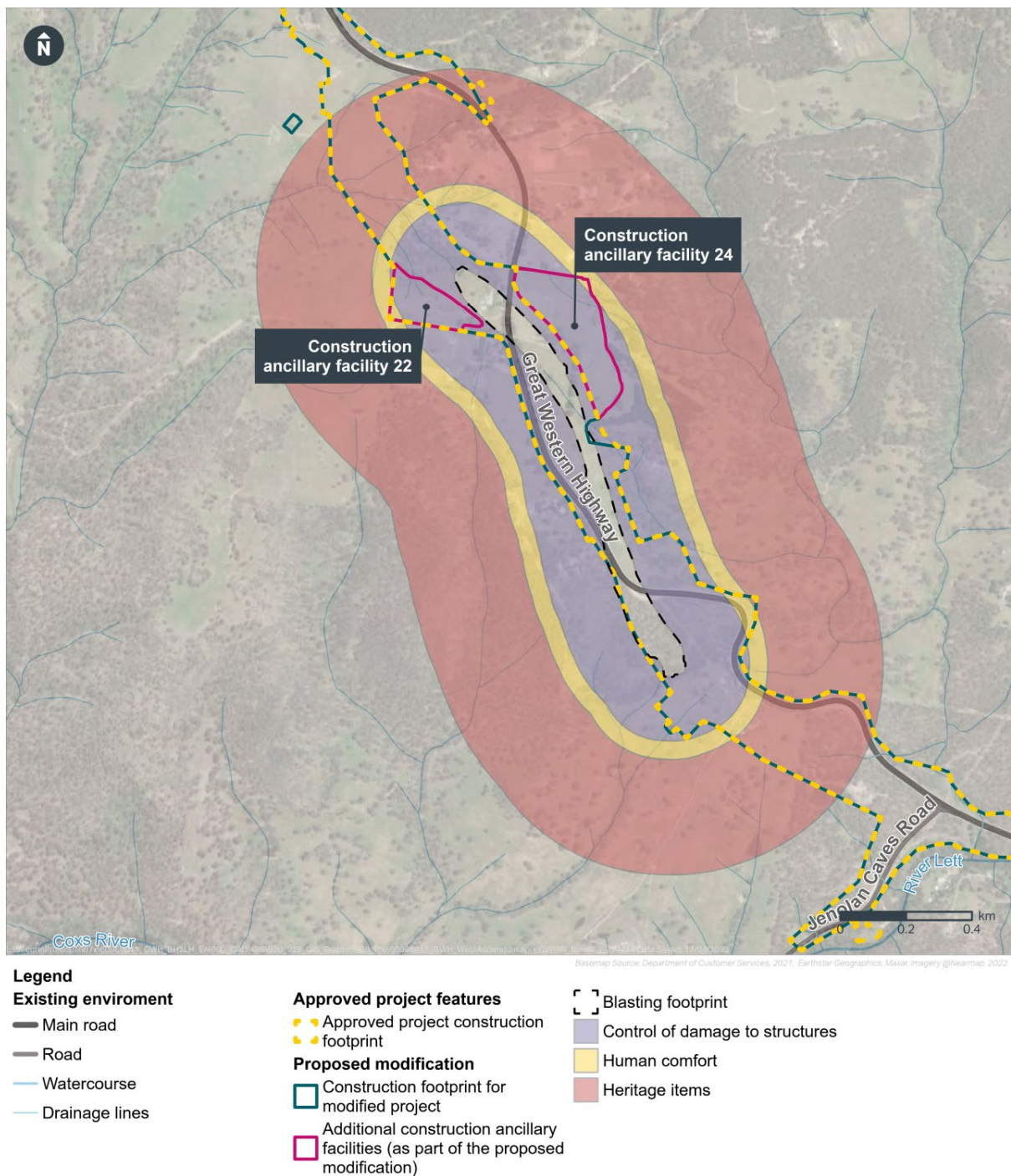


Figure 6-5 Blasting minimum working distances

Table 6-14 Blasting criteria

Human Comfort item		Control of Damage to Structures		
Peak particle velocity (PPV) (AS2187)	Over pressure (dBL) (AS2187)	Peak particle velocity (PPV) (AS2187)	Over pressure (dBL) (AS2187)	Heritage items (DIN 4150, Group 3)
10 mm/s *	120 dB(L) for 95% of blasts per year. 125 dB(L) maximum unless agreement is reached with occupier that a higher limit may apply	15 mm/s	133 dB(L) maximum unless agreement is reached with the owner that a higher limit may apply	2.5 mm/s
Notes	* Unless agreement is reached with the occupied that a higher limit may apply			

Table 6-15 Blasting minimum working distances

Maximum instantaneous charge (kg)	Minimum working distances		
	Human comfort	Control of damage to structures	Heritage items
54	250 m	194 m	600 m

Operation

Potential noise and vibration impacts associated with the proposed modification are generally consistent with those assessed in the approved project REF. No additional receivers are expected to be impacted by operational noise, and no additional mitigation measures would be required.

Road traffic noise assessment

Post-construction

Noise levels have been predicted for each assessment scenario across the extent of the proposed modification. The greatest impacts were identified during Year 2036 and are summarised as follows:

- Road traffic noise levels are predicted to exceed the L_{Aeq} controlling noise criterion at a total of six sensitive receivers. Of these:
 - Noise levels are predicted to increase by more than 2 dB(A) at one sensitive receiver
 - Noise levels are predicted to equal or exceed the cumulative limit at three sensitive receivers (i.e. $\geq L_{Aeq(15\text{ hr})}$ or $L_{Aeq(9\text{ hr})}$ noise criterion + 5 dB(A))
 - No noise sensitive receivers have been identified as being acute (i.e. $\geq L_{Aeq(15\text{ hr})}$ 65 dB(A) or $L_{Aeq(9\text{ hr})}$ 60 dB(A))

The updated operational noise predicted volumes are outlined in Annexure G (Operational results) of Appendix F (Technical Working Paper Addendum – Noise and Vibration Impact Assessment).

The Road Noise Mitigation Guideline provides three triggers where a receiver may qualify for consideration of 'additional noise mitigation' (beyond the use of 'integrated noise reduction measures'). These are:

- Trigger 1 – the predicted 'Build' noise level exceeds the Road Noise Criteria Guideline controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the 'Build' minus the 'No Build') is greater than 2.0 decibels
- Trigger 2 – the predicted 'Build' noise level is 5 dB or more above the Road Noise Criteria Guideline controlling criterion (i.e. exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project
- Trigger 3 – the noise level contribution from the road project is acute (daytime $L_{Aeq}(15\text{hour})$ 65 dB(A) or higher, or night-time $L_{Aeq}(9\text{hour})$ 60 dB(A) or higher) even if noise levels are controlled by a non-project road.

Of the six sensitive receivers where road traffic noise levels are predicted to exceed the L_{Aeq} controlling noise criterion, two do not meet the above criteria for additional noise mitigation, and the remaining four are considered to be eligible for the consideration of feasible and reasonable noise mitigation measures, in accordance with the Road Noise Mitigation Guideline. Of these, three were identified as part of the approved project REF, and the remaining receiver was identified as part of the adjacent Blackheath to Little Hartley Upgrade. Therefore, no additional receivers have been identified as requiring additional mitigation for operational road traffic noise as a result of the proposed modification.

During construction

Section 3.3.1 of the approved project REF stated that there would be a need for temporary diversions (side-tracks) to allow for construction works to be completed safely. Through design progression, diversion routes have been identified, as shown in Figure 6-6. These include:

- The approved westbound off-ramp to Jenolan Caves Road would be used for a side-track off the existing Great Western Highway for two to two and a half years
- The approved River Lett Hill side-track along the proposed Great Western Highway for two to two and a half years.

The *Road Noise Policy* requires the assessment of road traffic noise at the year of opening and at the design year. As the diversions are temporary the road traffic noise at the year of opening is applicable only.

Noise levels have been predicted for each assessment scenario around the proposed diversion routes. Road traffic noise levels are not predicted to exceed the L_{Aeq} controlling noise criterion at any sensitive receiver. No receivers are considered to be eligible for the consideration of feasible and reasonable noise mitigation measures.

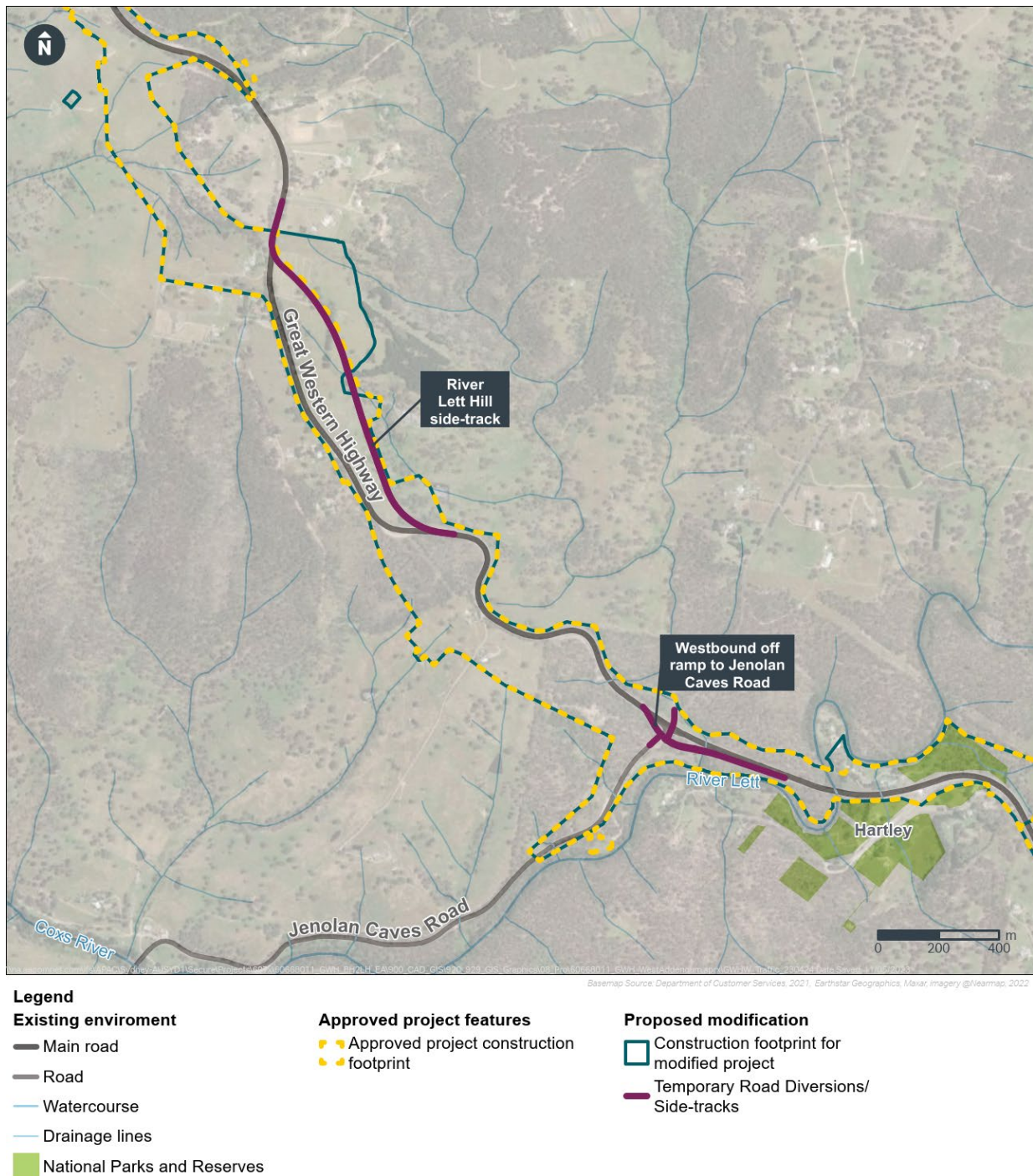


Figure 6-6 Proposed temporary diversion routes

Operational noise from fixed facilities

Noise may arise from fixed facilities associated with the proposed modification, particularly the Berghofers Pass car park. The noise sources associated with car parking which have been assessed are:

- Engine ignition
- Door and/ or boot slamming
- Cars accelerating.

Noise levels have been predicted for the operation of the Berghofers Pass car park at all nearby noise sensitive receivers (see Appendix F (the addendum NVIA)). Noise levels at the most affected receiver are predicted to comply with night-time noise criterion under the *Noise Policy for Industry* (NSW EPA, 2017).

Table 6-16 Most affected receiver at Berghofers Pass car park

Receiver ID	NCA	L _{Aeq} (period), dB(A)		
		Night-time noise criterion	Predicted noise level	Exceedance
30	1	35	24	-

6.3.4 Safeguards and management measures

No revised or additional noise and vibration safeguards and management measures are proposed as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

6.4 Aboriginal heritage

This section provides a summary of the assessment of potential impacts to Aboriginal heritage during construction and operation of the proposed modification and identifies mitigation measures to address these impacts.

6.4.1 Methodology

The Aboriginal heritage assessment involved the following:

- A review of previous assessments relevant to the modified project, including areas previously surveyed, subject to excavation and sites identified, and extraction of relevant information:
 - PACHCI Stage 3: Aboriginal Cultural Heritage Assessment Report (the 'approved ACHAR') (Transport, 2021d)
 - PACHCI Stage 2: Addendum Aboriginal Cultural Heritage Assessment Report (August 2022) (the 'addendum ACHAR') (Appendix I of this addendum REF)
- Review of Transport for NSW's Stage 1 PACHCI completed for construction footprint for the modified project (Appendix J) which indicated there was a low risk of impacting Aboriginal cultural heritage values and determining that no further stages of the PACHCI process were required
- Gap analysis of information required for the assessment of the proposed modification, including additional construction footprint areas
- Assessment of the construction footprint for the modified project, plus a 50 metre search radius (the 'study area,' which is defined below)
- Assessment of cultural heritage significance of any Aboriginal object or place in and near the study area
- An assessment of impacts to the Aboriginal heritage values of any Aboriginal object or place associated with the construction of the proposed modification
- Review of existing mitigation measures for the approved project to avoid, minimise, and manage impacts to Aboriginal objects or places, including archaeological investigation, and identification of any revised or additional measures.

Study area

As the majority changes in the construction and operational design of the modified project are located between the base of Victoria Pass and around 100 metres to the east of Coxs River Road, with construction ancillary facility 23 located in Hartley, and construction ancillary facilities 24 and 25 located at River Lett Hill, only these areas have been considered as part of the Aboriginal heritage assessment within this addendum REF. A buffer of 50 metres has been applied to this area for the purpose of identifying and assessing potential Aboriginal cultural heritage items and values.

6.4.2 Existing environment

Aboriginal context

The proposed modification is located close to the traditional boundaries of the Wiradjuri, Gundungurra and Darug people and within the boundaries of the Bathurst Local Aboriginal Land Council (LALC). The exact boundaries are unknown, and it is suggested that instead of a fixed boundary there was actually a 'zone of interaction' between the Wiradjuri, the Darug and the Gundungurra people (Transport, 2021d). The Wiradjuri, Gundungurra, and Darug all had their own language although the three nations could communicate with each other. They each had their own distinct spiritual beliefs and creation stories. Each nation moved within their defined territories according to the seasons, along well-established pathways.

A variety of resources were utilised by Aboriginal groups within the upper Blue Mountains. Basalt is available as water-rolled pebbles in the Grose River, and other major streams. Chert is another raw material known to be used for tools. Chert is a glossy, fine-grained siliceous stone which was often used to create knives, scrapers, and points due to the sharp edge it can create.

Aboriginal cultural heritage register searches

A search of the State Heritage Register (SHR) for Aboriginal sites located within the Upper Blue Mountains region was carried out in October 2022. No Aboriginal sites or places listed on the SHR were identified within the study area.

In October 2021, Aboriginal sites and places listed in Schedule 5 of the Lithgow 2014 LEP identified no Aboriginal sites or places within the study area.

A search of the National Native Title Register in October 2021 indicated there are two native title claimants or native title holders within the construction footprint. These include:

- Native Title claim NC2018/002 Warrabinga-Wiradjuri #7
- Land use Agreement NI2014/001 – Gundungurra Area Agreement.

A search of Aboriginal objects, sites, and places registered on the Aboriginal Heritage Information Management System (AHIMS) within 100 meters of the Great Western Highway Upgrade Program was completed in June 2022. The search identified eleven previously registered sites within 100 metres of the construction footprint of the proposed modification.

In the approved project REF and subsequent surveys (Appendix I), four sites within the construction footprint for the modified project were found to be invalid, and one within 50 metres of the construction footprint for the modified project was found to be invalid. Any sites found to be invalid have not been taken forward for further assessment.

Archaeological field survey

Two field surveys to support the Aboriginal heritage impact assessment for the proposed modification have been undertaken: one for the approved ACHAR and one for the ACHAR addendum, which are detailed below.

Previous Aboriginal heritage investigations

PACHCI Stage 3: Aboriginal Cultural Heritage Assessment Report

Jacobs Group (Australia) Pty Limited (Jacobs) was engaged by Transport to provide an assessment of impact associated with the approved project (Transport, 2021d). Test excavations were undertaken in 17 locations; a total of 113 test pits were excavated throughout the approved project construction footprint (a total of 144.5 square metres), with over 1,790 artefacts recovered. The field investigations and assessments were carried out to meet the requirements of the *Roads and Maritime Services (RMS) Procedure for Aboriginal*

Cultural Heritage Consultation and Investigation (RMS, 2011) (PACHCI) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010).

Within the study area for the proposed modification, seven sites were identified using database searches, and two Potential Archaeological Deposits (PADs) were identified and confirmed during the surveys. It was determined that all of the Aboriginal sites located within the construction footprint would be impacted by the approved project, including three sites that would have a moderate impact (GWH 11 (45-4-1074); GWH 12 (45-4-1075); and GWH 20-3). The results were presented in the approved ACHAR, which was appended to the approved project REF.

PACHCI Stage 2: Addendum Aboriginal Cultural Heritage Assessment Report

In the addendum ACHAR, provided in Appendix I of this addendum REF, Jacobs built on the results of its previous assessment (Transport, 2021d). An additional Aboriginal archaeological survey was undertaken, which investigated three areas within the Great Western Highway Upgrade Program that would be considered “worst-case scenario areas” for impacts on Aboriginal heritage items of significant value. Little Hartley, in the vicinity of the proposed modification, was considered to be one of these areas. The survey was undertaken in May 2022 with assistance from Registered Aboriginal Parties (RAPs): four members of Bathurst Local Aboriginal Lands Council and three from Mingaan Wiradjuri Aboriginal Corp.

During this survey, two Aboriginal sites previously identified as PADs (Hartley Grange 2 (45-4-1190) and GWH 12 (45-4-1075)) were reassessed and determined to be artefact sites (see Table 6-17). One potential Aboriginal site was identified outside of the construction footprint for the proposed modification as part of the PACHCI Stage 2 addendum ACHAR (Appendix I): ‘Potential rock engraving 1 GWH.’

PACHCI Stage 1: ‘Preliminary assessment results for the Project, Current Addendum REF construction boundary footprint’

In February 2023, the Aboriginal Cultural Heritage team within Transport undertook a preliminary assessment of the areas outside of the approved project construction footprint but within the construction footprint for the modified project that were not assessed as part of the approved project REF. This preliminary assessment was based on PACHCI Stage 1, ground truthing survey evaluations, and reports (including AHIMS and the approved project REF) reviewed in January 2023. A letter containing the details of this assessment is provided in Appendix J.

The assessment concluded that the proposed modification is unlikely to harm known Aboriginal objects or places outside of the approved project construction footprint but within the construction footprint for the modified project that were not assessed as part of the approved project REF. It was noted that the study area did not contain landscape features that indicated the presence of Aboriginal objects, based on Heritage NSW’s *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services’ procedure. The cultural heritage potential of the study area was assessed as heavily reduced due to the current road alignment and past disturbance, i.e. previous farming activities.

Areas where there is a low likelihood of impacting Aboriginal cultural heritage are presented in Appendix J. This assessment covers all other areas within the construction footprint for the modified project.

Aboriginal heritage sites

Aboriginal sites within the construction footprint for the proposed modification that were appraised under the approved ACHAR and addendum ACHAR are listed in Table 6-17.

Table 6-17 Aboriginal sites within the construction footprint for the proposed modification

AHIMS ID	Site name	Site features	Reappraisal features (under the approved ACHAR)	Reappraisal features (under the addendum ACHAR)	Status
45-4-1077	GHW 14	Open artefact scatter	No artefacts observed, all natural gravels. Confirmed invalid during site survey.	Not applicable	Invalid
N/A* (to be determined)	GWH 20-3	Artefacts with PAD	Recorded as two large Potential Archaeological Deposits (PAD) in the project REF that was confirmed through test excavation. A total number of 42 artefacts were found.	Not applicable	Valid
45-4-1076	GWH 13	Isolated find	Rock does not have artefact feature. Confirm invalid during site survey.	Not applicable	Invalid
45-4-1190	Hartley Grange 2	Artefact: 9	Recorded as PAD in the project REF.	<p>Identified as artefact site during survey in May 2022. At least nine surface artefacts were identified and recorded, in an area of 200 by 60 metres.</p> <p>Very tall and very old culturally significant Ribbon Gum (<i>Eucalyptus viminalis</i>) Tree located within Hartley Grange 2, referred to as 'Grandfather Tree 1'. It houses many important native animals which play a key role in the social and cultural landscape of Aboriginal people. This tree is located about five metres outside the construction boundary for the proposed modification.</p>	Valid

AHIMS ID	Site name	Site features	Reappraisal features (under the approved ACHAR)	Reappraisal features (under the addendum ACHAR)	Status
45-4-1073	GWH 10	Open artefact scatter	Three natural gravel fragments within a massive artificial deposit of construction scree. Confirmed invalid during site survey.	Not applicable	Invalid
45-4-1075	GWH 12 PAD	Artefact	Two chert flakes recorded on an eroding patch of ground near fence line. Recorded as PAD in the project REF.	Identified as artefact site during survey in May 2022. Located in a highly disturbed area.	Valid
45-4-1074	GWH 11	Isolated find	Artefact scatter and PAD located near private airstrip.	Not applicable	Valid
45-4-1098	GWH 21	Isolated find	Report photo does not illustrate artefact features. Confirmed invalid during site survey.	Not applicable	Invalid
45-4-1081	GWH 18	Open artefact scatter	Low density artefact scatter within a carpark near the Lolly Bug café.	Not applicable	Valid
45-4-1103	GWH 31	Open artefact scatter	High density artefact scatter located on high ground east of River Lett near houses, north side of Great Western Highway, Hartley.	Not applicable	Valid
45-4-1106	GWH 34	Artefact site	Not assessed due to access constraints.	Not applicable	Valid
Notes	* Not yet registered on AHIMS.				

Significance assessment

All Aboriginal objects in NSW are protected under the *National Parks and Wildlife Act 1974*. It is recognised that harm to Aboriginal sites may be necessary to allow other activities or developments to occur. In order for the consent authority to make informed decisions on such matters, an important element of cultural resource management is determining the significance of cultural heritage places and objects to understand what may be lost, and how best it can be mitigated.

Significance assessments for the Aboriginal sites identified during the archaeological investigation completed within the construction footprint for the proposed modification are presented below in Table 6-18. The methodology for determining the scientific significance has followed the methodology provided in Transport (2021d). The assessment of significance has been based on a review of the similarities of sites within a culturally sensitive area.

The significance of potential rock engraving 1 GWH has not been identified as it is located outside the construction footprint for the modified project.

Table 6-18 Significance assessment for valid sites within the study area for the proposed modification

AHIMS ID		Site name	Social	Historic	Aesthetic	Scientific significance	Overall Significance
N/A (To be determined)		GWH 20-3	High	Moderate	High	Moderate	Moderate-high
45-4-1190		Hartley Grange 2	N/A *			Moderate	Moderate
45-4-1075		GWH 12 PAD	N/A *			Low	Low
45-4-1074		GWH 11	N/A *			Moderate	Moderate
45-4-1081		GWH 18	High	Low	Low	Low	Low
45-4-1103		GWH 31	High	Moderate	Moderate	Moderate-High	Moderate
45-4-1106		GWH 34	N/A *			Moderate	Moderate
Notes	* Significance assessments were not undertaken in the approved project ACHAR due to site constraints. Scientific significance was identified in the addendum ACHAR.						

6.4.3 Potential impacts

Impacts to Aboriginal heritage sites

The potential impacts of the proposed modification on Aboriginal heritage sites within the construction footprint for the modified project are summarised in Table 6-19.

There are seven Aboriginal heritage sites within the construction footprint of the proposed modification that would be directly affected by construction. All sites were also assessed as being either directly or indirectly affected by construction of the approved project, with many requiring salvage, and therefore these sites would experience no greater impact attributed to the proposed modification than what was concluded in the approved project REF.

Therefore, the mitigation measures presented in the approved project REF, including active protection and community collection, would still be applicable and are considered adequate to manage the potential impacts of the proposed modification. Salvage excavation and community collection will be undertaken at GWH 20-3, GWH 12 PAD (45-4-1075), GWH 11 (45-4-1074), GWH 31 (45-4-1103) (see mitigation measures AH07 and AH08).

Table 6-19 Impact assessment for Aboriginal sites within the addendum construction footprint

AHIMS ID	Site name	Overall significance	Type of potential harm (overall)	Degree of harm	Significance of potential impact
N/A (To be determined)	GWH 20-3	Moderate	Direct	Fully	Moderate
45-4-1190	Hartley Grange 2	Moderate	Direct	Partial	Moderate
45-4-1075	GWH 12 PAD	Low	Direct	Partial	Low
45-4-1074	GWH 11	Moderate	Direct	Partial	Moderate
45-4-1081	GWH 18	Low	Direct	Total	Negligible
45-4-1103	GWH 31	Moderate-High	Direct	Partial	Moderate
45-4-1106	GWH 34	Moderate	Direct	Partial	Minor

Now that the road connecting the proposed modification to the Blackheath to Little Hartley Upgrade project has been altered and moved northwards, Hartley Grange 2 is subject to a partial impact which is consistent with the approved project and Aboriginal Heritage Impact Permit (AHIP). In addition, construction ancillary site 20 would be located on the southern half of Hartley Grange 2, though this area would be avoided through the establishment of an exclusion zone and restored to its former land use following completion of construction.

Under the approved project REF, Hartley Grange 2, among other sites, will be managed under the approved Aboriginal Heritage Management Plan (AHMP) (see mitigation measure AH01). Hartley Grange 2 (45-4-1190) will also be added to the list of sites where temporary boundary fencing will be placed along its boundary to establish an exclusion zone (mitigation measure AH06). Together, these are considered appropriate to manage potential impacts of the proposed modification, and the impact rating would remain as per the approved project REF (moderate).

'Potential rock engraving 1 GWH' was previously not assessed in the approved project REF as it was located at least 50 metres from the approved project boundary. Under the proposed modification, 'Potential rock engraving 1 GWH' now lies just outside of the construction footprint for the modified project (within ten metres of construction ancillary site 20) and could experience indirect impacts from construction (such as vibration). However, as the construction ancillary site 20 would include site offices, amenities, and workshops, and the activities to be undertaken there would include laydowns and stockpiling (see Table 3-4 in Chapter 3 (Description of the proposed modification)), vibration impacts on 'Potential rock engraving 1 GWH' are likely to be negligible. The 'Potential rock engraving 1 GWH' will be managed under the AHMP, as described in Section 6.4.4. The site will also be fenced off to prevent accidental access during construction and all workers would be made aware of this site within toolbox talks as part of the CEMP.

Impacts to Aboriginal cultural values

Discussions held with Aboriginal community members during preparation of the approved ACHAR revealed that the entire area within the modified project area is significant to Aboriginal people. Five areas of high cultural values were identified in the approved project REF based on cultural information collected during consultation, field surveys, and consultation during the test excavation program. Of these, the following would be applicable to the proposed modification:

- *Coxs River Valley*: The Coxs River Valley is reported to have been the pathway in which the Gundungarra people would have traversed to attend ceremony and trade meetings.
- *Great Western Highway*: Knowledge holders reported the significance of the Great Western Highway as a songline and walking track for all Aboriginal people, and that it was a connector to other pathways such as Mount York and Bells Line of Road.

It is considered unlikely that there would be any further impacts to Aboriginal cultural values attributed to the proposed modification that were not assessed in the approved project REF, and therefore no additional mitigation measures are required.

6.4.4 Safeguards and management measures

The proposed additional and/ or modified Aboriginal heritage safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided in Table 6-20. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Table 6-20 Additional safeguards and management measures – Aboriginal heritage

No.	Impact	Environmental safeguards	Responsibility	Timing
AH06	Impacts to Aboriginal heritage during construction	Temporary fencing will be placed on the boundary of the following Aboriginal heritage sites: <ul style="list-style-type: none">• GWHAS01• GWH 20-3• GWH 20-2• 45-4-1103 (GWH 31)• 45-4-1097 (GWH 7)• 45-4-1072 (GWH 9)• 45-4-1071 (GWH 8)• [REDACTED] Site• South Bowenfels Rural Fire Brigade Site• Magpie Hollow Road site• 45-4-1111 (GWH 42)	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • <u>Hartley Grange 2 (45-4-1190)</u> • <u>'Potential rock engraving 1 GWH'</u> 		

Other safeguards and management measures that would address potential vibration impacts on heritage items are identified in Section 6.3 (Noise and vibration).

6.5 Non-Aboriginal heritage

This section provides a summary of the assessment of potential impacts to non-Aboriginal heritage and archaeological items during construction and operation of the proposed modification and identifies mitigation measures to address these impacts.

6.5.1 Methodology

The non-Aboriginal heritage assessment involved the following:

- A review of previous assessments relevant to the modified project, including areas previously surveyed, subject to excavation and sites identified, and extraction of relevant information:
 - Technical Working Paper – Non-Aboriginal Heritage (referred to as the ‘approved project Heritage Impact Assessment (HIA)’ (Transport, 2021e)
- Gap analysis of information required for this assessment
- Assessment of the construction footprint of the modified project plus a 50 metre buffer (the ‘study area,’ which is defined below)
- Assessment of potential direct and indirect impacts on identified items (listed, unlisted, and areas of archaeological potential) within the study area associated with construction and operation of the proposed modification
- Review of existing mitigation measures for the approved project to avoid, minimise, and manage impacts to the heritage significance of non-Aboriginal sites, and identification of any revised or additional measures.

Study area

The majority of the proposed changes in the construction and operational design of the project would be located between the base of Victoria Pass and around 100 metres to the east of Coxs River Road, with construction ancillary facility 23 located in Hartley, and construction ancillary facilities 24 and 25 located at River Lett Hill. Only these areas have been considered as part of the non-Aboriginal heritage assessment within this addendum REF (Figure 6-7). A buffer of 50 metres has been applied to this area for the purpose of identifying and assessing potential non-Aboriginal heritage items.

There are no changes in the existing non-Aboriginal heritage context of the proposed modification compared with the information presented in the approved project REF. A summary of the relevant heritage items within the study area is provided below.

6.5.2 Existing environment

Non-Aboriginal heritage context

The Great Western Highway and original roads

Crossing of the Blue Mountains by European settlers was thought to have begun in the 1790s, though the best-known expedition occurred in 1813. This expedition resulted in the first road, Coxs Road, which was constructed between 1814 and 1815 and employed convict labour. While Coxs Road opened the interior to settlers, many found the descent at Coxs Pass difficult and dangerous. Further, with the increase of traffic, the road began to deteriorate, therefore making the road more dangerous. The Western Road was then commissioned by Major Thomas Mitchell between Emu Ford (now Emu Plains) and Bathurst, in an effort to improve roads in the colony. The existing Great Western Highway largely follows this route, with a few exceptions; one such exception exists at Little Hartley,

with the access road from the Great Western Highway to Nioka being part of Mitchell's original road (AECOM, 2023).

While surveying another road, Mitchell noted that the descent to Hartley could be achieved by spanning the deep abyss at Victoria Pass, thereby bypassing the descent from Mount York altogether. This resulted in the construction of Victoria Pass (also called "the Pass of Victoria") between 1830 and 1832 (AECOM, 2023).

Several roads in the area, including Coxs Road and Victoria Pass, were constructed using convict labour. Stockades built to house the convicts included Mount Victoria Stockade, located in close proximity to the eastern boundary of the construction footprint for the modified project. A description by Surveyor William Romaine Govett from 1835 stated: *"Near the Stockade were the barracks for the soldiers, constables' huts, and a small cottage &c., for the officers; on the opposite side of the swamp was the residence of the commissariat officer, a neat, thatched cottage, and a store-house built of logs"* (Casey and Lowe Pty Ltd, 2009). As well as the buildings noted by Govett, contemporary newspaper articles note that the Mount Victoria stockade also had a hospital and cook house (The Sydney Gazette and New South Wales Advertiser, 1833). The stockade remained in use until 1833, after which many of the convicts were redistributed to other stockades along the Western Road. It was reopened briefly in 1836 to make repairs to Victoria Pass, then closed permanently (AECOM, 2023).

Little Hartley

The hamlet of Little Hartley was created in response to traffic along Thomas Mitchell's line of road down Victoria Pass between 1829 and 1830. The Royal Garter Inn (now Billesdene Grange (LEP I023)) was first constructed in 1831 as an inn, and then served as a courthouse and police station. Other inns were erected, including Harp of Erin (LEP I028), the Victoria Inn (now Rosedale (LEP I024)) and the Rose Inn (now Ambermere (LEP I022)). Little Hartley developed as an elongated hamlet along the Great Western Highway. Archaeological potential was identified during surveys for the approved project REF at the rear of the Harp of Erin (particularly within the 'house paddock'), related to previous outbuildings related to the inn.

Hartley

Located four kilometres northwest of Little Hartley lies the village of Hartley, which was formerly a judicial and administrative centre, with the courthouse built first in 1837. Hartley replaced Little Hartley as the primary transport hub west of the mountains and associated accommodation and public buildings (hotels and inns) were opened to take advantage of this shift. Although Hartley fell into disuse when it was bypassed by the new railway in the 1860s, it survived as a perfectly preserved village that is a superb example of 19th century architecture. The village was recognised for its heritage values and passed into the ownership and management of the National Parks and Wildlife Service (NPWS), who own the majority of the buildings (SHR 00992, LEP I030).

South of Hassans Walls

Fernhill (formerly the Australia Arms) (SHR 00225, LEP I043) is the only listed heritage item located in proximity to additional construction ancillary sites 24 and 25, about 1.1 kilometres south of Hassans Walls. Originally an inn, it was constructed between 1856 and 1859.

Previous non-Aboriginal heritage investigations

Great Western Highway Upgrade Program, Little Hartley to Lithgow (West Section) – Technical Working Paper

Jacobs Group (Australia) Pty Limited (Jacobs) was engaged by Transport to provide an assessment of impacts associated with the approved project (the approved project HIA). The approved project HIA addresses non-Aboriginal (historical) heritage items, conservation areas and historical archaeology in accordance with the Heritage NSW guidelines, the Australia International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance (Burra Charter), and the Transport Heritage Guidelines.

The approved project HIA considered the heritage significance and impact on items, including those between the base of Victoria Pass and 100 metres east of Coxs River Road, such as Rosedale, Nokia, Billesdene Grange, and the Little Hartley Heritage Conservation Area, as well as other related items outside the study area for the proposed modification, such as the Harp of Erin and Ambermere. Of these items, Billesdene Grange was assessed to be impacted both directly and indirectly by the approved project, whereas Rosedale and Nokia were assessed as being visually impacted indirectly.

Recommended mitigation measures included archival recording of the Billesdene Grange property. A structural assessment for its convict-built causeway was also recommended to establish its structural capability and its vulnerability to the proposed impacts. An archaeological investigation of the causeway area of impact was proposed to understand the structure and to inform an archival recording.

Three items of potential archaeological significance in proximity to construction ancillary facility 25 were noted. That assessment recommended that an archaeological assessment should be completed, including a detailed survey of the lot and area of potential prior to any works taking place, particularly because of its potential to contain human remains. It is understood that this archaeological assessment has not yet been undertaken.

In relation to items visually impacted, mitigation measures included the design of batter slopes and embankments to blend with existing topography. Where construction required removal of vegetation, these embankments were recommended to be of an obtuse angle to enable new landscape plantings. Such new plantings were recommended to match previously existing vegetation, with tall height species not to be introduced in areas where they were not previously present.

Summary of heritage items

Listed heritage items in the study area are presented in Table 6-21 and Figure 6-7.

Table 6-21 Listed heritage items within the study area

Item name	Register *	Register ID	Significance	Notes (approved project HIA)
Hartley Valley	NHL	106092	National	The National Heritage List contains a nomination which covers the entirety of the Hartley Valley, however this nomination is currently listed as 'ineligible for the proposed priority assessment list (PPAL1)' and is considered non-existent unless it is resubmitted for consideration.
Hartley Historic Site	SHR, LEP	00992, I030	State	Hartley is historically highly significant for its close association with early settlement west of the Blue Mountains, for its role as an early government administrative centre and for its having been a wayside service centre over a lengthy period. The village has an extremely high level of intactness and it contains a rich range of building forms, materials and architectural styles.
Fernhill	SHR, LEP, NT	00225, I043, R4569	State	An inn dating from the mid-nineteenth century that once formed a part of a chain of other inns stretching from Sydney to the Western Goldfields.
Little Hartley Conservation Area	LEP	C8	Local	Designated to protect multiple heritage elements, such as buildings, archaeology, and landscape, which have a collective heritage significance and historical relationship.
Rosedale	LEP, RNE, NT	I024, 834, R3404	Local	An essential element in the development of the Great Western Highway in the 1830s. It operated as an inn and a holiday farm in the 1980s. Rosedale has maintained a social significance in the area.
Nioka	LEP	I025	Local	Constructed in the 1880s, in a different architectural style of the other inns in the area and contains archaeological evidence for the 1856 single-storied inn. Approach is along a remnant section of the old Mitchell's Road alignment, currently blocked with tall security fencing.
Billesdene Grange	LEP, NT	I023, R3389	Local	Constructed in 1831-32, the single storey, sandstock brick cottage is an example of colonial Georgian style architecture. The cottage served as an inn, courthouse and police station in the 1830s. After a period of leases, orchards were established by the owner along with ancillary buildings. The orchards continued until 1969. The convict-built causeway, which is associated with the listing, is believed to date as early as 1830s and is a rare example of early road construction techniques which contribute to the wider historical landscape of Little Hartley and Billesdene Grange.
Notes	* LEP (Local Environment Plan), NHL (National Heritage List), RNE (Register of the National Estate), NT (National Trust), SHR (State Heritage Register).			

There are four unlisted potential heritage items within the study area (Table 6-22) (Figure 6-7), all of which were identified in the approved project HIA (Transport, 2021e).

Table 6-22 Potential unlisted heritage items within the study area

Item	Location	Description
Mount Victoria Stockade site	The General Stockade Site (outer boundary) is located approximately 45 metres east of the proposed modification, within the study area. The Stockade Site is located 140 metres to the east, and the General Stockade Commissariat Building is located about 600 metres to the east of the proposed modification, both outside of the study area.	Although disturbed, the site has never been subjected to detailed archaeological investigation. The site therefore retains the potential to yield information regarding the layout of the stockade, artefacts evidencing the use of the stockade by both convicts and the military and the site's overall use during the construction of Victoria Pass.
Possible rubbish dump	Located just north-east of construction ancillary facility 25, within the study area but outside of the construction footprint for the modified project.	Moderate potential for archaeology related to a possible gravesite and 19th and 20th century rubbish dumps recorded in oral history. There may also be material related to campsites and work areas related to bullock drays and the use of the possible bullock track and creek crossing.
Possible grave site		
Possible bullock track diversion	Located on the western boundary of construction ancillary facility 25, and travels north along Fernhill, and then west across the construction footprint for the modified project.	Historically provided a viable alternative to a difficult section of Mitchells Road for the regular freight traffic of the time. Currently being used as a farm track.

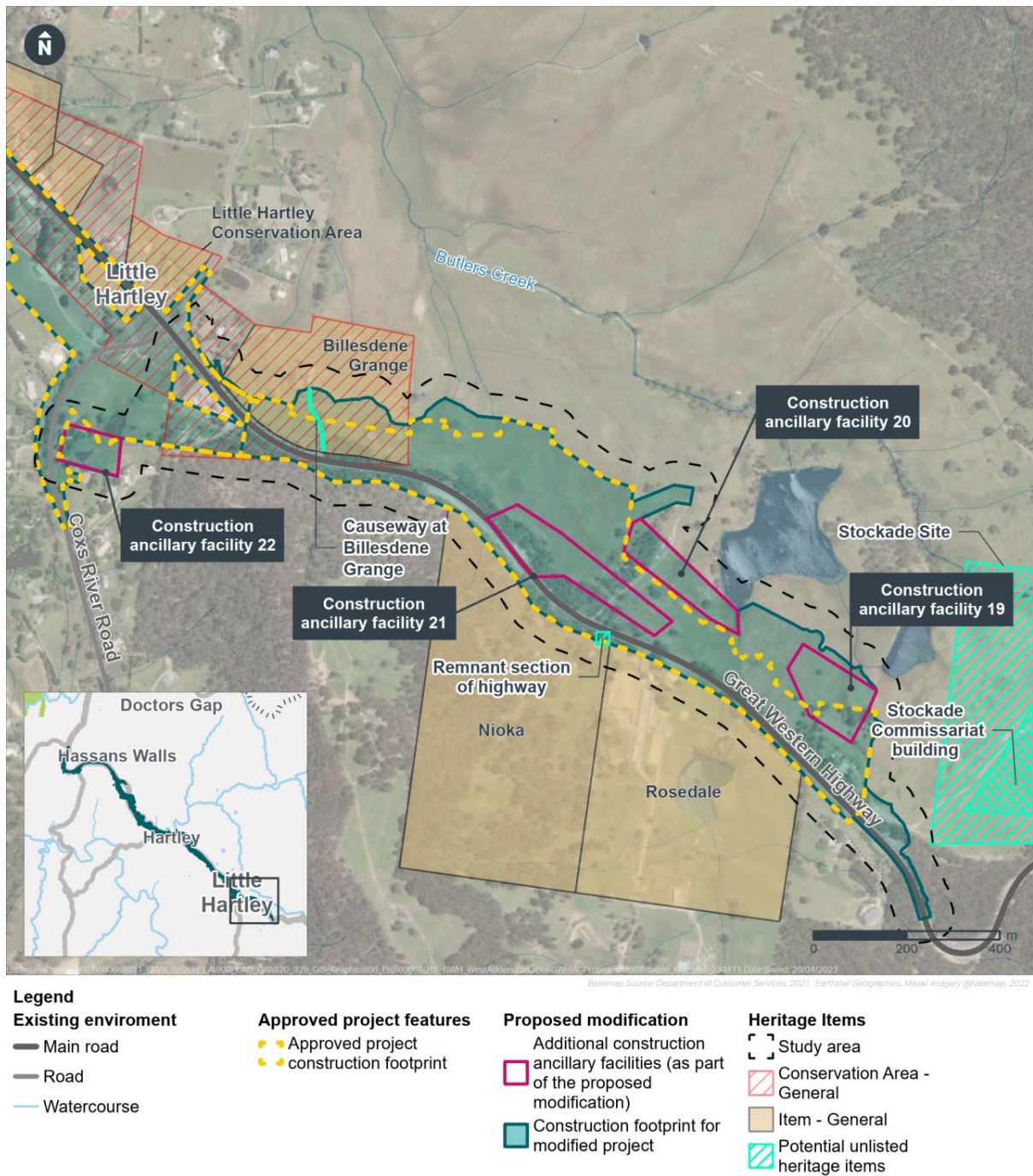


Figure 6-7a Listed and potential non-Aboriginal heritage items within the study area

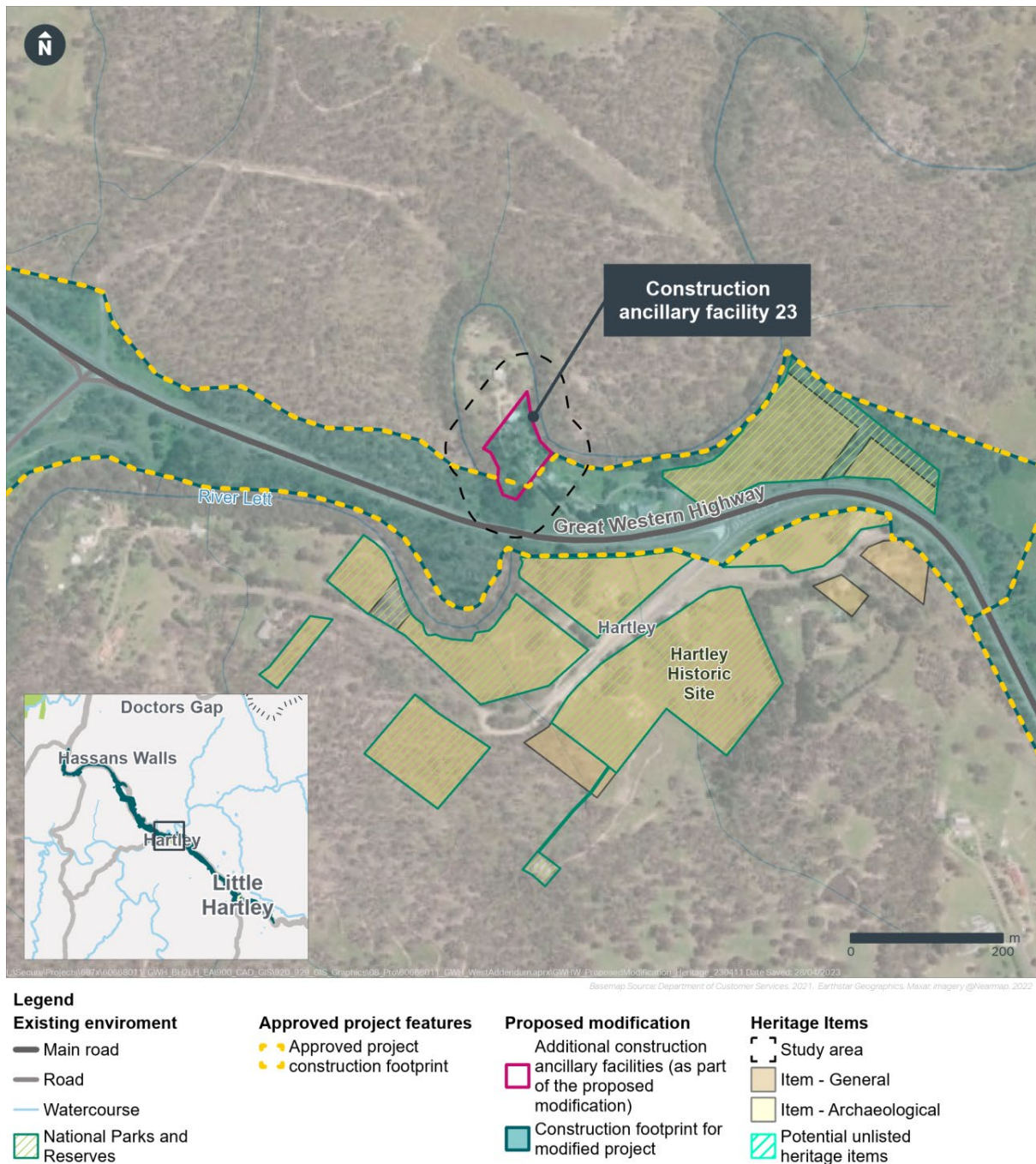


Figure 6-7b Listed and potential non-Aboriginal heritage items within the study area

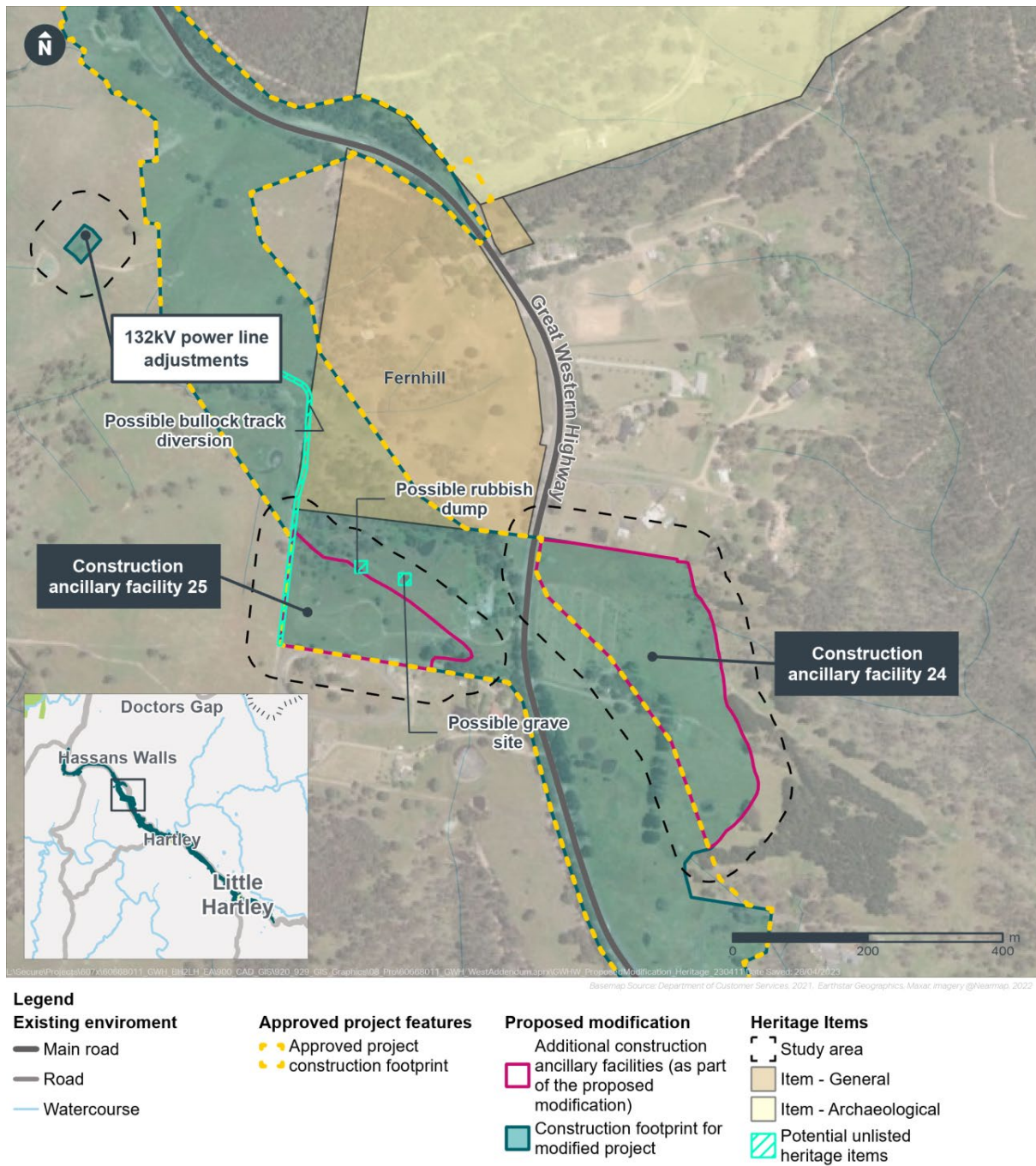


Figure 6-7c Listed and potential non-Aboriginal heritage items within the study area

6.5.3 Potential impacts

Construction

A summary of potential impacts on non-Aboriginal heritage items within the study area during construction is presented in Table 6-23.

There are 12 listed and potential heritage sites that may be impacted by the construction works associated with the proposed modification, including five currently unlisted sites. The majority of sites would experience a similar impact to that presented in the approved project REF.

Billesdene Grange would experience a greater impact as Service Road 1 would be realigned further north relative to the approved project, resulting in further acquisition within the heritage curtilage and additional indirect impacts in the form of visual intrusion and potential vibration during construction. An assessment of potential impacts to this item is discussed further in Table 6-23, which concludes that the impact rating (moderate) is consistent with the rating identified in the approved project REF.

A convict-built causeway connecting Billesdene Grange to the Great Western Highway was a potential unlisted heritage item identified in the approved project REF and may experience a greater impact with the proposed modification due to the realignment further north in this area compared to the approved project. Under the mitigation measures set out in the approved project REF, a structural assessment by a heritage structural engineer will be undertaken in order to determine the structural capability of the causeway, the probable impacts from the road construction and required compaction, and any additional management or mitigation measures. It should also include advice regarding the acceptable limits of vibration, which in turn will inform potential additional management measures. The heritage mitigation measures in the approved project REF also require an archaeological investigation of the area of impact, in order to fully understand the structure and enable a comprehensive archival recording to be produced. These measures would also be applied and are considered adequate to manage the potential impacts of the proposed modification.

The Mount Victoria Stockade site was not assessed under the approved project REF due to its distance from the approved project construction area. The proposed modification would now be located about 45 metres from the Mount Victoria Stockade site, which is likely to be of State significance (Transport, 2023a). Archaeological investigation of the area of impact will be undertaken as part of the Blackheath to Little Hartley Upgrade project in order to fully understand the structure and enable a comprehensive archival recording to be produced.

The three unlisted items, shown in Figure 6-8c, would experience negligible to minor impacts in relation to temporary acquisition and indirect impacts on their setting. However, the sites would already experience partial to full impact under the approved project REF. Archaeological investigation of these sites of impact will be undertaken under the approved project REF in order to fully understand these potential heritage items and enable a comprehensive archival recording to be produced. As one of the items is a potential grave site, archaeological investigations will need to include non-invasive investigations such as ground penetrating radar (GPR) to ascertain the likelihood of human remains being present, or to determine if it had once held human remains. If human remains are found, these will need to be exhumed and reburied and additional research undertaken in line with the Unexpected Heritage Items Procedure (Transport, 2022b).

Table 6-23 Potential impacts on non-Aboriginal heritage items – construction

Item name	Significance	Description of impact	Level of impact to items heritage significance
Hartley Valley	National	<p>Direct (physical)</p> <p>No significant physical impacts to integrity of the site from what was proposed in the project REF, as the immediate vicinity would still relate to the Great Western Highway.</p> <p>Indirect (visual, noise, air quality)</p> <p>Construction of the modified project may involve temporary disturbance of rural setting of this Nationally significant heritage asset, including decline in visual amenity due to presence of construction equipment and machinery, removal of vegetation, and increase in amount of bare earth and concrete; an increase in congestion on the Great Western Highway and local roads; and increase in noise, vibration, and air quality impacts. This would be negligible in the context of the entire Hartley Valley.</p>	Negligible
Hartley Historic Site	State	<p>Direct (physical)</p> <p>No temporary or permanent occupation of the Hartley Historic Site would be required for works at construction ancillary site 23 (the construction ancillary site is located about 75 metres from the Hartley Historic Site boundary and its closest point).</p> <p>Indirect (vibration)</p> <p>The oldest building in the Hartley Historic Site was built in 1837 (the courthouse) and is considered susceptible to vibration impacts from vibration-intensive activity in proximity to the site.</p> <p>However, the closest building within the site is located about 170 metres from construction ancillary site 23 and potential vibration impacts would therefore be unlikely to be an issue.</p> <p>Indirect (visual, noise, air quality)</p> <p>Construction of the modified project may involve temporary disturbance of the rural setting of the State significant heritage item, including decline in visual amenity due to presence of construction equipment and machinery at the construction ancillary sites, removal of surrounding vegetation, and increase in amount of bare earth and concrete; increase in congestion passing through the site due to traffic management measures during construction; and increase in noise, vibration, and air quality impacts.</p>	Minor

Item name	Significance	Description of impact	Level of impact to items heritage significance
Fernhill	State	<p>Direct (physical)</p> <p>No temporary or permanent occupation of the Fernhill site would be required for works at construction ancillary sites 24 and 25 (the construction ancillary sites are located about 20 metres from the Fernhill site boundary at their closest point).</p> <p>Indirect (vibration)</p> <p>The property was originally built in 1856-59 and is considered susceptible to vibration impacts from vibration-intensive activity in proximity to the site. However, the closest building within the Fernhill site is located about 300 metres from the closest construction ancillary site and potential vibration impacts would therefore be unlikely to be an issue.</p> <p>Indirect (visual, noise, air quality)</p> <p>Construction of the modified project may involve temporary disturbance of the rural setting of the State significant heritage item, including decline in visual amenity due to presence of construction equipment and machinery at the construction ancillary sites, removal of surrounding vegetation, and increase in amount of bare earth and concrete; and increase in noise, vibration, and air quality impacts.</p>	Minor
Mount Victoria Stockade site	Unlisted (likely of state significance)	<p>Direct (physical)</p> <p>No temporary or permanent occupation of the site would be required for the proposed modification. However, the exact location of the subsurface archaeology of the stockade site and its many outbuildings are unknown. Previous investigations have produced a predicted curtilage that is based on limited historical information, the presence of surface artefacts and ground disturbance. Given the limited reliability of these factors, the curtilage of the site has been made deliberately large but this may still not accurately encapsulate the full extent of significant subsurface deposits. Any ground disturbance in the vicinity of the curtilage has the potential to disturb potential State-significant archaeological deposits and should be avoided.</p> <p>Indirect (vibration)</p> <p>As the site is archaeological in nature, there is no potential for impact through vibration.</p> <p>Indirect (visual, noise, air quality)</p> <p>As the site is archaeological in nature, there is no potential for visual impacts.</p>	Minor

Item name	Significance	Description of impact	Level of impact to items heritage significance
Little Hartley Conservation Area	Local	<p>Direct (physical)</p> <p>Direct acquisition and occupation of areas within the Little Hartley Conservation Area (temporary and permanent – see Section 6.9 (Property and land use)) would be required.</p> <p>The modified project would lie further north than the approved project, meaning that the southern areas of Lots 1 and 2 (DP 540599) would be permanent occupied by project infrastructure (about an additional 60 metres) (see Billesdene Grange) resulting in further loss of vegetation and cleared, open, grass paddocks, which together contribute to the conservation area's rural identity.</p> <p>Indirect (visual, noise, air quality)</p> <p>Construction of the modified project may involve temporary disturbance of the rural setting of the conservation area, including a decline in visual amenity due to presence of construction equipment and machinery, removal of vegetation, and increase in amount of bare earth and concrete; and increase in noise, vibration, and air quality impacts.</p>	Minor
Billesdene Grange	Local	<p>Direct (physical)</p> <p>Direct acquisition and occupation of Lot 2 (DP 540599), upon which the Billesdene Grange property lies, would be required.</p> <p>Service Road 1 would be located further north to the boundary of the approved project REF construction footprint. Larger batters would be included in the south-east of the lot, resulting in further land take of the southern heritage curtilage (about an additional 60 metres) and further permanent loss of vegetation and cleared, open, grass paddocks, which together contribute to the property's rural identity. However, the movement of the road northward in the proposed modification would reduce the requirement for earthworks within the property boundary.</p> <p>Following assessment in the approved project REF, the addendum construction footprint has been refined to avoid acquisition of the property building and the convict-built causeway, which provides access between the building complex and the highway.</p> <p>Indirect (vibration)</p> <p>The property was originally built in 1831-32 and is considered susceptible to vibration impacts from vibration-intensive activity in proximity, which would now be closer to the property with the new alignment of Service Road 1.</p>	Moderate

Item name	Significance	Description of impact	Level of impact to items heritage significance
		<p>The property lies 10-20 metres north of the construction footprint for the modified project, which is about 60 metres closer than assessed in the approved project REF.</p> <p>A dilapidation survey was proposed under the approved project REF, which would still be applicable for this item.</p> <p>Indirect (visual, noise, air quality)</p> <p>Potential impacts associated with the construction of the modified project would be as per the Little Hartley Conservation Area (refer above).</p>	
Rosedale	Local	<p>Direct (physical)</p> <p>No additional acquisition or vegetation removal is expected as there would be no change to the construction footprint in this area compared with what was assessed in the project REF.</p> <p>There has been archaeological potential identified around the main building complex; however, the modified works would not encroach into the property and there is no potential for archaeological impacts.</p> <p>Indirect (vibration)</p> <p>The property was originally built in 1839 and is considered susceptible to vibration impacts from vibration-intensive activity in proximity. There would be a negligible to minor change in vibration impacts due to minimal alignment changes in this area.</p> <p>Indirect (visual, noise, air quality)</p> <p>Potential impacts associated with the construction of the modified project would be as per the Little Hartley Conservation Area (refer above).</p> <p>Additional construction ancillary site 21 would be located about 50 metres north of the property, meaning further decline in visual amenity given equipment and construction vehicles would be closer, plus a greater impact of noise and traffic of vehicles accessing the site.</p>	Minor

Item name	Significance	Description of impact	Level of impact to items heritage significance
Nioka	Local	<p>Direct (physical)</p> <p>No additional acquisition or vegetation removal is expected as there is no change to the construction footprint in this area compared with what was assessed in the project REF.</p> <p>There has been archaeological potential identified on the current driveway; however, there is no change to the proposed works in this area and therefore there is no additional impact compared to what was assessed in the project REF.</p> <p>Indirect (vibration)</p> <p>The property was originally built in 1856 and is considered susceptible to vibration impacts from vibration-intensive activity in proximity. There would be a negligible to minor change in vibration impacts due to minimal alignment changes in this area.</p> <p>A dilapidation survey was proposed under the approved project REF, which would be still applicable for this item.</p> <p>Indirect (visual, noise, air quality)</p> <p>Potential impacts associated with the construction of the modified project would be as per the Little Hartley Conservation Area (refer above).</p> <p>Additional construction ancillary site 21 would be located about 30 metres north of the property, meaning further decline in visual amenity due to closer presence of equipment and construction vehicles, plus a greater impact of noise and traffic of vehicles accessing the site.</p>	Negligible
Possible rubbish dump Possible grave site	Unlisted (noted likely of local significance in the approved HIA)	<p>Direct (physical)</p> <p>The sites would experience negligible to minor impacts in relation to temporary acquisition. Archaeological investigation of these sites of impact will be undertaken under the approved project REF in order to fully understand these potential items and enable a comprehensive archival recording to be produced. As one of the items is a potential grave site, archaeological investigations will need to include non-invasive investigations such as ground penetrating radar (GPR) to ascertain the likelihood of human remains being present, or to determine if it had once held human remains.</p> <p>Indirect (visual, noise, air quality)</p> <p>These sites would experience minor impacts on their visual/ landscape settings due to activities in construction ancillary site 25.</p>	Major

Item name	Significance	Description of impact	Level of impact to items heritage significance
		The sites would already experience complete impact under the approved project REF, as Service Road 8 would travel through both sites. Therefore, the resulting impact associated with the modified project would remain as per the approved project REF. Ground-truthing and archaeological assessment of the possible dump and grave would occur prior to the commencement of construction as recommended in the approved HIA. The construction compound may impact on these potential sites.	
Possible bullock track diversion	Unlisted (noted likely of local significance in the approved HIA)	<p>Direct (physical)</p> <p>Acquisition would be required along the boundary of construction ancillary site 25.</p> <p>This site would already experience partial destruction due to the alignment of the approved project, though not within the area of construction ancillary site 25.</p> <p>Indirect (visual, noise, air quality)</p> <p>This site would experience minor impacts on its visual/ landscape setting due to activities in construction ancillary site 25.</p>	Moderate

Operation

A summary of potential impacts on heritage items within the study area during operation of the modified project is presented in Table 6-24.

Of the 12 heritage sites, only Billesdene Grange would experience a slightly greater impact than presented in the approved project REF, and the level of impact to the heritage significance presented in the approved project HIA for this item would remain consistent as a consequence of the proposed modification. Much of the land temporarily occupied during construction would be returned to its former land use, unless required for the operation of the modified project (see Section 6.9 (Property and land use)).

Billesdene Grange would experience a slightly greater impact as Service Road 1 would be realigned further north relative to the approved project. This would introduce an increased visual bulk in closer proximity to the heritage item building complex than currently exists and would impact the rural setting of the property. The mitigation measures presented in the approved project REF are appropriate to manage additional impacts to Billesdene Grange.

Table 6-24 Potential impacts on non-Aboriginal heritage items – Operation

Item name	Significance	Description of impact	Level of impact to items heritage significance
Hartley Valley	National	Indirect (visual) No additional visual impacts are anticipated compared with what was assessed in the project REF.	Negligible
Hartley Historic Site	State	No operational changes are proposed at this site compared with what was proposed in the project REF.	Negligible
Fernhill	State	No operational changes are proposed at this site compared with what was proposed in the project REF.	Negligible
Mount Victoria Stockade site	Unlisted (likely of state significance)	No operational impacts are expected.	Negligible
Little Hartley Conservation Area	Local	Indirect (visual) There would be a minor change in visual amenity through the changes to the project alignment, but this would not be significantly different to what was assessed in the project REF.	Negligible
Billesdene Grange	Local	Indirect (visual and noise) The proposed modification would introduce an increased visual bulk in closer proximity to the heritage item building complex than currently exists, due to Service Road 1 being realigned further north relative to the approved project. This would impact the rural setting of the property. The mitigation measures presented in the approved project REF are appropriate to manage additional impacts to Billesdene Grange. Indirect (vibration) The property was originally built in 1831-32, and therefore may be susceptible to vibration impacts from vehicles on the road, which would come closer to the property with the modified alignment of Service Road 1.	Moderate

Item name	Significance	Description of impact	Level of impact to items heritage significance
Rosedale	Local	Indirect (visual) The modified project would result in no additional visual impact compared with what was assessed in the project REF. Native planting will be re-established along the property boundary to screen the road and to minimise potential visual impacts. As vegetation grows, the visual impact would be reduced.	Minor
Nioka	Local	Indirect (visual) The modified project would result in no additional visual impact compared with what was assessed in the project REF. Native planting will be re-established along the property boundary to screen the road and to minimise potential visual impacts. As vegetation grows, the visual impact would be reduced.	Negligible
Possible rubbish dump	Unlisted (noted likely of local significance in the approved project HIA)	No operational changes are proposed at this site compared with what was proposed in the approved project REF. The land acquired for the additional construction ancillary site 25 would be returned to its original land use.	Major
Possible grave site	Unlisted (noted likely of local significance in the approved project HIA)	No operational changes are proposed at this site compared with what was proposed in the approved project REF. The land acquired for the additional construction ancillary site 25 would be returned to its original land use.	Major
Possible bullock track diversion	Unlisted (noted likely of local significance in the approved project HIA)	No operational changes are proposed at this site compared with what was proposed in the approved project REF. The land acquired for the additional construction ancillary site 25 would be returned to its original land use.	Major

6.5.4 Safeguards and management measures

The proposed additional and/ or modified non-Aboriginal heritage safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided in Table 6-25. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out.

A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Other safeguards and management measures that would address potential vibration impacts on non-Aboriginal heritage sites are identified in Section 6.3 (Noise and vibration).

Table 6-25 Additional safeguards and management measures – Non-Aboriginal heritage

No.	Impact	Environmental safeguards	Responsibility	Timing
NH16	Ground disturbance in an area of moderate archaeological potential	<p>Test excavations will be required prior to ground disturbance at the following sites, and will be carried out in accordance with the requirements of a s140 permit under the Heritage Act:</p> <ul style="list-style-type: none"> • Ben Avon (LEP I053) • Former Bowenfels Lockup (unlisted) • Bowenfels Presbyterian Cemetery (LEP A030) • <u>Unidentified lot (unlisted).</u> <p>For works within the SHR curtilage, the excavations would <u>also</u> require approval under s60 of the Heritage Act instead. Where test excavations are proposed, an archaeological research design and methodology will be prepared in accordance with <i>Archaeological Assessments: Archaeological Assessment Guidelines</i> (NSW Heritage Office, 1996a)</p>	Contractor	Prior to construction
NH17	Disturbance of an area of high archaeological potential	<p>Archaeological investigation will be completed under appropriately qualified supervision to expose, investigate, and record the Billesdene Grange causeway fabric.</p> <p>A detailed archival recording of the causeway and Billesdene Grange (LEP I023) frontage to the Great Western Highway will be completed prior to works.</p> <p>Investigation will include structural assessment by a heritage structural engineer in order to determine the structural capability of the causeway, the probable impacts from the road construction and required compaction, and any required additional management or mitigation measures. <u>It will also include advice regarding the acceptable limits of vibration, which in turn will inform potential additional management measures.</u></p>	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<u>Transport's <i>Unexpected Heritage Items Procedure (2022b)</i> will be implemented for archaeological investigations within this area.</u>		
NH18	Disturbance of an area with the potential for human remains	<p>An assessment of archaeological potential in proximity to construction ancillary facility 25 is to be completed, including a detailed survey of the lot and area of potential, in order to assess the landform and identify any surface features, and remote sensing of an appropriate method. <u>Archaeological investigations will include non-invasive investigations such as ground penetrating radar (GPR) to ascertain the likelihood of human remains being present.</u></p> <p>Based on the results of the survey and remote sensing, an archaeological research design should be prepared for management of the site and. It should include f <u>Further research should to try and endeavour to</u> ascertain the potential identity of the deceased and may if required <u>subsequently</u> include genealogical research to locate any of their descendants.</p> <p><u>If human remains are found, these will be managed in line with Transport's <i>Unexpected Heritage Items Procedure (2022b)</i>.</u></p> <p>If the archaeological assessment identifies potential features, complete a test excavation. If the results are inconclusive, then the area to be impacted should be monitored during the removal of topsoil by an appropriately qualified archaeologist. This work would require a s139 exception <u>under the <i>Heritage Act 1977</i></u> and should be completed with the support of an physical anthropologist in case potential human remains are identified.</p>	Contractor	Prior to construction

6.6 Groundwater

This section provides a summary of the assessment of potential groundwater impacts during construction and operation of the proposed modification and a review of mitigation measures to manage these potential impacts.

6.6.1 Methodology

The groundwater assessment of the proposed modification involved the following:

- A review and update (where required) of the desktop assessment of the existing groundwater environment and risks identified in the approved project REF
- Review of the design changes and changes to excavation areas ('cuts') associated with the proposed modification
- Estimation of the potential rate of groundwater ingress and associated drawdown for each proposed cut considered likely to intersect the water table, using the same analytical equations applied in the approved project REF
- Assessment of the potential changes in groundwater impacts during construction and operation from the proposed modification, including:
 - Estimation of change in groundwater levels based on criteria adopted in the NSW Aquifer Interference Policy (AIP) Minimal Impact Considerations (DPI, 2012)
 - Estimation of change in groundwater quality in accordance with the ANZG (2018) Water Quality Guidelines, the Guidelines for Groundwater Quality Protection in Australia (Australian Government, 2013) and the Minimal Impact Considerations from the AIP (DPI, 2012)
 - Estimation of change in groundwater quality assessed against the neutral or beneficial effect (NorBE) principle due to the proposal residing within the Sydney Drinking Water Catchment
- An assessment of the adequacy of the existing mitigation measures and identification of additional or revised measures.

Study area

The proposed modification predominantly relates to areas from the base of Victoria Pass to around 100 metres to the east of Coss River Road. Whilst three additional construction ancillary facilities are located west of this, only the proposed modified cuts within the aforementioned section have been assessed for this addendum REF. Cuts within other sections of the modified project have not been modified from those assessed in the approved project REF.

As per the approved project REF, the groundwater assessment has applied an assessment area of two kilometres from the construction footprint for the modified project. Vertically, the study area is limited to the approximate vertical extent of the proposed modification, which due to proposed road cuts, is about 21.5 metres below ground level (bgl).

6.6.2 Existing environment

The existing hydrogeological environment is largely consistent with the description in the approved project REF, with the exception of some more recent groundwater testing carried out to inform hydraulic connectivity.

Groundwater systems conceptualised to be present within and beneath the construction footprint include:

- Localised areas of unconfined to semi-confined unconsolidated alluvial groundwater systems
- Semi-confined groundwater systems within the Shoalhaven Group, consisting of siltstone, lithic sandstone, and conglomerate
- Semi-confined groundwater systems within fractured granite of the Lachlan Fold Belt.

A summary of the existing hydrogeological environment relevant to the proposed modification area is provided in Table 6-26.

Table 6-26 Hydrogeological summary of the proposed modification area

Issue	Summary
Groundwater elevation	<p>A three-dimensional numerical groundwater model has been developed for the Blackheath to Little Hartley upgrade project. Incorporated in the model is an inferred pre-construction groundwater elevation map (reproduced as Figure 6-8) which extends to the proposed modification area between the base of Victoria Pass and around 100 metres to the east of Coss River Road.</p> <p>The modelled pre-construction groundwater elevation has been used to assess the potential for groundwater ingress into and drawdown around the road cuts forming part of the proposed modification.</p>
Groundwater flow	<p>As per the approved project REF, groundwater flow has been conceptualised to generally flow from areas of relatively high elevation to areas of relatively low elevation, predominantly via fracture networks and faults.</p>
Hydraulic conductivity	<p>Packer testing was carried out in 2022 for the Blackheath to Little Hartley upgrade project within the Berry Siltstone (Shoalhaven Group) which consisted of three tests at three locations in Little Hartley. The Houlby Lugeon values provided from the investigations have been converted to metres per day (m/day) to attain hydraulic conductivity estimates. Hydraulic conductivity ranges from 2×10^{-4} to 1×10^{-3} m/day.</p>
Groundwater recharge and discharge mechanisms	<p>Groundwater recharge primarily occurs via rainfall infiltration. Groundwater discharges include via:</p> <ul style="list-style-type: none"> • Discharge to surface water bodies and drainage systems • Leakage to underlying groundwater systems • Evapotranspiration • Groundwater abstraction (licensed and unlicensed bores).
Groundwater quality	<p>As per the approved project REF, groundwater quality data is summarised as follows:</p> <p><i>Shoalhaven Group – Berry Siltstone</i></p> <ul style="list-style-type: none"> • Fresh to brackish • pH ranges from 5.14 to 7.37, with an average value of 6.61. Location BH123 at Little Hartley has a recorded pH value of 5.14, outside the ANZECC 2000 lowland rivers physical and chemical stressors guidelines (6.5 to 8.5)

Issue	Summary
	<ul style="list-style-type: none"> • Water types include mixed, sodium chloride and calcium bicarbonate • Dissolved manganese ranges from 0.183 milligrams per litre (mg/L) to 1.88 mg/L, with an average concentration of 0.93 mg/L • Dissolved iron ranges from 0.18 mg/L to 40.6 mg/L, with an average concentration of 11.21 mg/L. <p><i>Lachlan Fold Belt – granite</i></p> <ul style="list-style-type: none"> • Fresh • pH ranges from 6.55 to 7.47, with an average value of 7.12, and within the ANZECC 2000 lowland rivers physical and chemical stressors guidelines (6.5 to 8.5) • Water types include calcium bicarbonate and calcium carbonate • Dissolved manganese ranges from 0.134 mg/L to 1.11 mg/L, with an average concentration of 0.50 mg/L • Dissolved iron ranges from <0.05 mg/L to 42 mg/L, with an average concentration of 7.63 mg/L.
Groundwater users	A review of the licenced groundwater bore database was carried out in November 2022 (WaterNSW, 2022). No further licenced groundwater bores have been identified beyond those presented in the approved project REF.
Groundwater dependent ecosystems	<p>As identified in Section 6.1 (Biodiversity), the ‘Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps’ bioregions occur throughout the area required for the proposed modification.</p> <p>Potential impacts to groundwater dependent ecosystems (GDEs) are assessed in Section 6.1 (Biodiversity) of this addendum REF and discussed below.</p>
Groundwater contamination	Potential areas of groundwater contamination are assessed in Section 6.10 (Soils and contamination) of this addendum REF and discussed below.

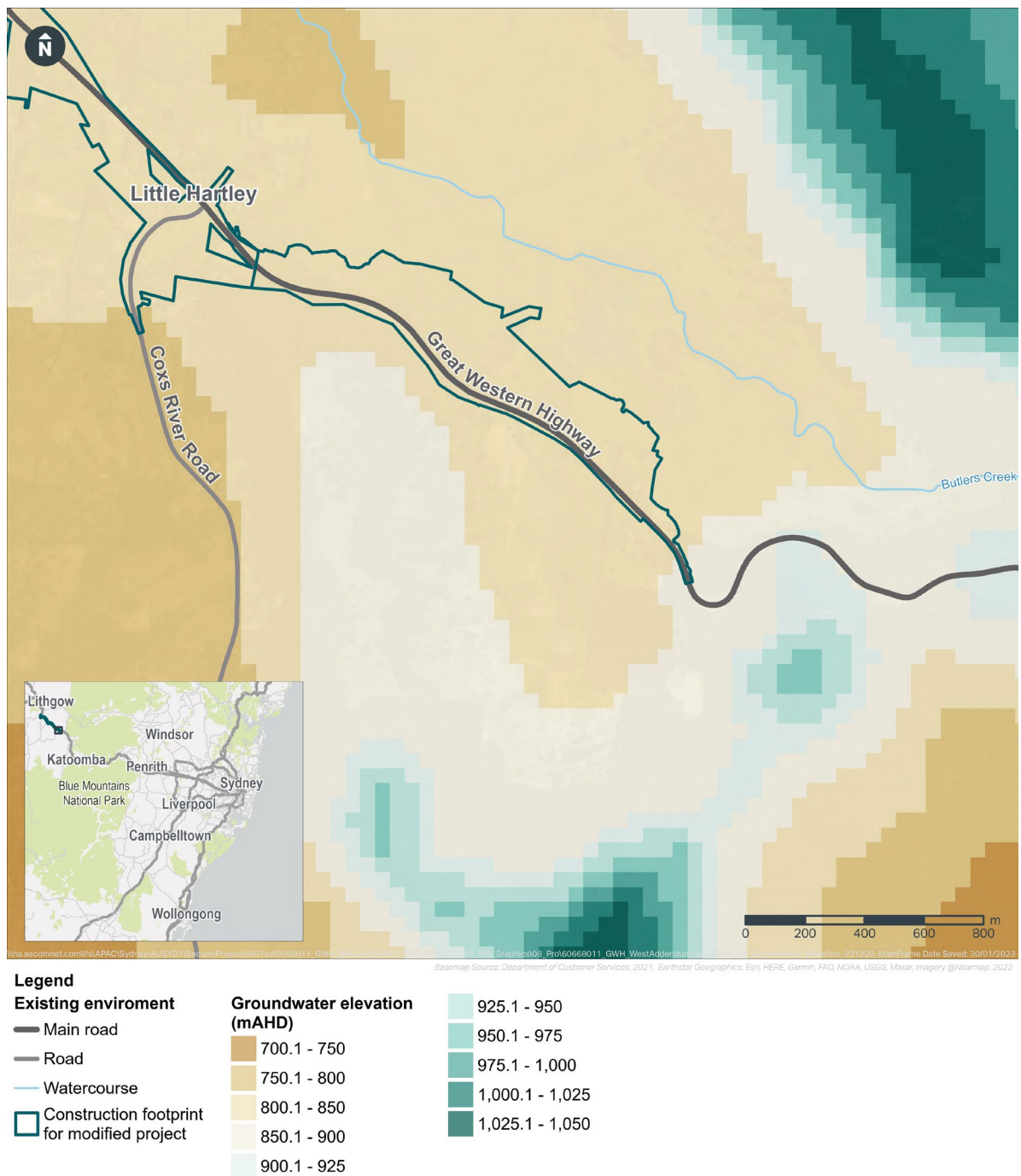


Figure 6-8 Inferred groundwater elevation from numerical groundwater model

6.6.3 Potential impacts

Potential for groundwater inflows, drawdown, and changes to flow regime

The potential areas in which cuts required for the modified project may intersect the groundwater table have been identified based on the inferred groundwater levels derived from the three-dimensional numerical groundwater model developed for the Blackheath to Little Hartley upgrade project (refer to Figure 6-8). Only one cut has been identified as likely to intersect the groundwater table (labelled 'L2R-2' in Figure 6-9), for a distance of around 115 metres. This cut was also identified in the approved REF as likely to intersect the groundwater table.

Estimates of inflow and drawdown, and changes to flow regime

Estimates of groundwater inflow rates and the extent of groundwater drawdown around cut L2R-2 included in the modified project design geometry have been made using the groundwater elevation from the model and field-collected hydraulic conductivity. The assessment was performed using the Thiem-Dupuit steady state analytical equation (Kruseman & de Ridder, 2000), which assumed radial groundwater flow and an unconfined aquifer.

The maximum groundwater drawdown within the immediate area of the L2R-2 cut is estimated to be around 3.6 metres.

It is estimated that the zone around the cut, in which groundwater levels would be affected (drawn down), would extend up to 62 metres from the L2R-2 cut. Groundwater level drawdown would decrease exponentially from the cut. Within the 62 metre drawdown zone, groundwater flow direction would be altered to flow towards the cut; beyond the 62 metre zone, groundwater flow direction would not be altered by the cut. The zone of influence of the cut is not predicted to intersect other areas of groundwater impact, hence there is no cumulative impact associated with the L2R-2 cut.

It is estimated that the groundwater inflow to the cut would be around 2.2 cubic metres per day (0.0022 megalitres per day or 0.805 megalitres per year) or on average 0.025 litres per second within the 115 metre long cut. This inflow rate is very low, and therefore unlikely to cause material environmental impact.

A comparison between the groundwater impacts related to the approved project and proposed modification is provided in Table 6-27. It shows that the proposed modification is likely to have a comparable and potentially lower impact on groundwater than the approved project.

Table 6-27 Comparison between groundwater impacts for the approved project and proposed modification at cut L2R-2

Assessment	Maximum drawdown (m)	Zone of influence (m)	Inflow (m ³ /day)
Approved project	6	26 - 81	0.72 – 2.85
Proposed modification	3.6	62	2.2

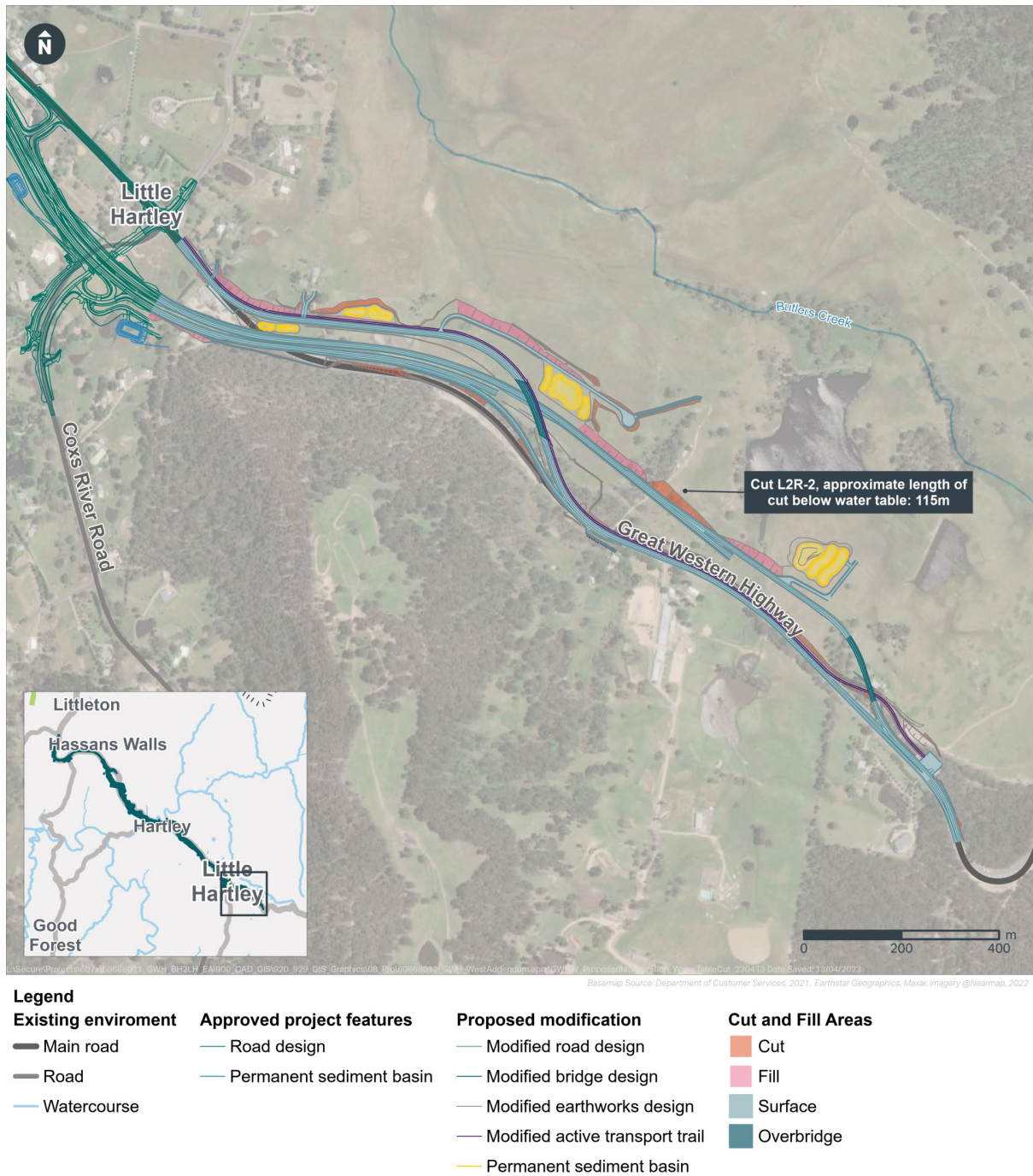


Figure 6-9 Modified cuts expected to intersect the water table

Impacts to existing bores

No registered bores are located within the groundwater drawdown zone around cut L2R-2, hence impact to groundwater users in the area is unlikely.

The closest registered bore for water supply purposes (GW104752) is located around four metres south of the proposed modification, about 330 metres south-east of Coxs River Road (located within the construction footprint for the modified project). This is outside the 62 metre drawdown zone for the cut L2R-2. Therefore, groundwater drawdown impacts at this bore are unlikely as the water table elevation in this area is predicted to be below the depth of the road cut. Additionally, the bore is likely to be decommissioned due to its proximity to the modified project.

The closest registered bore to the project area used for water supply purposes (GW104752) is located around four metres south from the proposed modification within the construction footprint and adjacent to a proposed road cutting. Groundwater drawdown impacts at this bore are unlikely as the water table elevation in this area is predicted to be below the depth of the road cutting and the bore is likely to be decommissioned due to its proximity to the project.

Impacts to GDEs

There are no GDEs located within the 62 metre drawdown zone for the cut L2R-2.

Potential impacts to GDEs are further discussed in Section 6.1 (Biodiversity).

Surface water–groundwater interactions

The potential change in surface water–groundwater interaction during the construction and operation phase of the proposed modification due to groundwater inflow to road cuts is likely to be low, because the predicted change in groundwater levels is relatively small and localised to the project vicinity.

Potential changes to groundwater quality

There is a risk that groundwater quality could be affected during construction and operational activities including:

- Leaks or spills of fuels, oils, and lubricating fluids used by vehicles and construction machinery (workshops, fuel, and waste storages and during fuelling operations)
- Potential acid sulfate soil or rock seepage if excavated, mobilised, and/or stockpiled

With the implementation of mitigation measures outlined in Section 6.6.4, (Safeguards and management measures) the risk of these activities impacting groundwater is considered to be low.

Potential groundwater contamination

Potential groundwater contamination impacts are considered in Section 6.10 (Soils and contamination).

NSW AIP minimal impact consideration assessment summary

The AIP (NSW Government, 2012) clarifies the licensing and assessment requirements for aquifer interference activities under the *Water Management Act 2000* (NSW) (WM Act) and would form the basis of the assessment and subsequent advice provided under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The WM Act includes the concept of ensuring “no more than minimal harm” to any water source, or its dependent ecosystems due to aquifer interference activities, for both the granting of water access licences and approvals. The minimal impact considerations have been developed for impacts on groundwater sources, connected water sources, and their dependent ecosystems, culturally significant sites, and water users, by aiming to maintain water levels, water pressure, and water quality in aquifers.

No high priority GDEs or culturally significant sites are located within the zone of predicted groundwater change. The beneficial use category of groundwater sources is not anticipated to be lowered and is likely to have a neutral impact on groundwater quality.

Sydney Drinking Water Catchment NorBE assessment

In the context of the Sydney Drinking Water Catchment, with adoption of the recommended mitigation measures outlined in Section 7.2, the proposed modification is assessed as likely to have a neutral impact on groundwater quality.

6.6.4 Safeguards and management measures

No revised or additional groundwater safeguards and management measures are proposed as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Other safeguards and management measures that would address impacts are identified in Sections 6.1 (Biodiversity) and 6.10 (Soils and contamination) of this addendum REF.

6.7 Hydrology and flooding

This section provides a summary of the assessment of potential hydrology and flooding impacts during construction and operation of the proposed modification and a review of mitigation measures to manage these potential impacts.

6.7.1 Methodology

The groundwater assessment methodology of the proposed modification involved the following:

- A review of the existing environment for flooding, hydrology, and surface water quality to be considered in the assessment of the proposed modification
- Review flooding, hydrology and surface water assessment in the approved project REF and assessment of changes arising from the proposed modification, including the use of existing and updated modelling data to reassess the proposed modification
- Review the Neutral or Beneficial Effect (NorBE) on water quality assessment prepared for the approved project REF and reassess for the proposed modification to confirm that requirements continue to be met
- Review of mitigation measures from the approved project REF and Submissions Report to identify any revised or additional measures required to manage the impacts of the proposed modification.

6.7.2 Existing environment

The existing environment of the modified project is generally consistent with that outlined in Section 6.8.2 of the approved project REF. This is summarised below.

Waterways

The modified project would be located in the Mid Coxs River catchment which is in the far-west section of the Hawkesbury Nepean catchment as described in the approved project REF. Additionally, the proposed modification is located within the Mid Coxs river sub catchment of the Sydney Drinking Water Catchment.

Elements of the proposed modification either lie within or would discharge surface water to the waterways and/ or catchments of Butlers Creek, Rosedale Creek, Moyne Creek, River Lett, Boxes Creek, and Whites Creek. Full descriptions of the relevant existing surface water features for key elements of the proposed modification are provided in Table 3-1 of Appendix G (Surface Water and Flooding Technical Working Paper).

Flooding

Flood modelling information from the approved project REF indicates that existing flood behaviour in most areas of the proposed modification involves localised ponding of up to 0.3 metres during one per cent Annual Exceedance Probability (AEP) flood events. This includes the location for Berghofers Pass carpark, construction ancillary facilities 21 and 22 and additional footprint areas for the realigned existing Great Western Highway and relocated surface water management infrastructure.

Some shallow localised flooding occurs near construction ancillary facilities 19 and 20 and areas to support the new eastbound off-ramp and bridge. The Rosedale Creek experiences flood depths up to 1.1 metres in the five per cent AEP storm event at construction ancillary facility 20 (as shown in Figure 6-10).

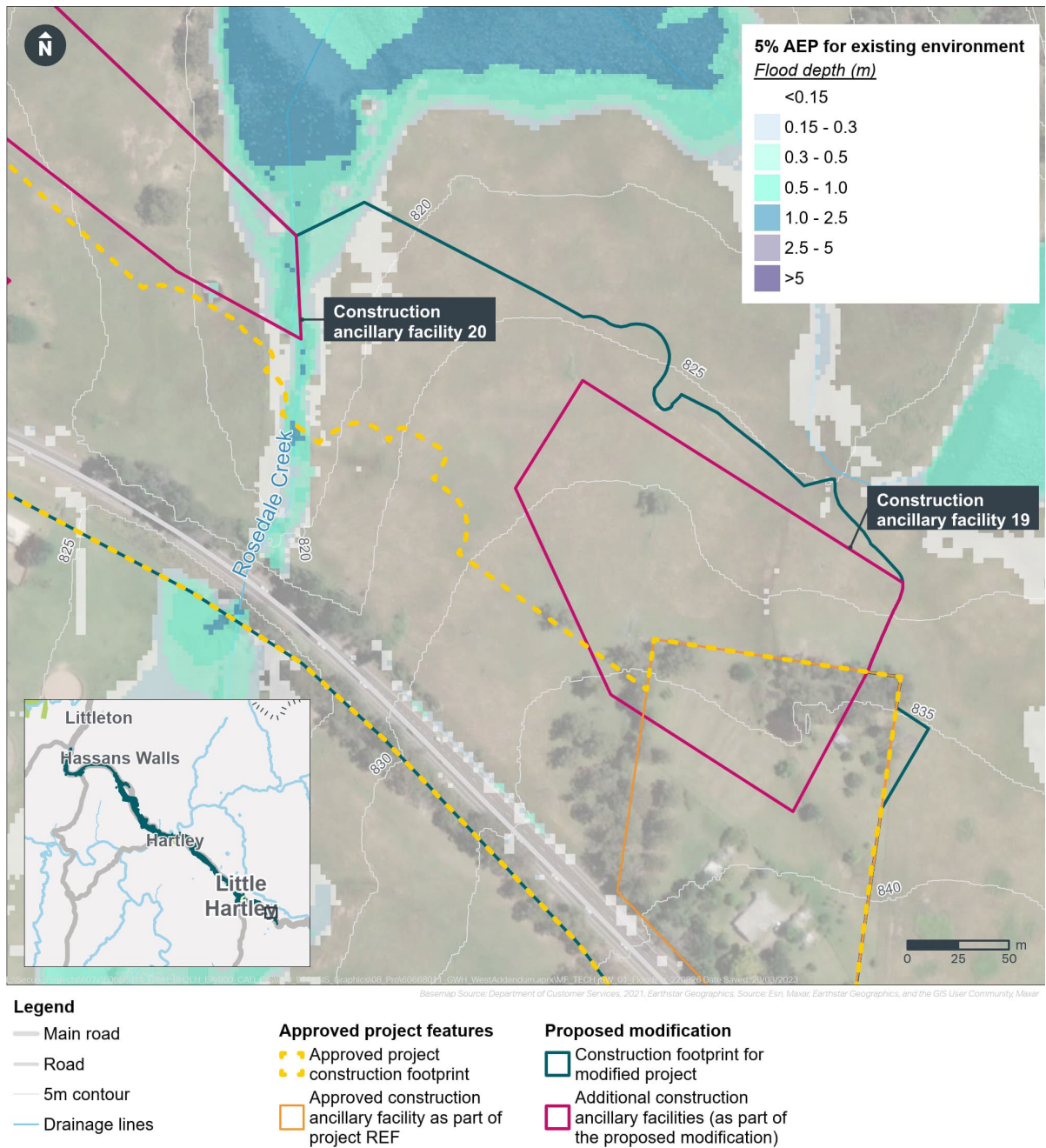


Figure 6-10 Existing flood depths at Rosedale Creek for the 5% AEP

The proposed locations for construction ancillary facilities 24 and 25 and adjustments to the existing 132 kilovolt power line are on steep grades and hence ponding unlikely to occur within these areas. The proposed location for construction ancillary facility 23 is unlikely to experience flooding based on existing flood modelling results in the approved project REF.

Surface water quality

All areas of the proposed modification are within the study area defined in the approved project REF. The surface water quality of watercourses within the proposed modification areas are consistent with that presented in Section 6.6.2 of the approved project REF.

6.7.3 Potential impacts

Construction

Potential impacts associated with surface water quality, hydrology, and flooding from construction of the proposed modification are generally consistent with those presented in the approved project REF and would include impacts such as altered flow rate and flow regime potentially resulting in bank erosion, inundation and damage to construction sites and machinery, and safety risks to construction workers. In summary, construction impacts associated with surface water quality, hydrology, and flooding of the proposed modification are no greater than what was concluded in the approved project REF.

Some of the new construction ancillary facilities have existing surface water features and watercourse within their extents, which were not assessed in the approved project REF. Where existing drainage lines may be impacted during construction of the proposed modification, an alternative (diversion) path of equal capacity will be established prior to commencing works.

An assessment of the approved project against the NorBE requirements for construction can be found in Appendix C of the approved project REF. NorBE requirements for the construction phase of the proposed modification would be achieved where the modified project meets the requirements of the Blue Book (Landcom, 2004).

Operation

Potential impacts associated with surface water quality, hydrology, and flooding from the operation of the proposed modification are generally consistent with those presented in the approved project REF. They may include changes in peak flood level and flood hazard, increases in velocity and scour potential, hydrological changes affecting integrity of threatened ecological communities (such as peat swamps) and increased soil erosion on downstream receiving environments.

The approved project REF demonstrated that the approved project would satisfy the applicable assessment criteria of flood immunity, flood impacts, and climate change risk. The proposed modification has also been designed to comply with these flood immunity, flood impacts, and climate risk criteria. Therefore, no significant or additional impacts to flooding during operation are expected to arise due to the proposed modification relative to the impacts assessed as acceptable in the approved project REF.

An assessment of the approved project in terms of a neutral or beneficial effect (NorBE) on surface water during construction can be found in Appendix C of the approved project REF. It concluded that the approved project would reduce the annual average pollutant loads from the Great Western Highway to be upgraded as part of the project by eight to 68 per cent. Changes to surface water quality management infrastructure as part of the proposed modification have adopted a consistent design approach to the approved project and therefore also result in a reduction in annual average pollutant loads (i.e. a beneficial effect on water quality in the catchment). As such, the proposed modification would also satisfy a neutral or beneficial effect during operation. Further details of the NorBE assessment for the proposed modification during operation are provided in Appendix D of this addendum REF.

In summary, operational impacts associated with surface water quality, hydrology, and flooding of the proposed modification are no greater than what was concluded in the approved project REF. The existing operational hydrology and flooding safeguard and management measures are considered adequate to manage potential surface water quality, hydrology, and flooding impacts of the modified project.

6.7.4 Safeguards and management measures

The proposed additional hydrology and flooding safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided in Table 6-28. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Table 6-28 Safeguards and management measures – Hydrology and flooding

ID	Impact	Environmental safeguards	Responsibility	Timing
<u>HF05</u>	<u>Hydrology and flooding</u>	<u>Where existing drainage lines may be impacted during construction of the proposed modification an alternative (diversion) path of equal capacity will be established prior to commencing works.</u>	<u>Design</u>	<u>Prior to construction</u> <u>Construction</u>
<u>HF06</u>	<u>Hydrology and flooding</u>	<u>The most current available flood mapping will be considered for the purposes of construction design.</u>	<u>Contractor</u>	<u>Prior to construction</u>

Other safeguards and management measures that would address impacts are identified in Sections 6.1 (Biodiversity), 6.6 (Groundwater), and 6.10 (Soils and contamination) of this addendum REF.

6.8 Landscape character and visual impact

This section outlines the potential landscape character and visual impacts from the construction and operation of the proposed modification and identifies safeguards and management measures to avoid or minimise these impacts.

6.8.1 Methodology

The assessment methodology for landscape character and visual impact assessment involved the following:

- A review and assessment of impacts on Landscape Character Zones (LCZs) and viewpoints (VPs) based on the sensitivity of the LCZ and VP to the change and the magnitude of change (Table 6-29, based on Transport, 2020a) arising from the proposed modification during construction and operation
- Reassessment of existing VPs and LCZs identified in the approved project REF that are affected by the proposed modification
- Review of existing mitigation measures for the approved project to avoid, minimise, and manage landscape character and visual impacts, and identification of any revised and additional measures.

Table 6-29 Landscape character and visual impact rating matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High – moderate	Moderate	Negligible
	Moderate	High – moderate	Moderate	Moderate – low	Negligible
	Low	Moderate	Moderate – low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.8.2 Existing environment

The existing environment of the modified project is generally consistent with that outlined in Section 6.9.2 of the approved project REF. This is summarised below.

Locality and landform

The modified project lies within the picturesque Hartley Valley; an area bordered by dramatic sandstone escarpments to the north and east, and undulating hills to the west.

Key landscape features include exposed sandstone escarpments such as Hassans Walls and Mount York. The valley's predominantly farming and settlement landscape character contrasts with the natural character of the densely vegetated ridges and hill slopes that surround it. This is supplemented by the World Heritage listed Greater Blue Mountains Area which lies adjacent the valley.

The combination of natural and cultural scenic qualities establishes a unique identity to the area, which provides a strong sense of place for locals, visitors and through traffic.

Landscape character

Four of the five LCZs identified in the approved project REF are relevant to the proposed modification (refer to Figure 6-11). These four LCZs and their sensitivity, as determined in the approved project REF, are summarised in Table 6-30.

Table 6-30 Summary of LCZs relevant to the proposed modification

LCZ	Sensitivity
LCZ 1 – Butlers Creek Valley	Moderate
LCZ 2 – Hartley Ridge	Moderate
LCZ 3 – River Lett Valley	Moderate
LCZ 4 – River Lett Hill	Moderate

General visibility

The approved project during operation was assessed from 27 viewpoints. Three of these would be affected by the proposed modification (refer to Figure 6-11) and have been reassessed (refer to Figure 6-11). These. These viewpoints and their sensitivity, as determined in the approved project REF, are summarised in Table 6-31.

Table 6-31 Assessed representative viewpoints

LCZ	Sensitivity
VP 1 – Bardens Lookout	Moderate
VP 2 – Great Western Highway, at the base of Victoria Pass	Moderate
VP 3 – Great Western Highway, at the entry of Hartley Valley Holiday Farm	Moderate

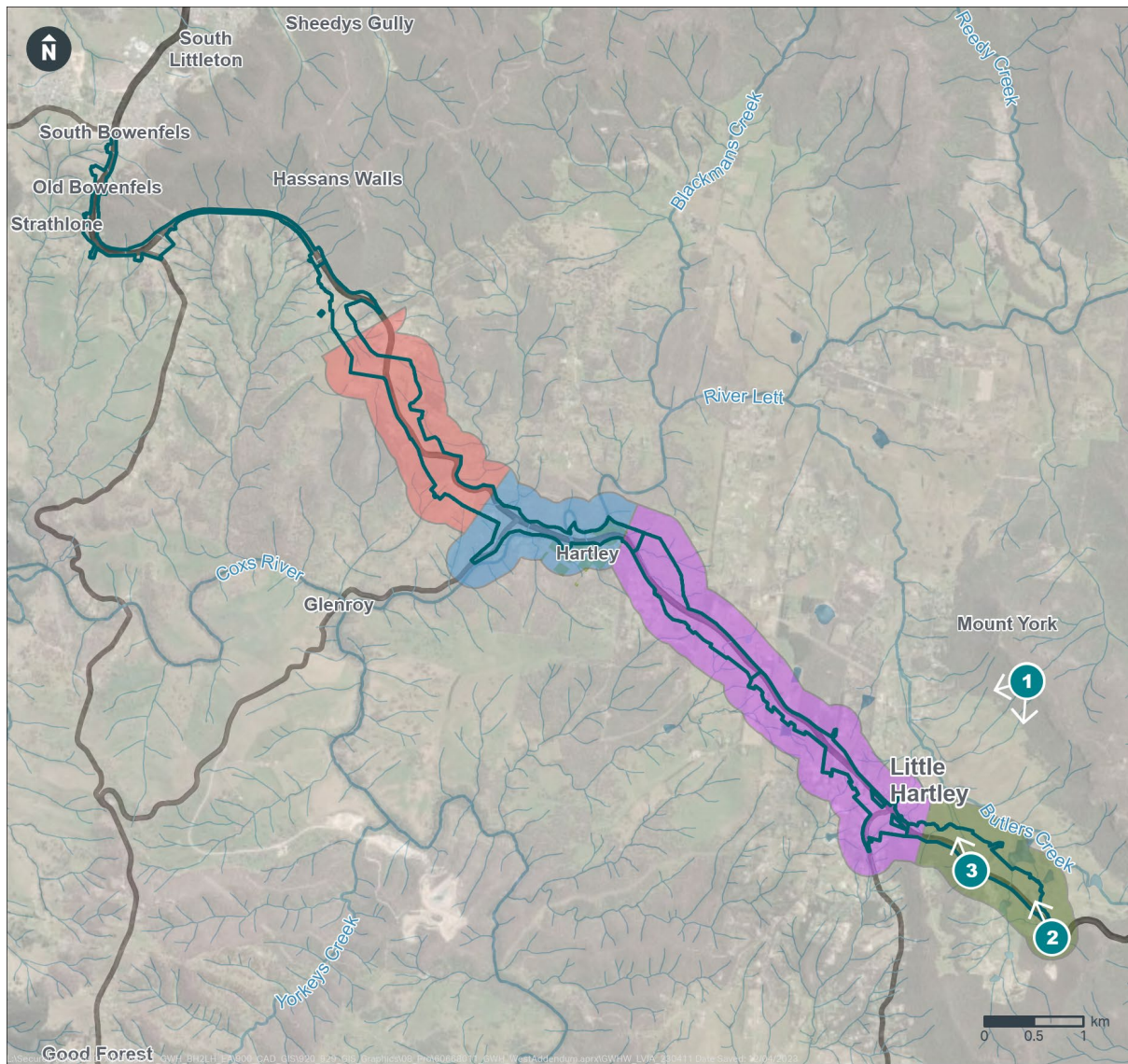


Figure 6-11 Landscape Character Zones (LCZs) and Viewpoints (VPs) relevant to the proposed modification

6.8.3 Potential impacts

Construction

Landscape character impacts

Construction infrastructure would be an uncharacteristic addition to the quiet, rural valley setting. The approved project REF identified that there would be temporary landscape character and visual impacts during construction. These impacts would include views of large earthmoving and construction equipment, construction activities, stored materials and stockpiles, activities in and around ancillary facilities, vegetation clearing, and excavation. Construction, particularly out of hours work, would require lighting at ancillary facilities and work areas. These locations could result in light spill impact on adjoining properties. This may result in a temporary visual impact at night, particularly near residences.

The proposed modification would involve seven additional construction ancillary facilities, including five located outside the approved project construction footprint. The proposed modification would involve seven additional construction ancillary facilities, including five located outside the approved project construction footprint. The potential landscape character and visual impacts identified in the approved project REF would also occur in and around these additional footprint areas required for the proposed modification, including vegetation clearing, and views of construction equipment and excavation works.

The magnitude of impact on the landscape character would be moderate to high during construction of the proposed modification, which would be consistent with the conclusion provided in the approved project REF. Any potential impacts on landscape character attributed to the modified project would be managed through the implementation of the management measures identified in Table 7-1 of this addendum REF.

Visual impacts

During construction the existing vegetation would be cleared to make way for construction support facilities and operations. This would comprise a visible change within Butlers Creek Valley, where three additional construction ancillary facilities would be located, two outside the approved construction boundary. However, it would result in minimal additional visual impact due to the position of the sites in relation to visual receptors and the limited tall vegetation within them. Other additional construction ancillary facilities would be spaced further apart but would result in a greater area of tree removal, and therefore would comprise more of a change to the views at operation.

The open, rural character of the landscape with scattered stands and rows of boundary trees would be visually opened out by the removal of vegetation during the construction period. In accordance with mitigation measures BI02 for the approved project, native vegetation removal will be minimised through detailed design. This will include further consideration for the placement of ancillary facilities currently positioned in native vegetation, which may also assist in reducing visual impacts of vegetation removal. Tree planting and rehabilitation of residual land during finishing works and landscaping for the approved project would also assist in mitigating this impact towards the end of the construction program. Night lighting within the currently unlit Butlers Creek Valley would comprise a change within the landscape setting.

Operation

Landscape character impacts

As per the approved project REF, large scale road infrastructure, including the dual carriageway highway, new and upgraded service roads, bridges, and permanent water quality basins would be introduced into the rural environment by the proposed modification. As part of the proposed modification, the location of Service Road 1 bridge would be altered,

and a second bridge, the eastbound off-ramp from the new to the existing Great Western Highway, would now be present. There would be changes associated with the existing Great Western Highway alignment with the introduction of active transport infrastructure from the new proposed Berghofers Pass car park heading north-west adjacent to the road.

Changes to the alignment would result in less battering and more natural batter shapes associated with the new roads. While the size of the water quality basins would increase, the shapes of the basins have been integrated more into the landform as part of the proposed modification design.

The position of the upgraded Great Western Highway, hugging the edges of forested mountains on the southern side of Butlers Creek Valley, would assist in reducing the overall impact of the Great Western Highway widening within the valley. However, the modified project would still result in a more prominent road corridor and a reduction in the extent of the rural landscape.

A similar area of vegetation would be removed compared with the approved project along the roadside of the existing Great Western Highway and further north into the valley. The landscape design aims to integrate the project into the existing landscape. This would include extensive revegetation using endemic Ribbon Gum Woodland species adjacent to existing stands and to screen the new highway from the existing highway and the broader valley. Scattered native tree planting would be provided on the fill embankments to replicate the current rural highway driving experience and to allow views over the valley and beyond to Mount York.

The magnitude of impact on the landscape character would be moderate to high during operation of the proposed modification, which would be consistent with the conclusion provided in the approved project REF. Further design measures to reduce the impact upon the landscape character would be investigation during detailed design. A summary of the operational landscape character impact assessment is provided in Table 6-32. A full version of the assessment is provided in Appendix H (Urban Design, Landscape Character, and Visual Impact Assessment).

Visual impacts

During operation, views to the realigned Great Western Highway would be characterised by larger operational infrastructure, including the altered Service Road 1 bridge and new eastbound off-ramp, retaining walls, and batters associated with the realignment of the dual carriageway of the Great Western Highway. Road furniture would be substantially larger, including gantries, VMS, signage, and lighting.

Views from distant locations, such as the Mount York escarpment (including a number of lookouts) would not change due to the proposed modification due to the limited amount of detail seen because of the distance of viewing. From the existing Great Western Highway, the addition of work to the northern side of the verge (including the addition of active transport infrastructure) would open out views to Butlers Creek Valley and the Mount York escarpment, which would change the composition of the views and increase the scale of transport infrastructure seen within them.

Tree planting, particularly at the southern end of Little Hartley would reduce the impact of the scale of the road and infrastructure on views over time. Further design measures to reduce the impact upon views would be investigation during detailed design.

There would be little change to the visual impact between the approved project and the modified project during operation. A summary of the operational visual impact assessment is provided in Table 6-33. A full version of the assessment is provided in Appendix H (Urban Design, Landscape Character, and Visual Impact Assessment).

Table 6-32 Summary of landscape character impact assessment during operation

LCZ	Sensitivity	Magnitude	Overall rating	Summary
LCZ 1 – Butlers Creek Valley	Moderate	High	High to moderate No change from approved project REF rating	<p>The proposed modification would:</p> <ul style="list-style-type: none"> • Introduce an extended length of road; however, alignment changes would result in less battering and more natural shapes • Increase water quality basin size; however, basin shapes have been integrated into the landform • Increase in large structural elements in the landscape (such as additional bridge and changes to an existing bridge) • Areas used for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to its former land use. <p>Overall, the scale of the modified project within the rural area would be substantial, but similar to that experienced due to the approved project.</p>
LCZ 2 – Hartley Ridge	Moderate	High	High to moderate No change from approved project REF rating	<p>The proposed modification would:</p> <ul style="list-style-type: none"> • Include minor changes in the surface road design 100 metres east of Coxs River Road • Areas used for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to its former land use. <p>Overall, the scale of the proposed road corridor and the extensive vegetation removal would be substantial but similar to that of the approved project.</p>

LCZ	Sensitivity	Magnitude	Overall rating	Summary
LCZ 3 – River Lett Valley	Moderate	High	High to moderate No change from approved project REF rating	There would be a temporary change within the LCZ during the construction stage, which would be reversible to a condition similar to existing once the construction ancillary facility 23 was removed and the land rehabilitated. There would be no changes to the design at operation within this LCZ; therefore, the magnitude of impact and overall rating would remain the same as assessed in the approved project REF.
LCZ 4 – River Lett Hill	Moderate	High	High to moderate No change from approved project REF rating	The proposed modification would not include operational changes within this LCZ. Areas used for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to its former land use. Therefore, the magnitude of impact and overall rating would remain the same as assessed in the approved project REF.

Table 6-33 Summary of visual impact assessment ratings during operation

VP	Sensitivity	Magnitude	Overall rating	Summary
VP 1	Moderate	Moderate	Moderate No change from approved project REF rating	<p>The proposed modification would:</p> <ul style="list-style-type: none"> • Introduce localised widening of the road corridor at the south-eastern extent of the modified project, near the base of Victoria Pass • Lower the proposed Great Western Highway alignment, reducing the battering required • Introduce a new eastbound off-ramp from new to existing Great Western Highway • Amend the position of the realised existing Great Western Highway and Service Road 1 bridge over new Great Western Highway • Alter the location of permanent sediment basins • Areas used for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to their former land uses. <p>The proposed modification would be visually recessive considering the distance of viewing and potential screening vegetation proposed as part of the design. Overall, the change in the view from this viewpoint would remain moderate, as assessed within the approved project REF.</p>
VP 2	Moderate	High	High to moderate Increase from the approved project REF rating; previously moderate to low	<p>The proposed modification would:</p> <ul style="list-style-type: none"> • Clear vegetation in the foreground and middle ground of the view, opening up the view to Butlers Creek Valley and the Mount York escarpment in the background • Make the upgraded and realigned Great Western Highway and new bridge visible in the fore and middle ground • Make the upgraded road corridor, including active transport trail and associated landscaping visible

VP	Sensitivity	Magnitude	Overall rating	Summary
				<ul style="list-style-type: none"> Make changes to the cuts for the proposed alignment of the Great Western Highway visible Areas used for the construction ancillary facilities that are not required for the operation of the proposed modification would be returned to its former land use. <p>Whilst the inclusion of bridges would also increase the amount of large infrastructure seen within the view, as trees matured within the planted landscape, the view along the existing Great Western Highway would narrow to along the road corridor.</p> <p>Overall, the change in the view seen from this viewpoint would increase from moderate to low (as assessed within the approved project REF) to be high to moderate.</p>
VP 3	Moderate	Low	Moderate to low No change from approved project REF rating	<p>At this location, the existing Great Western Highway travels through a small cut. The changes due to the proposed modification would be minimal, given the Great Western Highway alignment would remain the same, and the new alignment would be placed beyond the existing trees seen in the foreground. These trees would be retained as part of the project.</p> <p>As well as providing screening, the landscape design would aim to enhance the existing rural character with deciduous feature tree planting denoting the upcoming proposed bridge over the new highway as well as the entry to Little Hartley.</p> <p>Land used for construction ancillary facility 21, which lies directly in front of this VP, which would not be required for the operation of the proposed modification would be returned to its former land use. Overall, the change in the view seen by receptors from this viewpoint would remain moderate to low as assessed within the approved project REF.</p>

6.8.4 Safeguards and management measures

The proposed additional and/ or modified non-Aboriginal heritage safeguards and management measures to those for the approved project, as presented in the Submissions Report, are provided in Table 6-34. Any additional wording has been underlined, and deleted measures, or parts of measures, have been struck out. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

As concluded in this assessment, there would be minor change in the landscape and visual impact of the modified project relative to the approved project REF. As part of ongoing design development, some additional measures have been identified that weren't included in the approved project REF.

Table 6-34 Safeguards and management measures – Landscape character and visual impact

ID	Impact	Environmental safeguards	Responsibility	Timing
<u>LV06</u>	<u>Landscape character and visual impact – General</u>	<u>Site levels and grades for the project would integrate with the surrounding terrain to assist with the visual assimilation of the project into the surrounding landscape where practicable</u>	<u>Contractor</u>	<u>Detailed design</u>
<u>LV07</u>	<u>Landscape character and visual impact – General</u>	<u>Engineered slopes would have gradients no steeper than 3H:1V where possible to maximise the establishment of vegetation and allow for appropriate maintenance. The bulk of the modified project's designed batters are 2H:1V, in line with Transport's standards. Property acquisitions and land take is planned on 2H:1V fill batters, cut batters in softer cut materials, and 0.5H:1V for harder rock cuts.</u>	<u>Contractor</u>	<u>Detailed design</u>
<u>LV08</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Opportunities to provide vegetation by seeding and direct shrub and tree planting to mitigate the scale of the proposed infrastructure, reinstate the vegetation character of the area, frame views, and provide amenity along the road corridor would be</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
		<u>considered. New vegetation will be established progressively during construction.</u>		
<u>LV09</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Avoidance of formal rows of trees or blocks of shrub and grass plantings as these would be uncharacteristic within both the Little Hartley landscape setting</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Detailed design</u>
<u>LV10</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Carrying out appropriate soil analysis and identification of soil preparation requirements for landscaping treatments in accordance with the Batter Surface Stabilisation Guideline (Roads and Maritime Services, 2015).</u>	<u>Contractor</u>	<u>Construction</u>
<u>LV11</u>	<u>Landscape character and visual impact – Construction</u>	<u>Existing trees to be retained within the construction footprint would be identified, protected and maintained. Efforts to retain trees within proposed construction ancillary facilities would reduce the impact on views and landscape character at operation.</u>	<u>Contractor</u>	<u>Detailed design</u> <u>Construction</u>

Other safeguards and management measures that would address landscape and visual impacts are identified in Section 6.1 (Biodiversity).

6.9 Property and land use

This section provides an assessment of the potential impacts of the proposed modification on property and land use and identifies safeguards and management measures to avoid or minimise these impacts.

6.9.1 Methodology

The assessment methodology for impacts on land use and property included the following key tasks:

- A desktop assessment of property ownership and existing land uses in and around the construction footprint for the proposed modification
- Identification of potential future uses of land required for construction but not required for operation
- Assessment of potential impacts on properties including those that would need to be acquired to construct and operate the proposed modification
- Assessment of the potential impacts on existing and likely future land uses during construction and operation of the proposed modification
- Review of existing mitigation measures for the approved project to avoid, minimise, and manage impacts on land use and property, and identification of any revised and additional measures.

The impact assessment of the proposed modification on property and land use has been prepared taking into account:

- Land Acquisition (Just Terms Compensation) Act 1991
- Property Acquisition – A guide for residential owners (NSW Government, 2021a)
- Property Acquisition – A guide for residential tenants (NSW Government, 2021b)
- Land Acquisition Information Guide (Roads and Maritime Services, 2014).

6.9.2 Existing environment

Land use zoning

The modified project would be located in the Hartley Valley, between the base of Victoria Pass Little Hartley to Lithgow, within the Lithgow City local government area. The proposed modification would be located across the following land use zones (Figure 6-12a to Figure 6-12c), as defined by the Local Environmental Plan:

- SP2 Roads and Traffic Facility
- R5 Large Lot Residential
- RU1 Primary Production.

These types of land use zones are the same as those impacted by the approved project and assessed in the approved project REF.

Existing land uses

Existing land uses within and surrounding the construction footprint comprise:

- Roads and transport infrastructure, including the existing Great Western Highway and local roads, as well as adjacent lands included within the road corridor

- General rural uses, such as large lot farming and grazing
- Rural-residential uses, including rural living and smaller farm properties
- Commercial uses, including hospitality and retail services, accommodation, visitor information, and professional services
- Bushland.

The area of the proposed modification (between the base of Victoria Pass and around 100 metres to the east of Coxs River Road, in Hartley, and south of Hassans Walls) is largely characterised by rural and rural residential properties. Some commercial activities are present near Coxs River Road, including hospitality and retail services. Areas of agriculture and bushland are present adjacent to the Great Western Highway

Properties that would be impacted by the proposed modification and a description of their current use are identified in Table 6-35 and shown in Figure 6-12a to Figure 6-12c.

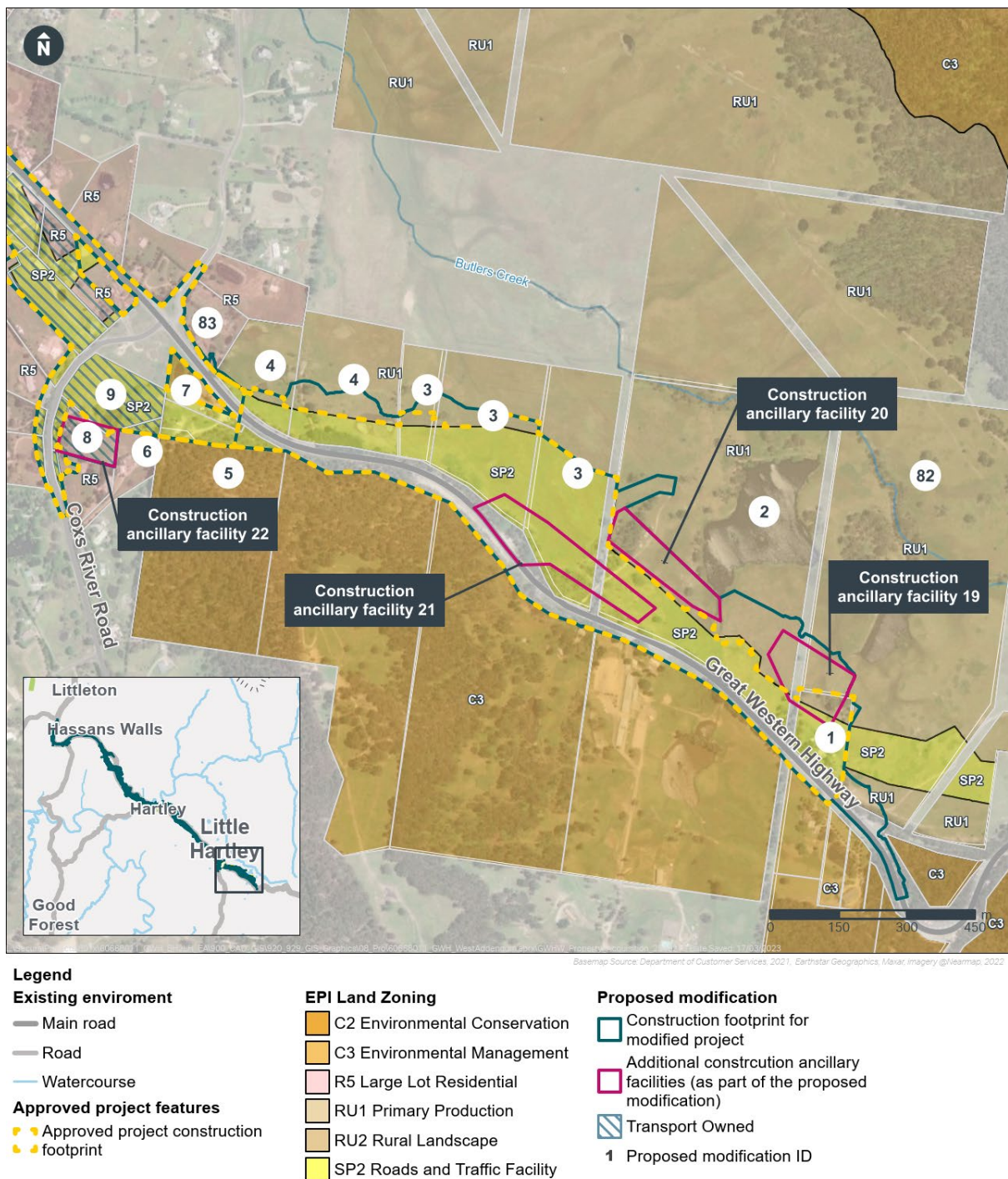
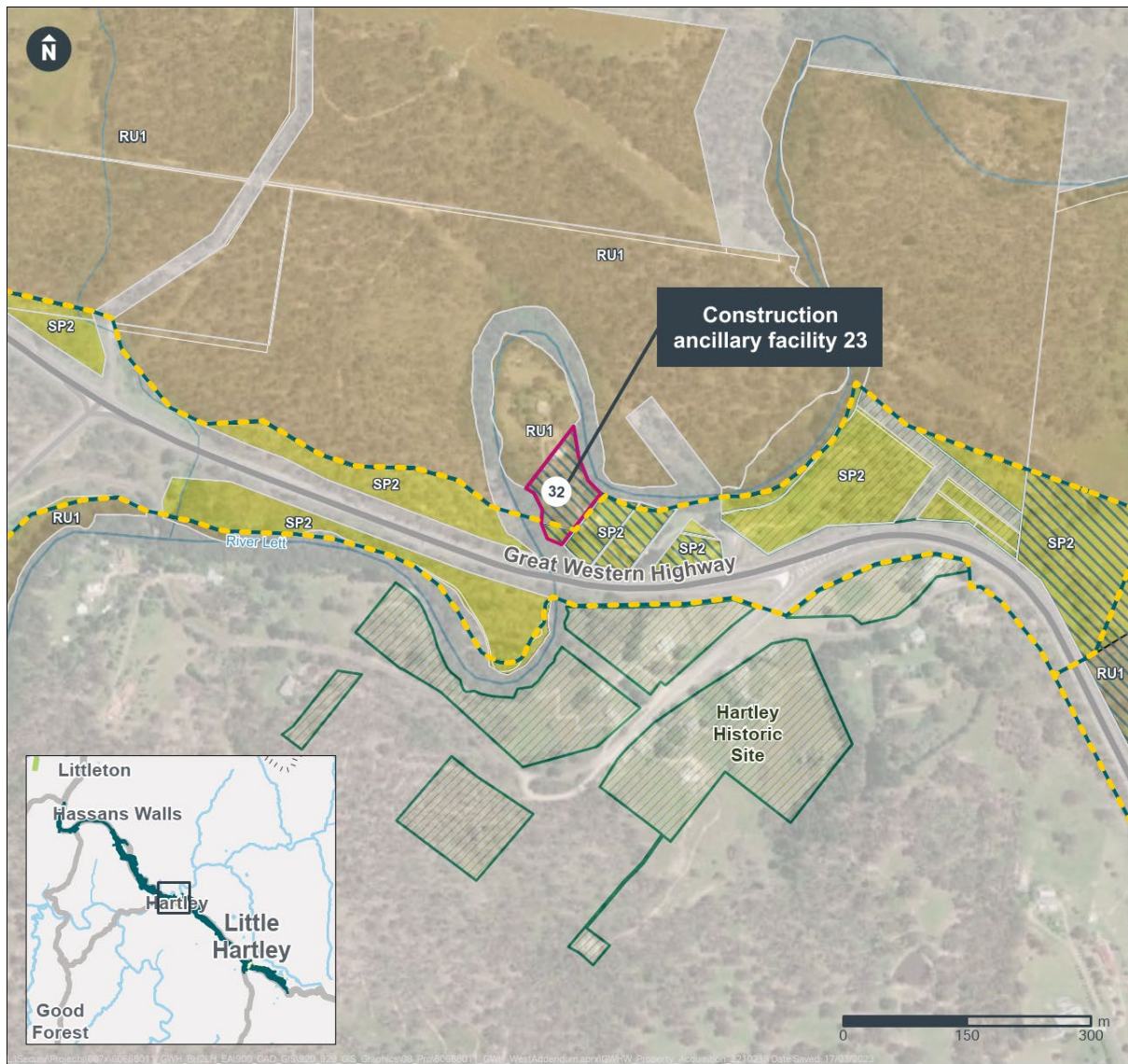


Figure 6-12a Land use zoning and property acquisition for the proposed modification



Legend

Existing enviroment

- Main road
- Road
- Watercourse
- ▨ National Parks and Reserves

Approved project features

- ▨ Approved project construction footprint

EPI Land Zoning

- ▨ RU1 Primary Production
- ▨ SP2 Roads and Traffic Facility

Proposed modification

- ▨ Construction footprint for modified project
- ▨ Additional construction ancillary facilities (as part of the proposed modification)
- ▨ Transport Owned
- 1 Proposed modification ID

Figure 6-12b Land use zoning and property acquisition for the proposed modification

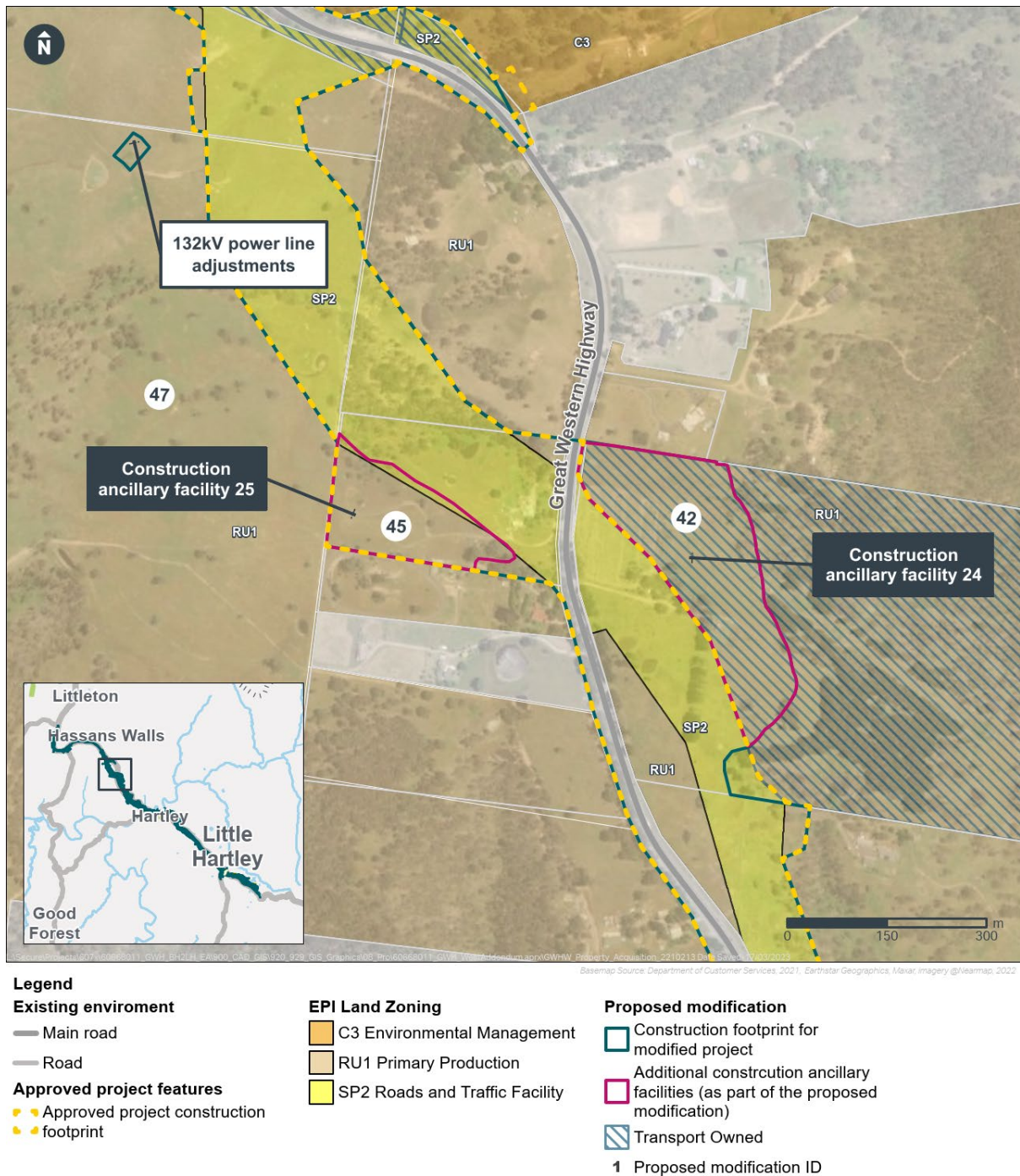


Figure 6-12c Land used zoning and property acquisition for the proposed modification

Table 6-35 Impacted properties and proposed property acquisition for the modified project

Property ID		Plan and Lot number	Ownership	Predominant land use	Acquisition required (Y/N)	Total area (sq m)	Approved project		Proposed modification			
Approved project REF	Proposed modification						Area of land to be acquired (%)	Area of land to be temporarily leased (%)	Area of land to be acquired (sq m)	Area of land to be acquired (%)	Area of land to be temporarily leased (sq m)	Area of land to be temporarily leased (%)
-	82	[REDACTED]	Private	Rural	Yes	1,995,150	-	-	7,244	0.4	-	-
1	1	[REDACTED]	Private	Rural-residential	Yes	20,393	100	-	20,393	100	-	-
2	2	[REDACTED]	Private	Rural	Yes	272,672	16.0	1.5	91,760	33.7	428.5	0.2 *
3	3	[REDACTED]	Private	Rural	Yes	79,136	43.1	3.9	46,544	58.8	0	0 *
3	3	[REDACTED]	Private	Rural	Yes	68,912	68.3	-	40,742	68.3	-	-
3	3	[REDACTED]	Private	Rural	Yes	21,763	26.6	9.4	10,320	47.4	0	0 *
4	4	[REDACTED]	Private	Rural-residential	Yes	63,858	24.5	-	27,784	43.5	-	-
4	4	[REDACTED]	Private	Rural-residential	Yes	31,421	19.2	4.7	8,967	28.5	0	0 *
5	5	[REDACTED]	Private	Bushland	Yes	138,237	9.7	-	11,117	9.7	-	-
7	7	[REDACTED]	Private	Commercial	Yes	10,936	34.8	-	4,282	39.2	-	-

Property ID		Plan and Lot number	Ownership	Predominant land use	Acquisition required (Y/N)	Total area (sq m)	Approved project		Proposed modification			
Approved project REF	Proposed modification						Area of land to be acquired (%)	Area of land to be temporarily leased (%)	Area of land to be acquired (sq m)	Area of land to be acquired (%)	Area of land to be temporarily leased (sq m)	Area of land to be temporarily leased (%)
6	6		Transport	Rural-residential	No	14,684	13.6	-	-	-	-	-
8	8		Transport	Rural-residential	No	13,064	16.9	-	-	-	-	-
9	9		Transport	Grassland	No	24,861	-	-	-	-	-	-
32	32		Transport	Rural-residential	No	6,235	-	-	-	-	-	-
42	42		Transport	Rural-residential	No	428,780	11.7	6.5	-	- †	-	-
45	45		Private	Rural-residential	Yes	73,078	100	-	73,078	100	-	-
Key		<p>Red text to indicate an increase in area to be acquired or leased from approved project</p> <p>Green text to indicate a decrease in area to be acquired or leased from approved project</p> <p>Amber text to indicate no change in area to be acquired or leased from approved project</p>										
Notes		<p>* Note that whilst the area that was to be temporarily leased in the approved project REF would now be permanently acquired. This is discussed further below.</p> <p>† Note that whilst the area was to be acquired in the approved project REF, the land has now been acquired by Transport and further land acquisition is not required.</p>										

6.9.3 Potential impacts

Construction

Potential property and land use impacts of the proposed modification would be related to property acquisition, changes to land use, and changes to property access. These impacts would be long term and would occur from the commencement of construction. Any permanent, long-term impacts (i.e. acquisition of properties) are considered as operational impacts of the proposed modification.

Property impacts

Short term property impacts would potentially occur during construction of the proposed modification as a result of activities such as land use changes, as well as leasing land for ancillary facilities. One additional property would be partially leased for the duration of construction for the proposed modification. Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard in consultation with the landowner.

Three properties would no longer require temporary leasing due to the proposed modification. Instead, additional acquisition would be required of these areas; this is discussed further below in the discussion on operational impacts of the proposed modification.

Land use impacts

During construction, potential impacts on existing land use within the proposal construction footprint would mainly relate to direct impacts from the siting of the construction ancillary facilities. These ancillary facilities would include temporary construction support sites and stockpile areas, as described in Chapter 3 (Description of the proposed modification) of this addendum REF.

Seven additional construction ancillary facilities are included in the proposed modification, all of which are currently rural-residential or agricultural land uses. Five are located either partially or fully outside the construction footprint that was assessed as part of the approved project REF:

- *Construction ancillary facility 19:* Land would be acquired in Property 82, which was not affected by the approved project
- *Construction ancillary facility 20:* Additional land in Property 2 would be acquired
- *Construction ancillary facility 22:* Land in Property 8 has been acquired by Transport in 2022
- *Construction ancillary facility 23:* Land in Property 32 was acquired by Transport prior to the determination of the approved project REF
- *Construction ancillary facility 24:* Land in Property 24 has been acquired by Transport in 2022.

Construction ancillary facilities 21 and 25 would be located within the approved project construction footprint and would not require additional land take. All seven additional construction ancillary facilities would be permanently acquired and are discussed further in the operational impacts section.

Temporary changes to local roads and property accesses

As detailed in Section 6.2 (Traffic and transport), temporary disruptions to local roads and property accesses would be expected during construction of the proposed modification. Local roads that would potentially experience some delays during construction include Coxs River Road, though this would be a minor change compared to the impacts identified for the approved project. Any impacts would be minimised through the implementation of a Traffic Management Plan as discussed in Section 6.2 (Traffic and transport) of this addendum REF. Additionally, the modified project's realigned new Service Road 1 would become a local road, with this and the new the westbound on-ramp and the eastbound off-ramp (see Figure 3-1) providing an opportunity to minimise disruptions to existing traffic during construction.

Impacts to existing property access points may occur as a result of the proposed modification however access to properties and businesses would be maintained for the full construction duration. As per the approved project REF, alternative access arrangements would be provided where the proposed modification would impact access to residential and commercial properties.

Operation

Operational impacts on property and land use as a result of the proposal would commence during construction of the proposed modification. The sections below describe these permanent and long-term impacts.

Property impacts

Details of permanent property acquisition as a result of the proposed modification compared to the approved project are provided in Table 6-35.

Eleven privately owned properties would be permanently acquired for the operation of the proposed modification, including two that would be fully acquired, with the remaining partially acquired. The areas of land that would be acquired would increase in six properties; in three of these, land that was due to be temporarily leased would now be permanently acquired.

Properties 6, 8, and 42 had required either full or partial acquisition under the approved project REF and have since been acquired by Transport in 2022. This has contributed to the selection of Properties 8 and 42 as additional construction ancillary sites.

Two additional properties that were not included in the approved project REF would be required the proposed modification:

- Property 82 would require partial acquisition for the construction of the proposed modification, and construction ancillary facility 19 would be located on this property
- Property 83 would require an adjustment to its access. No acquisition or leasing would be required, and the work would be subject to discussions with the landowner.

The areas of direct impact to property have been calculated using the modified design, construction footprint, and cadastral overlay. This would be subject to ground survey and further refinement during the detailed design phase of the proposal, which may alter the final acquisition requirements and estimates. All acquisitions would be carried out in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, *Property Acquisition – A guide for residential owners (NSW Government, 2021a)*, and *Property Acquisition – A guide for residential tenants (NSW Government, 2021b)*.

Due to the changes in the operational alignment and tie-in with the Blackheath to Little Hartley upgrade project, the proposed modification would lie closer to some properties than previously assessed. For instance, the residences on Properties 2 and 4 would lie in closer proximity to the new Great Western Highway and proposed Service Road 1 respectively and would no longer be set back from the road. This would have a long-term, negative impact on the setting and visual amenity of the residence. Indirect impacts on property and people are

discussed in further detail in Sections 6.3 (Noise and vibration), 6.5 (Non-Aboriginal heritage), 6.8 (Landscape character and visual impact), 6.11 (Socio-economic), and 6.12 (Air quality) where relevant.

Improvements have been identified to provide a new local property access road connection off the realigned existing Great Western Highway to property located in Properties 2, 4, and 83. In addition, the construction boundary for the modified project has been designed to minimise the footprint and physical impacts upon the property and driveway within Property 4, which both have local heritage value (see impacts relating to Billesdene Grange in Section 6.5 (Non-Aboriginal heritage)).

Land use impacts

Additional land required for the proposed modification outside of the approved project construction footprint is zoned as either RU1 Primary Production (about 90 per cent) and R5 Large Lot Residential (about 10 per cent). Some of the land required for the proposed modification within the approved project construction footprint is already land zoned as SP2 Roads and Traffic Facility. This overall transport corridor land use would remain with the proposed modification.

All but two properties would be only partially impacted, with many requiring partial acquisition where the proposed modification would have no substantial effect on the functionality or viability of the current or future use of the remainder of the property.

Short term property impacts would potentially occur during construction as a result of activities such as land use changes and changes to property access, as well as leasing land for ancillary facilities and temporary sediment basins. Nine lots would be partially leased for the duration of construction. Consultation with landowners would be held in relation to leasing these properties.

While the proposal design has sought to minimise impacts on property as far as practicable, permanent property adjustments would be required to some private properties, including adjustments to fencing and other infrastructure, due to partial property acquisitions. The proposed modification design, including evaluation of route options (described in Chapter 2 (Needs and options considered) of this addendum REF), has sought to minimise any impact of severance on farming operations as far as practicable. Any adjustments to properties required for the proposal would be carried out in consultation with the property owner.

Changes in external property accesses

Changes to external property access would be required for numerous properties as a result of the proposal. As per the approved project REF, alternative access would be provided where the proposed modification would alter access to residential and commercial properties.

6.9.4 Safeguards and management measures

No changes are proposed to the land use and property safeguards and management measures in the Submissions Report as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

6.10 Soils and contamination

This section provides an assessment of the potential impacts of the proposed modification on soils and contamination and identifies safeguards and management measures to avoid or minimise these impacts.

6.10.1 Methodology

The soils and contamination assessment methodology for the approved project is outlined in Section 6.12 of the approved project REF. The assessment of the potential soil and contamination impacts of the proposed modification included:

- A review of previous assessments completed for the modified project, including areas previously surveyed, and extraction of relevant information:
 - Great Western Highway Upgrade Program: Little Hartley to Lithgow (West Section) Technical Working Paper – Stage 1 Contamination Assessment (Transport, 2021f) (the approved project Contamination Assessment)
 - Great Western Highway Upgrade Program: Little Hartley to Lithgow (West Section) Technical Working Paper – Stage 2 Contamination Assessment (Transport, 2022i)
 - Blackheath to Little Hartley Upgrade Contamination Technical Report (Transport, 2023c), which overlaps with the eastern portion of the construction footprint for the modified project
- A high-level risk prioritisation exercise to:
 - Identify areas of environmental concern (with respect to contamination) within the additional footprint areas required for the proposed modification
 - Identify unmitigated risks to environmental and human receptors
 - Consider the nature of proposed construction activities for the proposed modification
 - Determine the level of risk that the proposed modification could intersect areas of potential contamination
- Review of existing mitigation measures for the approved project, and identification of any revised and/or additional measures required.

6.10.2 Existing environment

The existing soils and contamination environment was described in Section 6.12.2 of the approved project REF. This information, along with other current information identified since determination of the approved project REF, relevant to the proposed modification, is summarised below.

Geology and soils

Soil landscapes for the proposed modification site are illustrated in Figure 6-13 and summarised in Table 6-36.

A review of the Australian Soil Resource Information System (CSIRO, 2021) indicates that the entirety of the proposed modification site has low probability of encountering acid sulfate soils, though geotechnical investigations indicate that encountering acid sulfate rocks in cuttings would be likely. The approved project REF noted a risk for encountering acid sulfate rocks in the Shoalhaven Group located in the far east section of the proposed modification.

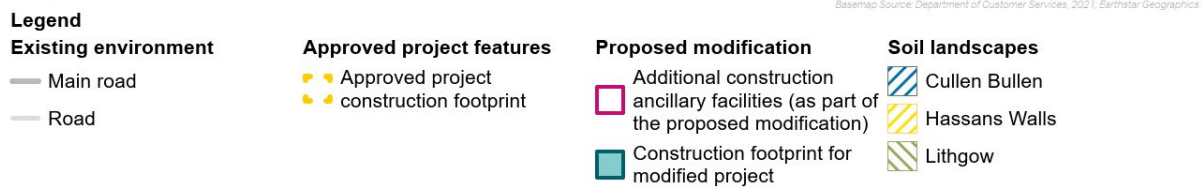
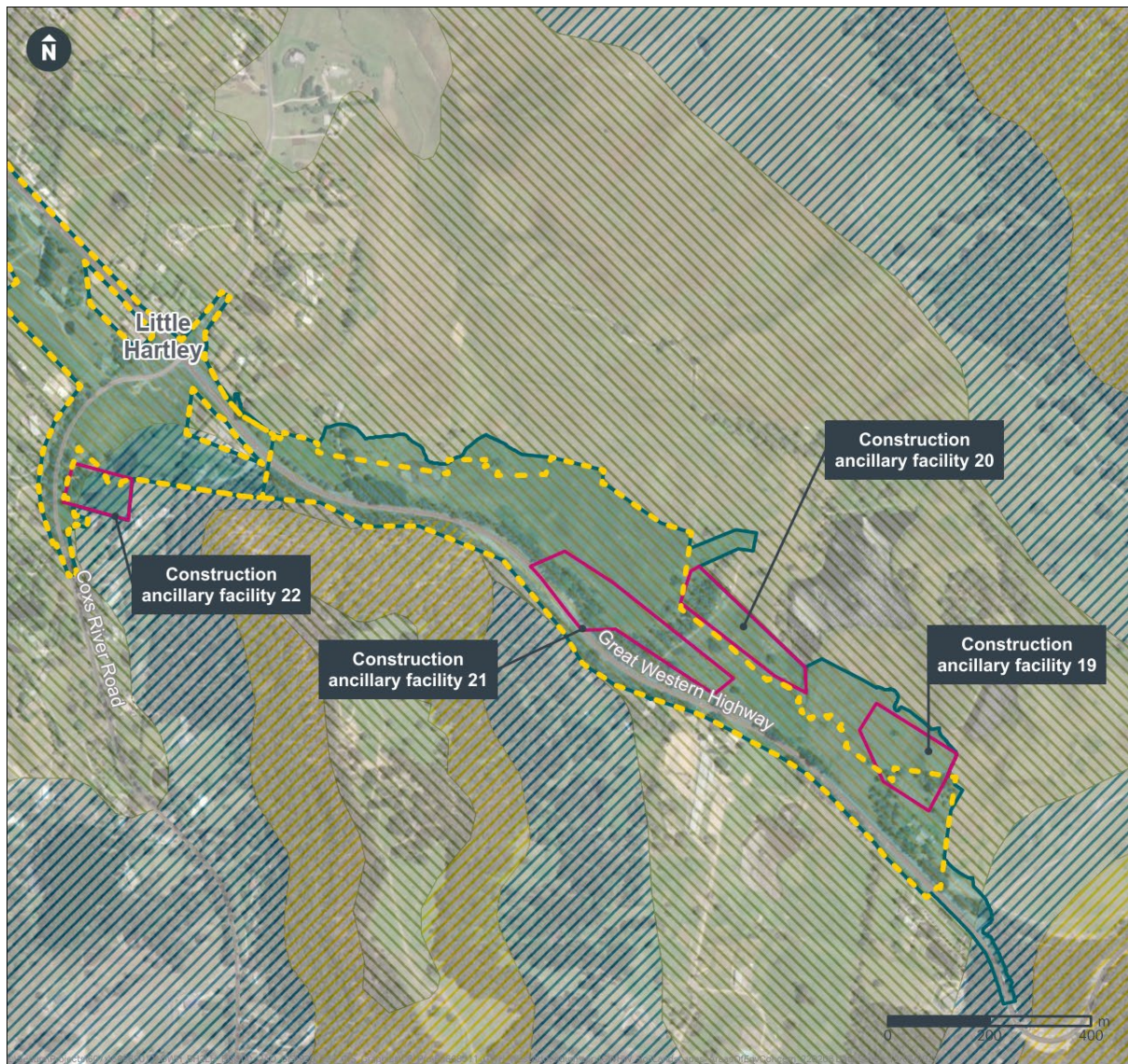


Figure 6-13a Soil landscapes

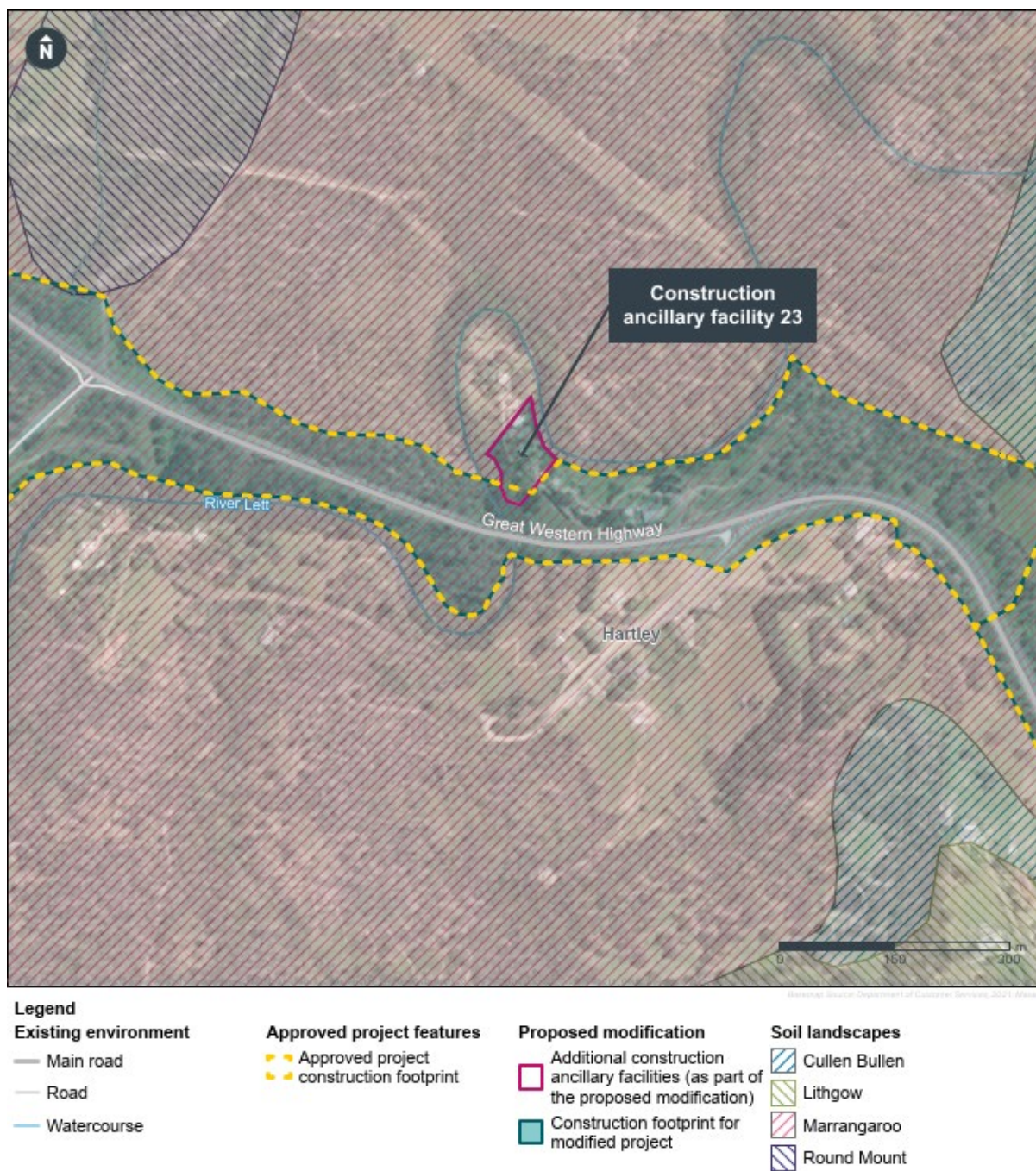


Figure 6-13b Soil landscapes

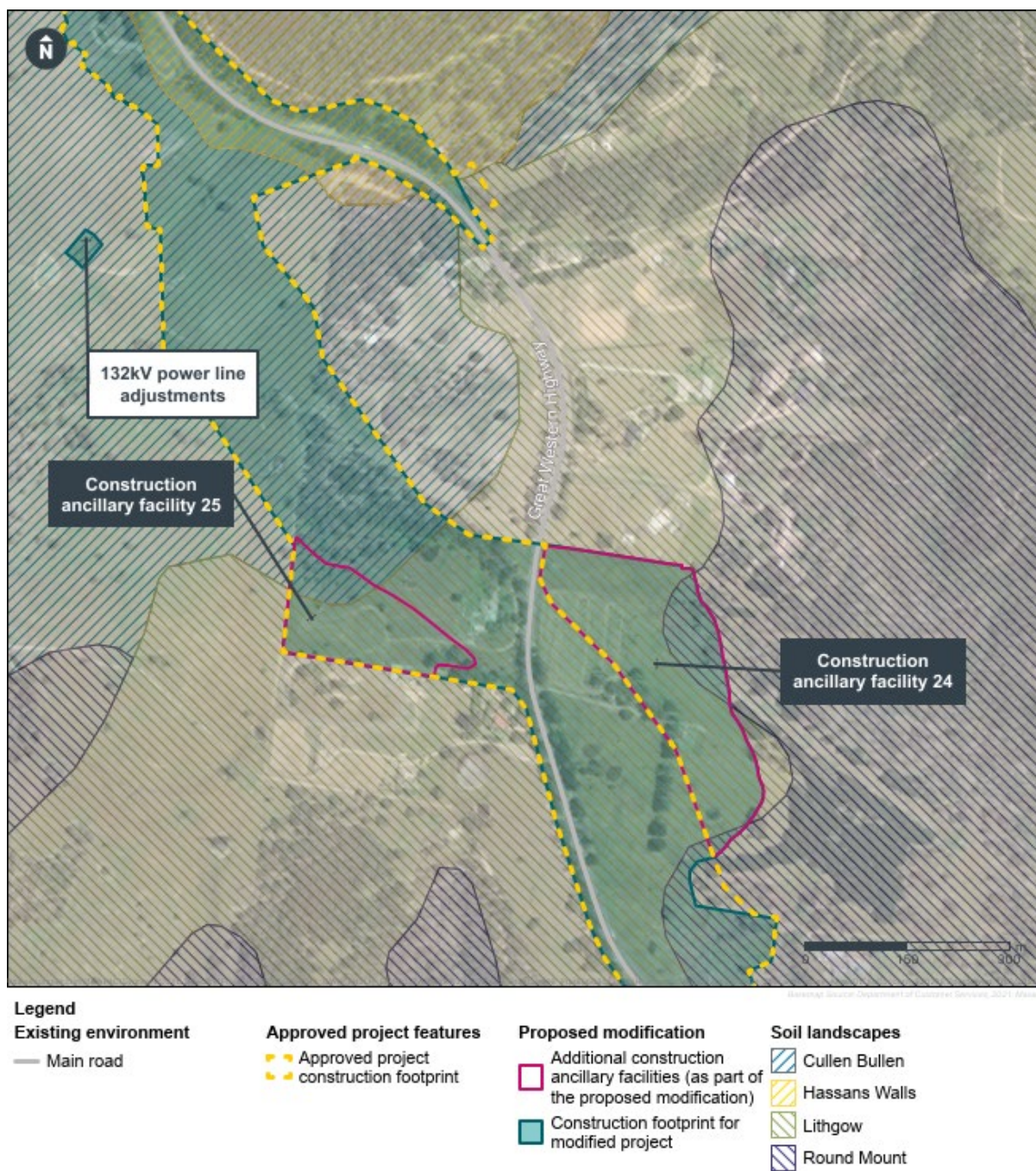


Figure 6-13c Soil landscapes

Table 6-36 Soil landscapes in the proposed modification site

Soil landscape	Description	Constraints
Cullen Bullen	Broad rolling low hills and rises on Illawarra Coal Measures and the Berry Formation with a local relief of <50m and 10-25% slopes. Extensively cleared open woodland with isolated remnants of original vegetation.	High water erosion hazard Mine subsidence district (localised) Rock fall hazard (localised) High run-on Rock outcrop (localised) High foundation hazard (localised)
Lithgow	Flat to undulating rises and broad valley floors on Illawarra Coal Measures and the Berry Formation with a 20m local relief and <10% slopes. Extensively cleared open woodland and open forest.	Hardsetting surfaces Mine subsidence district (localised) High run-on Rock fall hazard (localised) Moderate-high erodibility (nonconcentrated flows)
Marrangaroo	Rolling hills and narrow flat to rounded convex crests on Carboniferous granites with a local relief of 90m and <30% slopes. Extensively cleared open woodland.	Steep slopes Rock outcrop (localised) High water tables (localised) Moderate erodibility (non-concentrated flows)
Round Mount	Steep to very steep hills and mountains on Carboniferous granite in the Hartley Valley and Kanangra Gorge with a local relief of <400 m and >35% slopes. Undisturbed to extensively cleared open woodland with occasional cliffs.	Extreme water erosion hazard Steep slopes Rock outcrop Shallow soils High foundation hazard

Other sources of contamination

Areas of potential contamination within 500 metres of the proposed modification have been identified based on the previous investigations, including those undertaken to inform the approved project REF (see Section 6.10.1 (Methodology)). These areas are summarised in Table 6-37 and illustrated in Figure 6-14.

Table 6-37 Areas of potential contamination (east to west)

Site name	Distance from proposed modification (approximate)	Comments	Last inspected date	Potential impacts to the proposed modification?
CSR Building Products Clay/Shale, Structural Clay Mine	About 70 metres south of the eastern extent of the proposed modification. Located outside of the construction footprint for the proposed modification and outside of the construction footprint for the modified project.	Not inspected but high-level assessment as part of the Blackheath to Little Hartley upgrade project. Potential leaks and spills from storage of fuel, refuelling plant and machinery, maintenance activities on plant and machinery, and potential import of uncontrolled fill material to fill in mined areas.	Desktop assessment, December 2021 (Transport, 2023c)	Yes, based on proximity to the proposed modification
Stockpile	Located within proposed road upgrade, on the western boundary of construction ancillary facility 21.	Possible former stockpile location observed; however, material has been removed. Currently used as a stopping bay.	Stage 2 sampling, August-September 2021 (Transport, 2022i)	Yes, based on location within the proposed modification
Former Little Hartley Service Station	Located within proposed road upgrade, about 80 metres south-east of the junction of Coxs River Road.	Site currently undergoing construction following demolition of Lolly Bug confectionary store due to fire. Site inspection found no evidence of storage tanks or monitoring wells. However, it is noted in the Great Western Highway Mount Victoria to Lithgow Alliance (MV2LA) Corridor Study – Contaminated Land (MV2LA, 2011) that below ground fuel storage tanks and refuelling infrastructure was understood to remain at the front of the site. Possible septic tanks visible at rear of main building.	Stage 2 sampling, August-September 2021 (Transport, 2022i)	Yes, based on proximity to the proposed modification

Site name	Distance from proposed modification (approximate)	Comments	Last inspected date	Potential impacts to the proposed modification?
		Groundwater contamination (if present) could be exposed during excavation based on construction design and potential for shallow groundwater in area.		
Former Little Hartley Airfield	<p>Located about 130 metres north-west of construction ancillary facility 20.</p> <p>Located outside of the construction footprint for the proposed modification and partially within the construction footprint for the modified project.</p>	<p>Small airfield suitable for light aircraft located at rear of property.</p> <p>Perfluoro-octane sulfonic acid (PFOS) was detected in surface soil samples at the former Little Hartley airfield as part of the approved project Contamination Assessment between April and September 2021.</p>	Stage 2 sampling, August-September 2021 (Transport, 2022i)	Yes, based on proximity to the proposed modification
Former Little Hartley Motors	<p>Located about 430 metres north-west of the proposed modification.</p> <p>Located outside of the construction footprint for the proposed modification and adjacent to the construction footprint for the modified project</p>	Building now café (potentially closed). No observable evidence of fuel storage (e.g. vent pipes, fill points, surface scarring).	Stage 2 sampling, August-September 2021 (Transport, 2022i)	No, as there is sufficient distance between the site and proposed modification
Former Royal Hartley Hotel landfill	<p>Located about 400 metres east of construction ancillary facility 23.</p> <p>Located outside of the construction footprint for the proposed modification and within the construction footprint for the modified project.</p>	Site occupied by the Former Royal Hotel, which now acts as a historic tourist site. Some exposed rock and undulating ground which could indicate potential landfill waste location however not able to confirm.	April 2021, as part of the approved project Contamination Assessment	No, as there is sufficient distance between the site and proposed modification

Site name	Distance from proposed modification (approximate)	Comments	Last inspected date	Potential impacts to the proposed modification?
General: Hartley Historic Village – septic tanks	Located about 260 metres south-east of construction ancillary facility 23. Located outside of the construction footprint for the proposed modification and adjacent to the south of the construction footprint for the modified project	Septic tanks evident within village. Potential for other properties within alignment to also have septic tanks (private property inspections not undertaken).	Stage 2 sampling, August-September 2021 (Transport, 2022i)	No, as there is sufficient distance between the site and proposed modification
Former Corney's Garage	Located about 220 metres south of construction ancillary facility 23. Located outside of the construction footprint for the proposed modification and outside of the construction footprint for the modified project.	Former garage in Hartley historic village. No observable evidence of fuel/oil storage and use (e.g. vent pipes, fill points, surface scarring).	Stage 2 sampling, August-September 2021 (Transport, 2022i)	No, as there is sufficient distance between the site and proposed modification
Former mining operations – River Lett (location unknown)	River Lett – immediately adjacent to construction ancillary facility 23. Crosses through the construction footprint for the modified project immediately south	Potential contamination associated with mining operations. No ore processing understood to have occurred or visual evidence of tailings/ stockpiles.	Stage 2 sampling, August-September 2021 (Transport, 2022i)	Yes, based on proximity to the proposed modification
Farm works (cattle loader/ sheep dips)	Located about 260 metres south-west of construction ancillary facility 24.	Cattle loader observed on properties next to existing road, indicative of agricultural land use.	Stage 2 sampling, August-September 2021 (Transport, 2022i)	No, as there is sufficient distance between the site and proposed modification

Site name	Distance from proposed modification (approximate)	Comments	Last inspected date	Potential impacts to the proposed modification?
	Located outside of the construction footprint for the proposed modification and within the construction footprint for the modified project.			and proposed modification
Fernhill former bullock team camp waste burial	Located on the northern boundary of construction ancillary facility 25.	Waste disposal at Bullock Team Camp Sites in Fernhill from the 19th and 20th Centuries.	Stage 2 sampling, August-September 2021 (Transport, 2022i)	Yes, based on proximity to the proposed modification
Steel drums near side of road	About 120 metres north of construction ancillary facility 25. Located outside of the construction footprint for the proposed modification and outside of the construction footprint for the modified project.	Steel drums (inferred empty) observed on properties next to existing road, indicative of agricultural land use.	April 2021 (Transport, 2021f)	No, as there is sufficient distance between the site and proposed modification
General: current road corridor	Road corridor within the construction footprint of the modified project.	Potential contamination associated with vehicle emissions, fuel spills, and bitumen surface.	December 2021 (between the base of Victoria Pass and 100 metres east of Coss River Road) (Transport, 2023c). April 2021 (remainder of the construction footprint for the approved project) (Transport, 2021f)	Yes, based on proximity to the proposed modification

Site name	Distance from proposed modification (approximate)	Comments	Last inspected date	Potential impacts to the proposed modification?
General: agricultural land use	Agricultural land and waterways within the construction footprint of the modified project.	<p>Potential contamination associated with use of herbicides, pesticides, fuel, machinery, sheep/ cattle dips, and waste disposal.</p> <p>Five areas of agricultural land use across all study areas exhibited elevated total coliforms when compared to the biosolids guidelines (NSW EPA, 2000). The elevated total coliform numbers are likely due to the presence of livestock and other fauna in these areas</p>	<p>December 2021 (between the base of Victoria Pass and 100 metres east of Coss River Road) (Transport, 2023c).</p> <p>April 2021 (remainder of the construction footprint for the approved project) (Transport, 2021f)</p>	Yes, based on proximity to the proposed modification

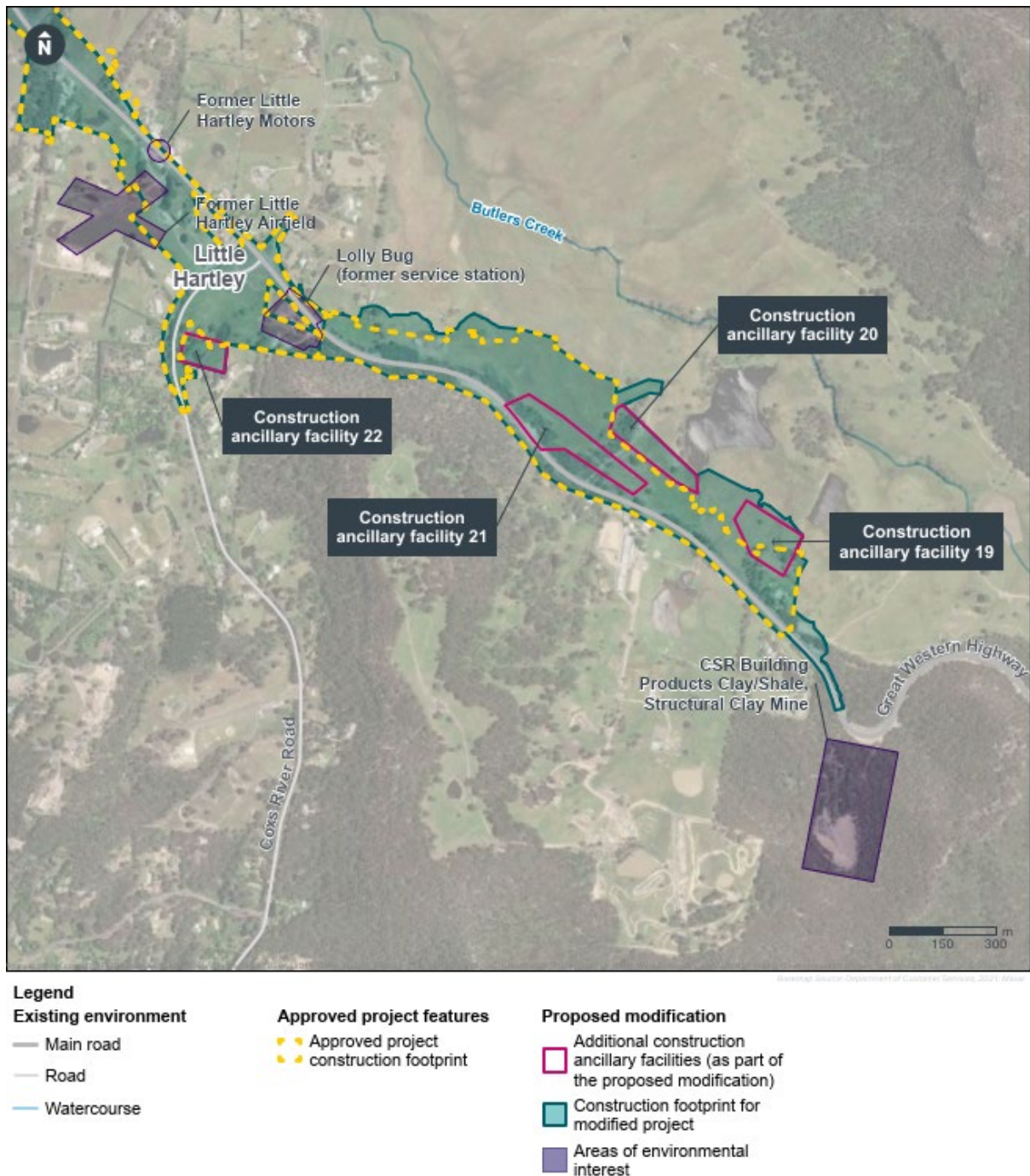
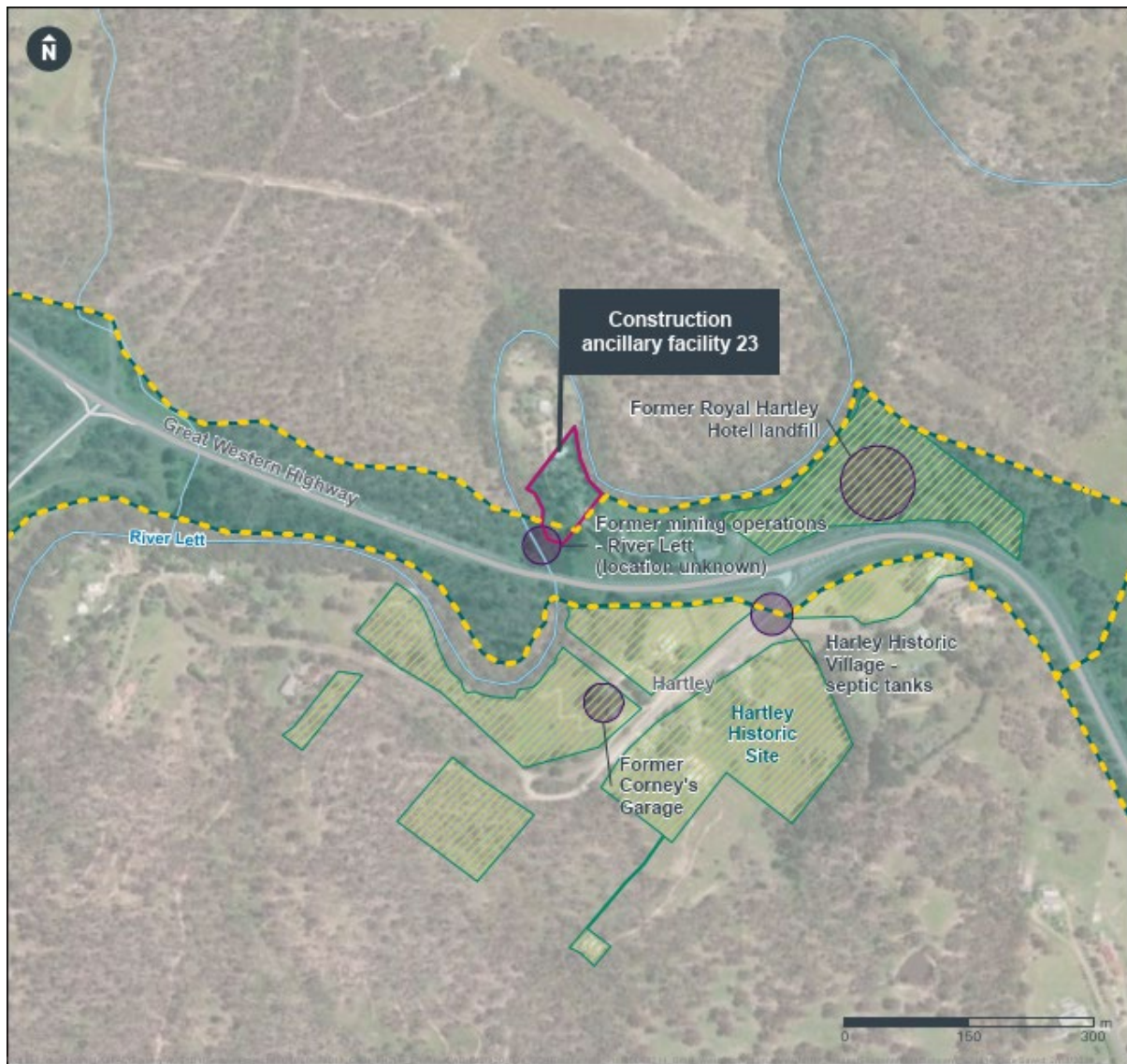
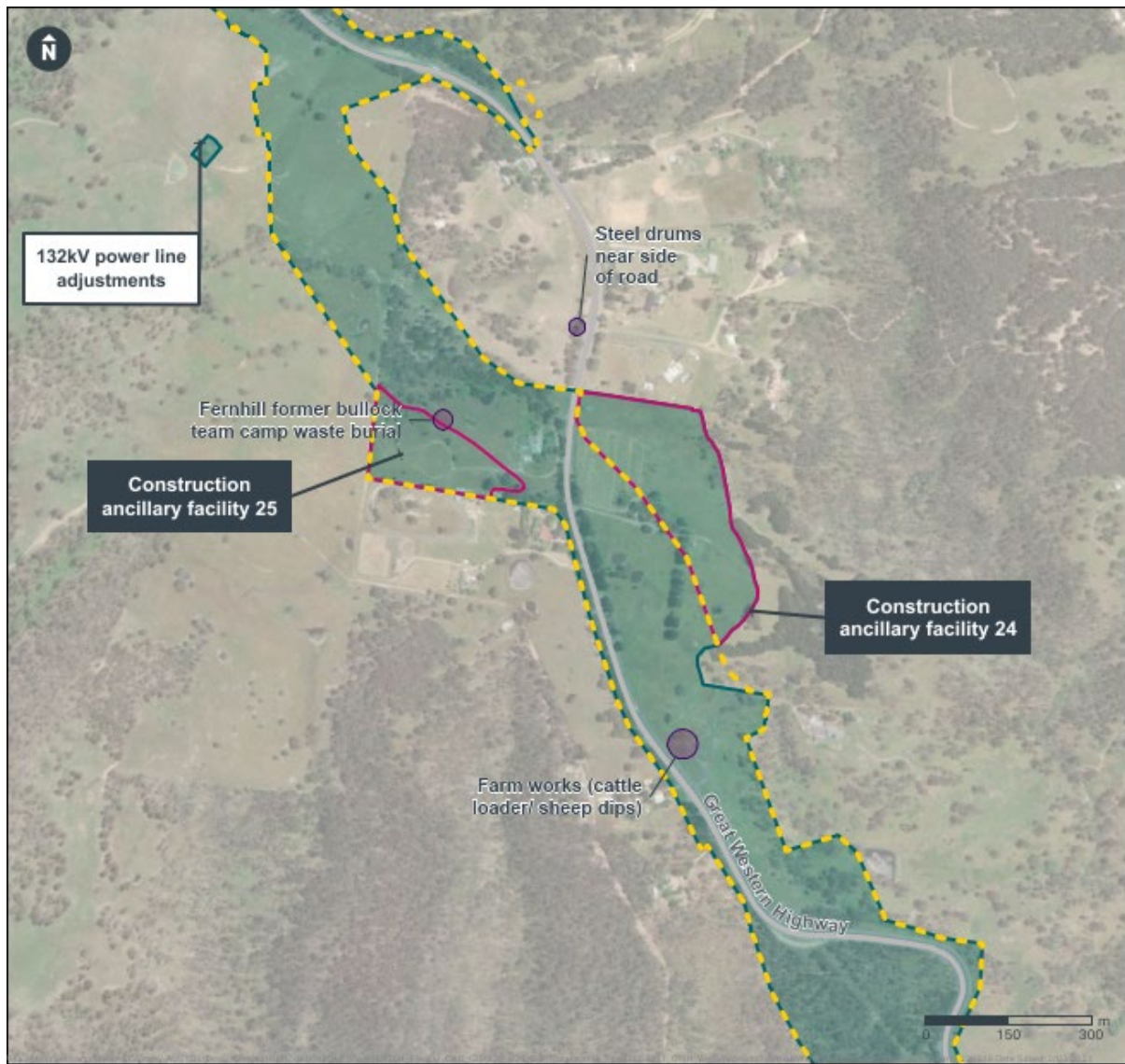


Figure 6-14a Areas of environmental interest



Legend		
Existing environment		
— Main road		
— Road		
— Watercourse		
▨ National Parks and Reserves		
Approved project features		
♦ ♦ Approved project		
♦ ♦ construction footprint		
Proposed modification		
▭ Additional construction ancillary facilities (as part of the proposed modification)		
▭ Construction footprint for modified project		
● Areas of environmental interest		

Figure 6-14b Areas of environmental interest



Legend		
Existing environment		
— Main road		
Approved project features		
Approved project		
construction footprint		
Proposed modification		
Additional construction ancillary facilities (as part of the proposed modification)		
Construction footprint for modified project		
Areas of environmental interest		

Figure 6-14c Areas of environmental interest

6.10.3 Potential impacts

Construction

Soils impacts

Construction activities for the proposed modification are consistent with those listed in Section 3.3.1 of the approved project REF. General construction activities that have the potential to impact soil erosion and sedimentation are consistent with those presented in the approved project REF. While the proposed modification increases the extent of works required, the earthworks for the proposed modification would be similar to the estimates provided and assessed in the approved project REF. Potential impacts associated with soils from construction of the proposed modification are generally consistent with those presented in the approved project REF and would include impacts such as soil erosion and surface water runoff, and leaks, spills, and disturbance of potentially contaminating materials into receiving environments. In summary, impacts associated with soils from construction of the proposed modification are no greater than what was concluded in the approved project REF, and the existing soils measures are considered adequate to manage the potential impacts of the modified project.

Acid sulfate soils and rock

Potential impacts related to acid sulfate rock are outlined in Section 6.6.3 of the approved project REF and include oxidation of potential acid sulfate rock producing sulfuric acid, resulting in potential impacts to groundwater and/ or surface water quality. The entire area of the proposed modification between the base of Victoria Pass and 100 metres east of Coxs River Road has low potential for acid sulfate soils and rock. As there may be acid sulfate rock in the area of the proposed modification, the potential impacts would be consistent with those assessed in the approved project REF.

Soil erosion

Soil erosion may result from the loss of topsoil, removal of vegetation (clearing and rubbing), and disturbance of the ground surface during site preparation, earthworks, excavation, and other construction activities. Earth-moving activities could also expose loose soils and mobilise these materials. Erosion and sediment transport during significant weather events could also cause sediment to flow offsite impacting land uses and the water quality of surrounding waterways (through, e.g., increased levels of turbidity, nutrients, metals, and other pollutants). Construction at waterway crossings could also result in erosion and sedimentation that directly impact waterways, creeks, and aquatic ecosystems. Inadequately controlled stockpiles would be subject to water and wind erosion and could become a source of sediments that impact waterbodies and off-site areas, if uncontrolled.

As shown in Table 6-36, the Round Mount soil landscape has extreme water erosion hazard, and the Cullen Bullen soil landscape has high water erosion hazard. This would mean that the following areas may have extreme water erosion hazard (from east to west):

- *High erodibility rating:* Construction ancillary facility 20
- *Moderate to high erodibility rating:* Areas to support upgrades to existing Great Western Highway and formalisation of Berghofers car park; areas to support road, new bridge and basin construction; local property access; and construction ancillary facility 19
- *Low to moderate erodibility rating:* Construction ancillary facilities 22, 21, and 23.

Soil contamination

Construction of the proposed modification has the following potential impacts associated with soil contamination:

- *Spills of contaminating materials:* There is potential for construction activities to result in contamination of soils due to leaks and spills of potentially contaminating materials
- *Disturbance of contaminated soil.* Where potential sources of contamination exist within the construction footprint for the modified project, there is potential for contaminated soil to be moved, and for contaminants to leach from soils into receiving environments (see below). Disturbance of potentially contaminated materials may also expose construction workers and/ or the general public to contaminants if appropriate controls are not implemented.

Sources of existing contamination

Areas of Environmental Interest (AEI) and potential contamination pathways for the proposed modification are provided in Figure 6-14 and outlined in Appendix K (Areas of Environmental Interest and potential for contamination). The following construction areas/ activities have been identified as having a moderate to high contamination impact potential:

- Cuts, bridge construction (potential piling), and construction of water quality control basins near Coxs River Road have a high impact potential to construction worker health, operational users, and the environment associated with soil and/ or groundwater contamination and contaminated vapour that may be present from underground fuel storage associated with the former service station adjacent to the alignment
- Disturbance of soil stockpiles is considered to represent a moderate impact potential to construction worker health or the environment (if contamination is present)
- Disturbance of contaminated soil or groundwater (if present) in the vicinity of River Lett during construction (cuts or construction of the new bridge) or as a result of ongoing groundwater seepage during operation due to historic mining operations (exact location unknown) has been assessed as representing a moderate impact potential to construction worker health, the environment or ongoing operations
- Disturbance of soil through agricultural areas is considered to represent a moderate impact potential to construction worker health or the environment if waste dumping/ burial, sheep/ cattle dips, septic tanks and chemical or fuel use and storage are disturbed during construction.

Operation

Soil impacts

No further soil impacts during operation are expected from what is presented in the approved project REF. During the operational phase of the modified project, the site would be completely stabilised. All roads, bridges, batters, median strips, and drainage channels would either be sealed or would have been stabilised with topsoil, hydromulching, landscaping or other scour protection. The potential for erosion and sedimentation during the operation stage is therefore anticipated to be negligible.

Soil contamination impacts would generally be associated with contaminated run-off, which may arise from normal vehicle operation (i.e. tyre wear, minor leaks of lubricants and fuels), maintenance practices, or a spill or accident.

Maintenance activities undertaken during operation, such as the management of vegetation, the cleaning of culverts and table drains, and the use of vehicles unpaved areas, have the potential to disturb soils. The use of vehicles during maintenance also has the potential to cause the spill of chemicals or fuels. The potential impacts associated with maintenance

activities would be minimised by adherence to relevant Transport (Roads and Maritime Services) specifications and the risk of impacts would be relatively low due to the infrequent nature of the activities.

Existing soil contamination

No further contamination of soils during operation is expected from what is presented in the approved project REF. Where existing soil contamination has been identified within the operational areas of the modified project and is to be managed onsite (i.e. reuse of potentially contaminated stockpiled material), appropriate environmental management plans will be prepared and implemented.

Implementation of appropriate environmental management plans would reduce the potential impacts from contaminated soil associated with the operation of the modified project.

Potential contamination of soils within and directly adjacent to the operational areas of the modified project could occur as a result of spills and leaks of hydrocarbons from vehicles, deposition of vehicle particulates, and accidents during operation.

Existing groundwater contamination

No further contamination of groundwater during operation is expected from what is presented in the approved project REF. Where existing groundwater contamination has been identified within and/ or adjacent to the operational areas of the modified project, appropriate engineering controls would need to be installed to either remove the risk of contaminated groundwater ingress (i.e. seepage of contaminated groundwater from cuts) or manage the risk to receptors via appropriate treatment prior to disposal, discharge, or reuse.

Implementation of appropriate engineering controls would reduce the potential impacts from contaminated groundwater to the operation of the modified project and receptors from discharge.

Potential contamination of groundwater within and directly adjacent to the modified project could occur as a result of spills and leaks of hydrocarbons from vehicles and accidents during operation.

Vapour

No further risk of vapour ingress during operation is expected from what is presented in the approved project REF. Where soil or groundwater contamination with volatile chemicals is present within and/ or adjacent to the operational areas of the modified project, appropriate engineering controls would be installed to reduce the ongoing risk of vapour ingress. Engineering controls could include surface or sub-surface extraction, or remediation of the contaminated soil or groundwater.

Implementation of appropriate engineering controls would reduce the potential impacts from vapour to the operation of the modified project.

6.10.4 Safeguards and management measures

No changes are proposed to the soils and contamination safeguards and management measures in the Submissions Report as a result of the proposed modification. Other safeguards and management measures that would address soil and contamination impacts are identified in Section 6.6 (Groundwater) and Section 6.7 (Hydrology and flooding). A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

6.11 Socio-economic

This section provides an assessment of the potential socio-economic impacts of the proposed modification during construction and operation and identifies if revised or additional safeguards or management measures are required.

6.11.1 Methodology

The socio-economic assessment methodology for the approved project is outlined in Section 6.10 of the approved project REF. Additional activities carried out to assess the potential socio-economic impacts of the proposed modification included:

- Scoping of the potential socio-economic issues for the proposed modification and identification of communities likely to be affected by the modified project
- Review and update (where required) of existing socio-economic conditions presented in the approved project REF, including information from the Australian Bureau of Statistics (ABS) Census of Population and Housing 2021, information from Government agencies and councils, and public consultation, and update where required
- Review of community feedback from updated concept design consultation in October and November 2022 (refer to Chapter 5 (Consultation))
- Identifying, assessing, and evaluating the potential impacts and benefits to socio-economic values from the proposed modification's construction and operation using the evaluation criteria outlined in Section 2 of Appendix M (Land use, property and socio-economic) of the approved project REF (Transport, 2021g)
- Review of existing mitigation measures for the approved project, and identification of any revised and/or additional measures required.

Study area

As the operational and construction changes proposed as part of the proposed modification construction would be generally dispersed across three discrete locations, this assessment has been split into these three sub-areas:

- Portal to Coxs River Road, to capture the operational changes of the proposed modification between the base of Victoria Pass and 100 metres east of Coxs River Road, and the addition of construction ancillary facilities 19 to 22
- Hartley Historic Site, to capture the addition of construction ancillary facility 23
- River Lett Hill, to capture the addition of construction ancillary facilities 24 and 25.

Impact assessment evaluation matrix and criteria

The socio-economic assessment for the proposed modification has adopted the same impact assessment evaluation matrix and criteria as Appendix M (Land use, property and socio-economic) of the approved project REF (Transport, 2021g).

6.11.2 Existing environment

This section provides a summary of population, housing, and socio-economic status of communities in the study area and wider region. Very little information has changed since the publication of the approved project REF; however, ABS data from the 2021 census was released in June and October 2022, which provides more recent data that was incorporated into the approved project REF.

Study area

The study area for the existing environment is the same as that presented in the approved project REF.

Regional existing environment

The socio-economic profile of the local community near the proposed modification based on 2021 Census data and other data from the ABS is outlined in Table 6-95 of the approved project REF. Changes in the socio-economic profile of the study area since the approved project REF are as follows:

- A total of 2,433 people live in the study area, of which half live in South Bowenfels (458 more than that presented in the approved project REF)
- A total of 1,085 households are located in the study area, of which about half are in South Bowenfels (324 more than that presented in the approved project REF)
- About 10 per cent of private dwellings are unoccupied
- Main occupations include professionals, managers, technicians and trades workers, clerical and administrative workers, and community and personal service workers
- Five people in South Bowenfels travelled to work by public transport, and no one in Hartley and Little Hartley travelled to work by public transport.

There were 1,335 registered businesses in the Lithgow City Council LGA in 2021 (ABS, 2022). Of these, about 19.7 per cent were construction related businesses, which made up about 16.9 per cent of NSW construction related businesses. About 18.7 per cent were agriculture, forestry, and fishing related businesses, and about 7.7 per cent were transport, postal, and warehousing related businesses.

Tourism is an important industry within the study area and surrounding Blue Mountains. In 2019 (prior to Covid), there were about 4.6 million overnight and daytrip visitors to the Blue Mountains Tourism Region (which includes the proposed development site) (Tourism Research Australia, 2021).

The Great Western Highway is important to the local community in connecting the area with Sydney in the east and Bathurst in Central West NSW. The highway is an important east-west connection for road freight, tourists and communities and towns along its length. Other important road links include Jenolan Caves Road, Darling Causeway and Hartley Valley Road. Communities in the study area and surrounding region are also serviced by the Blue Mountains Line (BMT), which provides regular intercity train services between central Sydney and Lithgow and regional train services to Bathurst, Dubbo, Parkes, and Broken Hill. The private bus, no. 100, operates between South Bowenfels and Lithgow.

Overall, the community values of the region, including the local character, amenity, and identity, are influenced by the area's natural features, nearby World Heritage Area, rural landscapes and lifestyles, and cultural and historic heritage of townships located along the Great Western Highway. These features offer a range of scenic amenity, environmental and recreational values that are important for tourists and visitors and provide economic and employment benefits for residents and business owners. The region's scenic amenity and landscape values contribute to the study area's sense of place. The protection of important outlooks and view sheds and the study area's rural setting are important to local communities.

Local existing environment

A brief summary of the existing socio-economic environment at the three sub-areas relevant to the proposed modification are presented in Table 6-38 to Table 6-40.

Table 6-38 Existing socio-economic environment – Portal to Coxs River Road

Socio-economic criteria	Description
Local business	<ul style="list-style-type: none"> • Visitor accommodation • Restaurants • Retail, including the Lolly Bug, Maple Springs Nursery and Gardens, and Mere Pantry and Store.
Social infrastructure	<ul style="list-style-type: none"> • None
Local access and connectivity	<ul style="list-style-type: none"> • Great Western Highway • Local roads including Coxs River Road, Ambermere Drive, and unnamed private roads • No bus or rail services.
Community values	<ul style="list-style-type: none"> • Local character and amenity which is influenced by rural character and lifestyle with large rural property holdings • Little Hartley village which supports businesses and is a focus for the community • Quietness of the area, access to open space, natural bushland, and wildlife • Heritage places of local and state significance.

Table 6-39 Existing socio-economic environment – Hartley Historic Site

Socio-economic criteria	Description
Local business	<ul style="list-style-type: none"> • Visitor accommodation in historic properties • Retail uses • Hartley Historic Village Visitor Centre.
Social infrastructure	<ul style="list-style-type: none"> • St John the Evangelist Anglican Church • Hartley Historic Village Visitor Centre.
Local access and connectivity	<ul style="list-style-type: none"> • Great Western Highway • Local roads including Old Great Western Highway, Kelly Street, Walker Street, Pumphouse, and unnamed private roads • No bus or rail services.
Community values	<ul style="list-style-type: none"> • Large areas of natural bushland and scenic landscapes that are interspersed with rural land uses including larger rural property holdings and areas of rural residential uses at Hartley • Hartley Historic Village is highly valued by local and regional communities as one of the first rural settlements west of Blue Mountains. Key heritage buildings include the courthouse, Royal Hotel, St Bernard's Catholic Church and Presbytery, St John the

Socio-economic criteria	Description
	<p>Evangelist Anglican Church, the former Shamrock and Farmers inns, the Finn residence of Bungarribee, Carney's cottage and garage and Ivy cottage</p> <ul style="list-style-type: none"> Tourism to Hartley Historic Village and surrounding heritage places of local and state importance such as Fernhill, Sunnyside Cottage and Hassans Walls Stockade and Barracks.

Table 6-40 Existing socio-economic environment – River Lett Hill

Socio-economic criteria	Description
Local business	<ul style="list-style-type: none"> Visitor accommodation
Social infrastructure	<ul style="list-style-type: none"> None
Local access and connectivity	<ul style="list-style-type: none"> Great Western Highway Local roads including several unnamed private roads No bus or rail services.
Community values	<ul style="list-style-type: none"> Large areas of natural bushland and scenic landscapes that are interspersed with rural land uses including larger rural property holdings and areas of rural residential uses at Hartley

6.11.3 Potential impacts

Construction

While the nature of socio-economic impacts during construction would be consistent with those assessed in the approved project REF, key differences would include the potential for temporary property access changes during construction and additional construction sites potentially discouraging some people from using holiday accommodation during construction. These impacts would present very similar impacts to the same receivers as considered in the approved REF. Therefore, the socio-economic construction impacts of the proposed modification are no greater than what was concluded in the approved project REF, and the existing socio-economic measures are considered adequate to manage the potential impacts of the modified project.

Operation

While the nature of socio-economic impacts during operation would be consistent with those assessed in the approved project REF, key changes would include formalisation of Berghofers car park providing greater visibility of and access to Berghofers trail, therefore providing a social infrastructure benefit in the area. In summary, the socio-economic operational impacts of the proposed modification are generally consistent with what was concluded in the approved project REF, with additional benefits from provision of the Berghofers car park formalisation.

6.11.4 Safeguards and management measures

No changes are proposed to the socio-economic safeguards and management measures in the Submissions Report as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

6.12 Air quality

This section provides a summary of the assessment of potential air quality impacts during construction and operation of the proposed modification.

6.12.1 Methodology

The air quality assessment for the proposed modification involved:

- Identification of key air quality related risks related to construction and operation of the proposed modification
- Review and update (where required) existing air quality conditions presented in the approved project REF for currency and relevance to the proposed modification
- Identification of sensitive receivers that may be adversely affected by the proposed modification. A study area of 500 metres from the construction footprint of the modified project was used during the identification of the sensitive receivers.
- A qualitative assessment of potential air quality impacts during construction and operation of the proposed modification
- Review of existing mitigation measures for the approved project, and identification of any revised and/ or additional measures required.

6.12.2 Existing environment

The nearest automatic weather station (AWS) with long-term records relevant to the proposed modification is located at Marrangaroo, around 17 kilometres to the north. An additional AWS was also identified at the Austen Quarry approximately four kilometres to the southwest of the proposed modification.

Meteorological conditions

Key meteorological statistics recorded at the station for the last two years are summarised in Table 6-41.

Table 6-41 Local meteorological statistics (Marrangaroo and Austen Quarry)

Statistic	Marrangaroo		Austen Quarry	
	2021	2022	2021	2022
Average wind speed (m/s)	1.6	1.7	ND	1.5
Mean maximum wind gust (m/s)	18.1	16.7	ND	15.8
Calm percentages (%)	29.1	24.4	ND	28.3
Note	ND refers to no data available for the calendar year			

Hourly records of wind speed and wind direction were examined in the approved project REF and the data showed that the wind speed statistics do not vary significantly from year to year. Wind patterns in the vicinity of the proposed modification are characteristic of the western foothills of the Blue Mountains, with the prevailing winds being from the east and west with higher calm percentages than are observed at the top of the Blue Mountains. High calm percentages occur consistently across the year with the highest proportion of calm conditions occurring during March and April.

These trends indicate that receivers located to the east and west of the proposed modification have the highest likelihood of experiencing impacts associated with emissions to air generated by the proposed modification. Different times of year also have a higher potential for impacts when calm percentages are higher (as calm conditions typically result in poor pollutant dispersion).

Air quality conditions

DPE has established a network of monitoring stations across NSW to understand current air quality conditions and impacts, and to help identify programs to improve air quality. The closest long term air quality monitoring stations to the proposed modification are located at Richmond (Sydney North-west), Bathurst (Central Tablelands), and Camden (Sydney south-west). In order to understand the expected existing air pollutant concentrations for the area around the proposed modification, data from the DPE stations were examined and compared to relevant impact assessment criteria in Section 6.13.2 of the approved project REF. These background levels are appropriate for use in this addendum REF and are presented in Table 6-42.

Table 6-42 Background concentrations applied in the vicinity of the modified project

Pollutant	Averaging time	Maximum background level	Notes
CO	1-hour	5,635 µg/m ³	Maximum 1-hour concentration from DPE Camden (2018 to 2022)
	8-hour	2,990 µg/m ³	Maximum 8-hour concentration from DPE Camden (2018 to 2022)
NO₂	1-hour	70 µg/m ³	Maximum 1-hour concentration from DPE Richmond (2016 to 2020)
	Annual	9.8 µg/m ³	Highest annual concentration from DPE Richmond (2016 to 2021)
PM₁₀	24-hour	29.2 µg/m ³	Maximum concentration was representative of peak 24-hour concentrations in 2021 and 2022 from DPE Bathurst, noting that data collected between 2018 and 2020 were affected by drought, dust storms and severe bushfires. Air quality data from DPE Bathurst is considered to be more representative of the proposal area than DPE Richmond which is located to the east within the Sydney Greater Metropolitan Area (GMA).
	Annual	11.3 µg/m ³	Highest annual concentration from DPE Bathurst between 2021 and 2022 noting the issues with the data collected in 2018 and 2020, and preference compared to DPE Richmond outlined above.
PM_{2.5}	24-hour	13.8 µg/m ³	As above for 24-hour averaged PM ₁₀ .
	Annual	5.1 µg/m ³	As above for annually averaged PM ₁₀ .

Subsequent to the assessment undertaken in 2021, Transport undertook ambient monitoring as part of the Blackheath to Little Hartley Upgrade project. Of the monitoring undertaken, data collected at Little Hartley was considered relevant to the proposed modification. As of the preparation of this document, 4.5 months of data had been collected which are summarised in Table 6-43.

Table 6-43 Background concentrations applied in the vicinity of the proposed modification

Pollutant	Averaging period	Units	DPE Data	Little Hartley	NSW EPA criteria
NO₂	1 Hour Max	mg/m ³	69.6	29.3	164
	All Hours Average *	mg/m ³	9.8	5.8	31
CO	1 Hour Max	mg/m ³	5,635	1,174	30,000
	8 Hour Max	mg/m ³	2,990	1,156	10,000
PM₁₀	24 Hour Max	mg/m ³	29.2	22.5	50
	Annual Average	mg/m ³	11.3	6.7 ¹	25
PM_{2.5}	24 Hour Max	mg/m ³	13.8	11.8	25
	Annual Average	mg/m ³	5.1	3.5 ¹	8
Notes	* Annual average for the Little Hartley cannot be calculated as significantly less than 12 months of data (<90% data capture rate) was collected. All hours average has been used as a proxy for annual average				

Pollutant concentrations measured at Little Hartley were all lower than the concentrations measured at the DPE Bathurst and DPE Camden stations. Although the Little Hartley concentrations only represent a sub-set of a full year of data, measured values suggest the pollutants in the area of the proposed modification are lower than those adopted in the approved project REF and therefore the approved project REF assessment is conservative.

Existing receptors

The closest human sensitive receivers to the proposed modification are presented in Table 6-38 to Table 6-40, in Section 6.11.2 (Socio-economic). These include:

- Rural homesteads and residences
- Visitor accommodation
- Hartley Historic Site
- Places of worship
- Social infrastructure, including St John the Evangelist Anglican Church and Hartley Historic Village Visitor Centre.

6.12.3 Potential impacts

Construction

The key air quality issue during construction of the proposed modification is expected to be dust generation and blast fumes. Construction dust emissions have the potential to cause nuisance and health impacts if not managed properly. Dust impacts during construction would primarily result from the following:

- Earthworks
- Vegetation clearing
- Topsoil stripping
- Soil stockpiling
- Blasting
- General material handling
- Driving on unsealed roads
- Redundant assets and structures demolition.

As stated in Section 3.3.4 (Earthworks), cut and fill earthworks would be required for the proposed modification, and for establishing the five new construction ancillary sites. Earthworks for the modified project would be largely consistent with the estimates provided and assessed in the approved project REF (earthworks would require about 1,547,000 cubic metres of excavation and about 2,273,000 cubic metres of fill). Therefore, the air quality impacts from the temporary increase in particulate matter due to movement of soils would be largely consistent with those identified in Section 6.13.3 of the approved project REF.

The exhaust fumes from the use of the additional plant, equipment, and vehicles may have a minor impact to local air quality. This impact, however, would generally be consistent with the air quality impacts described in the approved project REF and present a relatively low risk of harm to the environment.

Blasting would be required as part of the modified project, with a significant amount of blasting to occur through the deep cut at River Lett Hill. The same amount of blasting would be required for the modified project as was approved as part of the approved project REF with the only proposed change being the implementation of a faster program.

There is potential for odours and impacts from uncovered contaminated and/ or hazardous materials, and other airborne hazardous materials, which may be generated during demolition and excavation activities. These risks may also be present during excavation works, noting the presence of potentially contaminated soils and areas of illegal dumping within the construction footprint. It is not considered that these impacts would be any greater than what was described in the approved project REF.

Operation

The proposed modification is not expected to result in changes to the significance of potential air quality impacts identified in the approved project REF.

The Little Hartley to River Lett section of the operational air quality assessment in the approved project REF covers the area subject to the proposed modification during operation. The approved project REF identified that the Great Western Highway would move around 20 metres closer in this section to some receivers as a result of the proposed modification. This was identified to result in a potential increase in 24-hour average PM₁₀ concentrations greater than the EPA's 50 micrograms per cubic metre criterion at one sensitive receiver (R13). The proposed modification would result in a further shift of the Great Western

Highway of around 30 metres closer to this receiver, however as outlined in Section 6.9 (Property and land use), this receiver is now being acquired by Transport to facilitate the proposed modification and is therefore no longer a relevant receptor.

Concentrations of other pollutants with the modified project in 2026 and 2036 are expected to remain below the relevant EPA assessment criteria, consistent with the outcomes of the approved project REF.

As discussed in Section 6.1, the traffic and transport impacts related to the proposed modification upon the existing and planned road network would mostly be the same as the approved project REF. As such, impacts to air quality as a result of changes in traffic volumes would remain consistent with that presented in the approved project REF. No new traffic analysis has been conducted as part of the addendum REF.

6.12.4 Safeguards and management measures

No changes are proposed to the air quality safeguards and management measures in the Submissions Report as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

6.13 Other impacts

The approved project REF also assessed the potential impacts for the following environmental factors:

- Bushfire
- Waste
- Sustainability, greenhouse gas and climate change.

6.13.1 Existing environment and potential impacts

The existing environment and potential impacts for other relevant environmental factors are outlined in Table 6-44.

6.13.2 Safeguards and management measures

No changes are proposed to the other environmental safeguards and management measures in the Submissions Report as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

Table 6-44 Potential impacts for the other environmental factors

Environmental factor	Existing environment/ context	Potential impacts
Bushfire	<p>The existing environment for bushfire risks for the proposed modification is consistent with that outlined in Section 6.14.2 of the approved project REF.</p> <p>The Lithgow Bush Fire Management Committee area has, on average, 128 bush or grass fires each year, of which about three per year develop into major fires (>20 ha). The majority of the modified project is located on Category 3 land (medium bushfire risk). Construction ancillary facilities 23 and 25 are located partially on Category 1 land (the highest risk of bushfire).</p>	<p>Construction</p> <p>During construction, vegetation would be cleared within the proposed modification site area, with a clear zone of 10 to 14 metres for portions of the road with design speeds of 90 km/h and 110 km/h respectively. In the event of a fire, emergency services would be able to gain access via the existing Great Western Highway or tracks used for construction activities. The mitigation measures presented in Section 4 of Appendix P (Bushfire Assessment Report) would be applied for construction of the modified project. It is not considered that bushfire risks would be any greater than what was described in the approved project REF. Potential impacts would be appropriately managed by the EMMs outlined in the approved project REF and no further mitigation measures are required.</p> <p>Operation</p> <p>As per the approved project REF, bushfire risks associated with operation of modified project are anticipated to be less than construction due to improvements in road safety and greater separation of road users from bushfire fuel hazards. Potential impacts would be appropriately managed by the EMMs outlined in the approved project REF and no further mitigation measures are required.</p> <p>The proposed modification would improve resilience of the network during fire events with the addition of the eastbound bridge connection to the existing Great Western Highway, which would provide an alternative route for vehicles which may need to exit the new Great Western Highway during emergency road closures.</p>

Environmental factor	Existing environment/ context	Potential impacts
Waste	The background and legislative framework and guidelines for waste is consistent with that outlined in Section 6.15.1 of the approved project REF.	<p>Construction</p> <ul style="list-style-type: none"> • The waste types likely to be generated from the proposed modification during construction are consistent with those for the approved project, including: <ul style="list-style-type: none"> ○ Spoil and excavation waste ○ Green waste ○ Demolition waste ○ Excess building materials ○ Liquid waste ○ General waste ○ Contaminated material ○ Wastewater ○ Redundant erosion and sediment controls. <p>These waste types could have potential impacts in terms of:</p> <ul style="list-style-type: none"> • Excessive volumes of waste generated on-site • Excessive volumes of waste sent to landfill from the inadequate collection, classification, and disposal of waste • Contamination of soil, surface water, and groundwater from inadequate waste handling (refer to Sections 6.6, 6.7, and 6.10). <p>However, these impacts would be no greater than what was described in Section 6.15 of the approved project REF and the existing waste mitigation measures are considered adequate to manage the potential impacts of the proposed modification.</p>

Environmental factor	Existing environment/ context	Potential impacts
		<p>Operation</p> <p>During operation, there would be limited wastes produced from use and maintenance of the road. Potential impacts would be appropriately managed by the EMMs outlined in the approved project REF and no further mitigation measures are required.</p>
<p>Sustainability, greenhouse gas, and climate change</p>	<p>The existing sustainability, greenhouse gas and climate change environment is consistent with that outlined in Section 6.16.2 of the approved project REF.</p> <p>The <i>Great Western Highway Upgrade Environment and Sustainability Policy</i> has been developed to articulate the modified project's commitment to sustainable outcomes. This policy, plus the <i>Transport for NSW Environment and Sustainability Policy</i> (Transport, 2020b), have been followed in the design of the proposed modification.</p> <p>In terms of climate change, over the course of the 21st century, the Central West and Orana Region is expected to become warmer, wetter, and subject to more extreme weather conditions.</p>	<p>Construction</p> <p>As per the approved project REF, the following six principals would be followed to govern the environmental and socio-economic outcomes and performances for the modified project:</p> <ul style="list-style-type: none"> • Demonstrate leadership • Tackle climate change • Manage resources efficiently • Drive supply chain best practice • Value community and customers • Respect the environment. <p>Greenhouse gas emissions during the construction phase of the modified project are generally consistent with those estimated for the approved project as traffic volumes, materials, fuel consumption and vegetation clearance is expected to be generally consistent with the estimates in the approved project REF. Greenhouse gas emissions are projected to be predominately sourced from the embedded emissions of the materials used to construct the modified project, followed by fuel combustion.</p> <p>Operation</p> <p>Traffic emissions dominate the emissions of the maintenance and operation phase of the modified project.</p>

Environmental factor	Existing environment/ context	Potential impacts
		<p>Climate change impacts of the modified project are generally consistent with those assessed for the approved project in Section 6.16 of the approved project REF. Findings of the Climate Change Risk Assessment for the modified project would be used to inform further design considerations, mitigation measures and management plans regarding flooding in and around the modified project alignment. Potential impacts would be appropriately managed by the EMMs outlined in the approved project REF and no further mitigation measures are required.</p>

6.14 Cumulative impacts

This section provides an assessment of potential cumulative impacts during construction and operation of the modified project.

6.14.1 Methodology

Cumulative impacts occur when two or more projects are carried out in proximity and concurrently to one another. The impacts may be caused by both construction and operational and activities. This can result in greater impact to the surrounding area that would be expected if each project was carried out in isolation.

Projects were identified for consideration in the cumulative impact assessment if they met the screening criteria in Section 6.17 (Cumulative impacts) of the approved project REF.

For the purpose of this addendum REF, the following steps were undertaken for the cumulative impact assessment:

- Review of projects included in the approved project REF and the potential cumulative impacts identified
- Updated search of DPE Major Projects Register, Transport, Lithgow City Council, and other government agencies or infrastructure providers websites to identify any new project information of additional potential projects for consideration in the cumulative impact assessment (applying the screening criteria from Section 6.17 (Cumulative impacts) of the approved project REF)
- Assessment of the potential cumulative impacts of the modified project, including impacts due to the revised construction program for the project (refer to Chapter 3 (Description of the proposed modification))
- Identification of any revised or additional mitigation measures required to manage the potential cumulative impacts of the modified project.

6.14.2 Projects included in the cumulative impact assessment

Projects identified for consideration in the cumulative impact assessment for the approved project are listed below and described in Section 6.17 of the approved project REF:

- New Intercity Fleet Springwood to Lithgow Rail Corridor Modifications
- Mount Victoria Village Safety Upgrade
- Hartley Valley to Forty Bends road safety improvements
- Forty Bends upgrade
- McKanes Bridge upgrade
- Medlow Bath Upgrade
- Katoomba to Blackheath Upgrade
- Great Western Highway Blackheath to Little Hartley Upgrade.

These projects have also been considered for the cumulative impact assessment for the modified project.

Since exhibition of the approved project REF, additional construction timeframe information for the Great Western Highway Blackheath to Little Hartley Upgrade project has become available as part of the EIS for that project. Subject to planning approval and funding, construction for the Great Western Highway Blackheath to Little Hartley Upgrade is planned to commence in early 2024 and continue until 2031. This project will be opened in stages, with the earliest stage expected to be open to traffic by 2030.

Table 6-45 identifies additional projects considered for the cumulative impact assessment for the modified project. The final column identifies if the project has been included in the assessment, based on the criteria listed in Section 6.14.1.

Table 6-45 Other projects and developments within proximity of the modified project

Project	Timing	Construction impacts	Operational impacts	Project included for assessment?
<p>Great Western Battery Energy Storage System</p> <p>Battery energy storage system of approximately 500 megawatts and approximately 1000 megawatt-hour at 173 Brays Lane, Wallerawang, NSW 2845 as well as a new transmission line that would connect the Battery Energy Storage System to the existing Transgrid 330 kilovolt substation at Wallerawang.</p> <p>The project is located about 23 kilometres northwest of the proposed modification.</p>	<p>Construction is anticipated to commence in late 2023 and would continue for 26 to 32 months.</p>	<ul style="list-style-type: none"> • Biodiversity impacts • Historic heritage impacts • Construction traffic impacts. 	<ul style="list-style-type: none"> • Improvements to security, resilience, and sustainability of NSW's electricity grid. 	<p>No</p> <p>Location is too far away from the proposal for cumulative impacts.</p>

6.14.3 Potential impacts

The approved project REF stated that there would be cumulative impacts (greater than negligible) on the following receiver groups: biodiversity; traffic and transport; noise and vibration; Aboriginal heritage; non-Aboriginal heritage; soils and surface water; social; and contamination.

Potential cumulative impacts associated with the proposed modification and other projects identified in Table 6-45 are summarised in Table 6-46.

Table 6-46 Potential cumulative impacts

Environmental Factor	Construction	Operation
Biodiversity	<p>Minimal changes in cumulative impacts to those described in the approved project REF.</p> <p>The modified project would require the removal of an additional 1.42 ha of native vegetation and nine hollow bearing trees compared to the approved project.</p> <p>These impacts are considered manageable under the proposed safeguards and the overall cumulative impact would be consistent with that presented in the approved project REF.</p>	Overall cumulative impact would be consistent with that presented in the approved project REF.
Traffic and transport	<p>Minimal changes in cumulative impacts to those described in the approved project REF.</p> <p>Subject to funding, construction for the modified project is now expected to commence mid-2024 and expected to be open by 2028. Compared to the program presented in the approved project REF, there is the potential for peak construction activity overlap between the modified project and the other components of the Upgrade Program.</p> <p>These impacts are considered manageable under the proposed safeguards and the overall cumulative impact would be consistent with that presented in the approved project REF.</p>	Overall cumulative impact would be consistent with that presented in the approved project REF.
Noise and vibration	Overall cumulative impact would be consistent with that presented in the approved project REF.	Overall cumulative impact would be consistent with that presented in the approved project REF.
Aboriginal heritage	Minimal changes in cumulative impacts to those described in the approved project REF.	Overall cumulative impact would be consistent with that presented in the approved project REF.

Environmental Factor	Construction	Operation
	<p>These impacts are considered manageable under the proposed safeguards and the overall cumulative impact would be consistent with that presented in the approved project REF.</p>	
Non-Aboriginal heritage	<p>Minimal changes in cumulative impacts to those described in the approved project REF.</p> <p>The modified project would result in additional construction impacts to non-Aboriginal heritage compared to those presented in the approved project REF. These impacts range from negligible to moderate (refer Section 6.5).</p> <p>These impacts are considered manageable under the proposed safeguards and the overall cumulative impact would be consistent with that presented in the approved project REF.</p>	<p>Minimal changes in cumulative impacts to those described in the approved project REF.</p> <p>The modified project would result in additional operational impacts to non-Aboriginal heritage compared to those presented in the approved project REF. These impacts range from negligible to moderate (refer Section 6.5).</p> <p>These impacts are considered manageable under the proposed safeguards and the overall cumulative impact would be consistent with that presented in the approved project REF.</p>
Soils and contamination	<p>Overall cumulative impact would be consistent with that presented in the approved project REF.</p>	<p>Overall cumulative impact would be consistent with that presented in the approved project REF.</p>
Socio-economic	<p>Overall cumulative impact would be consistent with that presented in the approved project REF.</p>	<p>The proposed modification includes the improved integration of ancillary infrastructure, including active transport connections, access arrangements for local properties and carparking.</p> <p>The modified project would therefore result in an overall improvement in cumulative social impacts compared to those described in the approved project REF.</p>

6.14.4 Safeguards and management measures

The existing management measures for the approved project REF are appropriate to manage the impacts identified in Table 6-46. No changes are proposed to the other environmental safeguards and management measures in the Submissions Report as a result of the proposed modification. A complete list of safeguards and management measures for the modified project is provided in Section 7.2 of this addendum REF.

7 Environmental management

7.1 Environmental management plans

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport Environment and Sustainability Officer, Western Region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in:

- QA Specification G36 – Environmental Protection (Management System)
- QA Specification G38 – Soil and Water Management (Soil and Water Plan)
- QA Specification G40 – Clearing and Grubbing
- QA Specification G10 – Traffic Management.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the modified project are summarised in Table 7-1.

Section 7.2 of the approved project REF identified a range of environmental outcomes and management measures that would be required to avoid or reduce environmental impacts of the project. After consideration of issues raised in the public submissions, changes to the proposal and further environmental assessment carried out, the environmental management measures for the proposal were revised and presented in Section 6.2 of the Submissions Report.

The assessment carried out in this addendum REF has identified the need for some further revisions and additions to environmental safeguards and management measures for the project. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. Additional and/or modified environmental safeguards and management measures to those presented in the REF and Submissions Report are shown in underlined and deleted measures, or parts of measures, have been ~~struck out~~.

Table 7-1 Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
General				
GEN01	General – minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Transport Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • Any requirements associated with statutory approvals • Details of how the proposal <u>modified project</u> will implement the identified safeguards outlined in the project REF <u>REF addendum</u> • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor Transport project manager	Prior to construction Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
GEN02	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 Transport project manager	Prior to construction
GEN03	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the proposal <u>modified project</u>. This will include up- front site induction and regular "toolbox" style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • Areas of Aboriginal and non-Aboriginal heritage sensitivity • Threatened species habitat • Adjoining residential areas requiring particular noise management measures • Water quality management • Clearing of vegetation ensuring approved extents of clearing are strictly adhered to. 	Contractor Transport project manager	Prior to construction Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
Biodiversity				
BI01	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Transport's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects</i> (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas Requirements set out in the <i>Landscape Guideline</i> (RMS, 2008) Pre-clearing survey requirements Procedures for unexpected threatened species finds and fauna handling Procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013) Protocols to manage weeds and pathogens. 	Contractor Transport project manager	Detailed design Prior to construction
BI02	Removal of native vegetation, threatened species habitat, habitat features, and threatened plants	Native vegetation and habitat removal will be minimised through detailed design. This will include further consideration for the placement of ancillary facilities (including drainage and sediment basins) currently positioned in native vegetation and high value areas will be considered during the detailed design stage.	Contractor Transport project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
BI04	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Pre-clearing surveys will be carried out in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction
BI05	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Vegetation and habitat removal will be carried out in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction
BI06	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Native vegetation will be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction
BI07	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal <u>modified project</u> site.	Contractor	Construction
BI09	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Fauna will be managed in accordance with <i>Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BI10	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Habitat will be replaced or re-instated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011). Modified limbs salvaged from removed vegetation in the subject land would be preferenced over nest boxes for artificial hollow construction.	Contractor	Construction
BI12	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	A Purple Copper Butterfly management plan will be developed within the Flora and Fauna Management Sub-plan which will include measures to minimise impacts to the species including minimising vegetation removal around mapped habitat, consideration of construction activity timing/ scheduling to minimise mortality in areas of mapped habitat and a monitoring strategy to detect efficacy of management measures.	Contractor Transport project manager	Construction
BI13	Aquatic impacts	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) and <i>Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI, 2013).	Contractor	Construction
BI14	Aquatic impacts	Creek works and bridges will be designed in accordance with the <i>Policy and Guidelines for Fish Friendly Waterway Crossings</i> (DPI, 2003)	Contractor	Construction
BI15	Aquatic impacts	Instream works will be carried out during periods of low flow where possible. Where not possible, any creek diversions would require a permit from DPI (Fisheries).	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BI20	Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the <i>Wildlife Connectivity Guidelines for Road Projects</i> (RTA, 2011). This will include retrofitting culverts with fauna friendly design features suitable for target species. Any connectivity measures implemented will be installed under the supervision of an experienced ecologist and maintained during proposal operation <u>of the modified project</u> .	Contractor Transport project manager	Construction Operation
BI22	Fragmentation of identified habitat corridors	Revegetation of unused <u>existing</u> pavement beneath the bridge at Jenolan Caves Road would be investigated as a potential option to increase fauna connectivity in this area. This would <u>will</u> need to consider risk of road strike and feasibility of fauna fencing at this intersection.	Contractor	Detailed design
BI23	Fragmentation of identified habitat corridors	Riparian zone under the twin bridges at River Lett would be revegetated, where feasible, to ensure habitat connectivity is retained.	Contractor	Detailed design
BI24	Indirect impacts on native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011). A supervising officer will ensure clearing and fencing contractors stay within the approved boundary.	Contractor	Construction
BI25	Invasion and spread of weeds	Weed species will be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction
BI27	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BI28	Noise, light and vibration	Works in proximity to culvert 2 and 3 will be carried out at night, where possible to minimise impacts to roosting microbats.	Contractor	Construction
BI29	Noise, light and vibration	Detailed design will look at ways to minimise impacts of permanent shading and artificial light impacts on fauna habitat, particularly culverts with known microbat populations.	Contractor Transport project manager	Detailed design Construction
BI30	Noise, light and vibration	<p>Construction lighting impacts would be minimised as follows:</p> <ul style="list-style-type: none"> • Lighting would only be used as necessary to conduct construction activities at night. Lights would be turned off when not needed • Adaptive light controls to manage light timing, intensity and colour would be installed • Only the object or area intended would be lit where feasible • Lights would be kept close to the ground, directed and shielded to avoid light spill • The lowest intensity lighting appropriate for the task would be used • Use non-reflective, dark-coloured surfaces where possible • Use lights with reduced or filtered blue, violet and ultra-violet wavelengths where possible. 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BI31	Impacts to habitat in human made structures	A Microbat Management Plan will be prepared as a part of the Fauna and Flora Management Sub-Plan to manage impacts to microbats. It would include pre-clearance checks of culverts, monitoring of microbats during noisy works and stop works procedures.	Contractor	Construction
BI32	Impacts to habitat in human made structures	Permanent roost habitat for cave-dwelling microbats is to be included in the design of new bridges and culvert structures. This may include pre-casting roosting chambers on the underside of bridges or in the roof of culverts, and/ or retrofitting/ modifying standard structures to make them more suitable for microbats i.e. leaving grab holes and section joins unsealed, scabbling of concrete surfaces to make structures more suitable, particularly in recesses and potential roosting sites.	Contractor Transport project manager	Detailed design Construction
BI33	Impacts to habitat in human made structures	Access to Culvert 2 and 3 <u>will</u> be restricted during construction to minimise impacts to roosting microbats. If access to either culvert is required, consultation with an ecologist would be carried out and/or an ecologist would supervise activities/access.	Contractor	Construction
BI34	Vehicle strike	Fauna fencing <u>and crossings</u> will be installed at targeted locations along the highway <u>and around construction ancillary facilities</u> to minimise vehicle strike where reasonable and feasible. Fauna fencing <u>and crossings</u> would be designed to minimise impacts to threatened fauna species and species subject to vehicle strike. Locations selected would consider connectivity requirements of fauna and proposed structures.	Contractor Transport project manager	Detailed design Construction Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Early installation of fauna fencing <u>and crossings</u> will be considered to minimise impacts to threatened fauna species during construction.</p> <p><u>Appropriate warning signage of potential fauna crossing and slow speed will be installed.</u></p> <p>A monitoring strategy would be developed to detect efficacy of fauna fencing and maintenance requirements would be detailed as part of the Flora and Fauna Management Sub-plan of the CEMP.</p>		
BI35	Loss of hollow bearing trees	Artificial Hollow construction would include hollows suitable for Gang-gang Cockatoos.	Contractor	Construction
BI36	Introduction of Chytrid Fungus	Hygiene measures to prevent the spread of chytrid would be implemented in accordance with Hygiene guidelines Protocols to protect priority biodiversity areas in NSW from <i>Phytophthora cinnamomi</i> , myrtle rust, amphibian chytrid fungus and invasive plants (DPIE, 2020b).	Contractor	Construction
BI37	Indirect impacts to <i>C. dwyeri</i>	Targeted survey will be carried out during breeding season for <i>C. dwyeri</i> prior to construction. If found to be breeding at culvert 2 and 3, appropriate management measures would be implemented, such as scheduling works outside the November to January during breeding season.	Contractor Transport project manager	Prior to construction
BI38	Platypus burrow disturbance	<p>Thorough searches for platypus burrows would be conducted by a suitably experienced ecologist prior to construction to confirm the location of any burrows within the construction footprint and determine if any of these burrows are breeding burrows.</p> <p>Based on the findings of these surveys, suitable management measures would be developed. These may include:</p>	Contractor Transport project manager	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Locating drainage channels to avoid areas of medium and high quality Platypus habitat where reasonable and feasible Establishing a no-go an <u>exclusion</u> zone at retained areas of the River Lett banks during construction Restricting earth works for the bridge over River Lett construction to outside the Platypus breeding season (October to March) where reasonable and feasible. 		
BI39	Loss of individuals from habitat removal in unassessed areas	<p>Following acquisition of the following properties targeted surveys for Purple Copper Butterfly in areas of suitable habitat should be conducted:</p> <ul style="list-style-type: none"> Lot 10 DP 1134053 'Fernhill' 3109 Great Western Highway, South Bowenfels NSW 2790 Lot 154 DP 1122453 'Misty View' 3055 Great Western Highway, Hartley NSW 2790 <u>Lot 1 and 2 DP 540599 'Billesdene Grange' 2272 Great Western Highway, Little Hartley, 2790.</u> <p>Surveys should be conducted during detectable periods (DPIE (EES), 2021a).</p>	Transport project manager <u>Contractor</u>	Prior to construction
<u>BI40</u>	<u>Impacts to native flora and fauna</u>	<p><u>Exclusion zones will be established in the following areas:</u></p> <ul style="list-style-type: none"> <u>Within and adjacent to ancillary facility 20 surrounding a tributary of Butlers Creek</u> <u>Construction ancillary facility 23</u> <u>Construction ancillary facility 24.</u> <p><u>Specifically, this will be to minimise impacts to the following biodiversity values:</u></p>	<u>Transport</u>	<u>Prior to construction</u>

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <u>Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (EEC, BC Act)</u> <u>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions (EEC, BC Act)</u> <u>PCT 1615, Monkey Gum - <i>Eucalyptus blaxlandii</i> shrubby open forest on basalt of the Sydney Basin</u> <u>Purple Copper Butterfly</u> <u>Key Fish Habitat.</u> 		
<u>BI41</u>	<u>Impacts to native flora and fauna</u>	<u>Development and implementation of a Biodiversity Offset Strategy in accordance with the <i>No Net Loss Guidelines</i> (Transport for NSW, 2022f).</u>	<u>Transport</u>	<u>Prior to construction</u>
<u>BI42</u>	<u>Impacts to native flora and fauna</u>	<u>Standard wash-down procedures as per the RTA Biodiversity Guidelines (RTA, 2011a) should be implemented to reduce the likelihood of introduction or spread of <i>Phytophthora cinnamomi</i>.</u>	<u>Contractor</u>	<u>During construction</u>
<u>BI43</u>	<u>Key fish habitat</u>	<u>Works within key fish habitat to be undertaken must be in consultation with DPI in accordance with the FM Act.</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Prior to construction</u>
Traffic and transport				
TT01	Construction traffic	A Traffic Management Plan (TMP) will be prepared for the construction phase of the proposal modified project. This will adhere to Traffic Control at Worksites, Technical Manual, Issue No. 6, Transport, September 2020 and QA Specification G10 Traffic Management (Transport, August 2020). This will include details on:	Contractor	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Measures to maintain access to properties and local roads Site specific traffic control measures to manage and regulate traffic movement Requirement and methods to consult and inform the local community of impacts on the local road network Measures to maintain pedestrian and cyclist access Access to ancillary sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads A response plan for any construction road traffic incident Consideration of other developments which 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. <u>Construction planning during detailed design will further develop the required construction traffic management measures and ways to minimise their impacts. This includes development into heavy earth moving haulage plant/ moxy crossings of the Great Western Highway to reduce the need for road haulage trucks to travel on the existing Great Western Highway. Additionally, lane closures, contra flows for traffic switches or utility relocation cut and covers will occur at night.</u> 		

No.	Impact	Environmental safeguards	Responsibility	Timing
TT02	Construction traffic staging	Traffic management plans will be prepared for the construction area and progressively updated as the works progress. The plans would be prepared and implemented by suitably qualified personnel.	Contractor	Prior to construction Construction
TT03	Construction traffic staging	Schedule partial road closures to maintain two lanes at all times except for blasting periods. Full road closures will be required for short periods of time (about 15 minutes); however, this would be conducted at non-peak times.	Contractor	Prior to construction Construction
TT04	Consultation	Carry out consultation with local and regional bus companies prior to and during construction.	Contractor	Prior to construction Construction
TT05	Consultation	Carry out consultation with emergency services prior to and during construction to confirm any diversions during construction and any operational road network changes	Contractor	Prior to construction Construction
TT06	Consultation	Carry out consultation with businesses, property owners and occupiers regarding changes to access arrangements	Contractor	Prior to construction Construction
TT07	Consultation	Carry out consultation with local councils regarding potential impacts to parking during the construction period.	Contractor	Prior to construction Construction
TT08	Operational traffic management	Review incident management plan in the event the highway may be temporarily closed due to scheduled maintenance or accident.	Transport	Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
TT09	Operational traffic management	Consult with residents who may be affected by the temporary closure of the highway closed due to scheduled maintenance or accident.	Transport project manager	Operation
Noise and vibration				
NV01	Construction noise and vibration management plan	<p>A Construction Noise and Vibration Management Plan will be prepared before any work begins which would include:</p> <ul style="list-style-type: none"> • Identification of nearby sensitive receivers • Description of works, construction equipment and hours work would be completed in • Criteria for the proposal <u>modified project</u> and relevant licence and approval conditions • Requirements for noise and vibration monitoring • Details of how community consultation would be completed • Procedures for handling complaints • Details on how respite would be applied where ongoing high impacts are seen at certain receivers. 	Contractor	Prior to construction
NV02	Construction noise and vibration assessments	<p>Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:</p> <ul style="list-style-type: none"> • With the potential to result in noise levels above 75 dBA at any receiver • Required outside Standard Construction Hours likely to result in noise levels in greater than the relevant Noise Management Levels 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> With the potential to exceed relevant criteria for vibration. <p>The assessments should confirm the predicted impacts at the relevant receivers in the vicinity of the activities to aid the selection of appropriate management measures, consistent with the requirements of the CNVG.</p>		
NV03	Construction noise exceedances	<p>Where noise intensive equipment is to be used near sensitive receivers, the work will be scheduled for Standard Construction Hours, where possible. If it is not possible to restrict the work to the daytime, then the work will be completed as early as possible in each work shift.</p> <p>Appropriate respite will also be provided to affected receivers in accordance with the CNVG and/or the proposal <u>modified project's</u> conditions of approval.</p>	Contractor	Construction
NV04	Compounds Construction <u>ancillary facilities</u> noise	Hoarding, or other shielding structures, will be used where receivers are impacted near compounds <u>construction ancillary facilities</u> or fixed work areas with long durations. To provide effective noise mitigation, the barriers should break line-of-sight from the nearest receivers to the work and be of solid construction with minimal gaps.	Contractor	Construction
NV05	Vibration – monitoring	Monitoring will be carried out at the start of noise and/or vibration intensive activities to confirm that actual levels are consistent with the predictions and that appropriate mitigation measures from the CNVG have been implemented.	Contractor	Construction
NV06	Construction traffic	Potential construction noise impacts from construction traffic will be reviewed during detailed design when more information is available.	Contractor Transport project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
NV07	Vibration work within minimum working distance	<p>Where work is within the minimum working distances and considered likely to exceed the cosmetic damage criteria:</p> <ul style="list-style-type: none"> • Different construction methods with lower source vibration levels will be investigated and implemented, where feasible • Attended vibration measurements will be carried out at the start of the work to determine actual vibration levels at the item. Work should be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria. 	Contractor	Construction
NV08	Vibration work within minimum working distance	The potential human comfort impacts and requirement for vibration intensive work will be reviewed during detailed design, and any updated controls or mitigation included in the Noise and Vibration Management Plan.	Contractor	Detailed design
NV09	Vibration impacts on structures	Building condition surveys will be completed before and after construction where buildings or structures are within the minimum working distances and considered likely to exceed the cosmetic damage criteria during the use of vibration intensive equipment and/ or blasting activities.	Contractor	Prior to construction
NV10	Blasting	<p>A blast management plan will be prepared prior to the start of blasting. This will include:</p> <ul style="list-style-type: none"> • A schedule of trial blasts to be carried out at locations where blasting is proposed to occur within the minimum working distances • Monitoring of overpressure and vibration levels should be carried out at the potentially most affected receivers for each blast 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Notification of all potential affected receivers at least 24 hours prior to blasting. 		
NV11	Blasting	<p>A Flyrock Management Plan will be developed to manage the potential impacts of flyrock during blasting. This would be developed in consultation with technical specialists. Management measures to be considered would include:</p> <ul style="list-style-type: none"> Implementing a minimum clearance distance of 500 metres to non-construction personnel Temporary evacuation of residents within a 150 metre radius of each planned blast Timing of blasting to minimise disruption to local residents Use of blast mats and soil cover. 	Contractor	Prior to construction
NV12	Operational road traffic noise mitigation measures	<p>As proposals <u>the modified project</u> progress through the early design stages, road design features will be evaluated to minimise road traffic noise where necessary. This would include:</p> <ul style="list-style-type: none"> Adjustments to vertical and horizontal alignments Road gradient modifications Traffic management Cost effective use of site won spoil to provide landscape mounds where there is suitable site footprint. 	Contractor	Detailed design
NV13	Operational road traffic noise mitigation measures	<p>For receivers that qualify for consideration of additional noise mitigation, potential noise mitigation measures are to be considered in the following order of preference:</p>	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> At-source mitigation such as quieter road pavement surfaces In-corridor mitigation such as noise mounds and noise barriers At-receiver mitigation including at-property treatments. 		
Aboriginal heritage				
AH01	Aboriginal heritage management	<p>An Aboriginal Heritage Management Plan (AHMP) will be developed in consultation with the RAPs to document standard procedures for:</p> <ul style="list-style-type: none"> Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with RMS (2015) Standard Management Procedures Unexpected Heritage Items <u>Transport's <i>Unexpected Heritage Items Procedure</i> (2022b)</u> Detailed site salvage strategy Management and curation of salvaged Aboriginal objects Detailed locations and installations procedures for fencing and protective coverings Details of permissible activities and permissible vehicle access inside protected Aboriginal areas Heritage components of induction package for construction workers and supervisors Any other heritage matters addressed in the Conditions of Approval for the proposal <u>modified project</u>. 	Contractor Transport project manager	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AH02	Minimise impacts to Aboriginal heritage sites	<p>Detailed design will investigate opportunities to minimise impacts to:</p> <ul style="list-style-type: none"> Forty Bends contact site 45-4-1111 (GWH 42) GWH RS01. 	Contractor	Detailed design
AH03	Retention of sites located under elevated structures	<p>The feasibility of retaining portions of sites that are located under elevated structures (bridges) over River Lett and on River Lett Hill will be investigated as part of the detailed design process, including the following sites:</p> <ul style="list-style-type: none"> 45-4-1097 (GWH 07) 45-4-1072 (GWH 09) ██████ Site GWH 20-2. 	Contractor Transport project manager	Detailed design
AH04	Aboriginal cultural values interpretation	<p>A cultural heritage interpretation strategy will be developed for the proposal <u>modified project</u> and will include both Aboriginal and non-Aboriginal heritage considerations. The cultural heritage interpretation strategy will form part of the Urban Design Plan and will include consideration of the following interpretation elements for design integration:</p> <ul style="list-style-type: none"> Public works of art Interpretive signage Bridges Earthworks Plantings. 	Contractor Transport project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
AH05	Impacts to Aboriginal heritage during construction	Construction works will be closely confined to the minimum possible area required for construction activities. Haulage and other access roads will be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 metres of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.	Contractor	Detailed design
AH06	Impacts to Aboriginal heritage during construction	<p>Temporary fencing will be placed on the boundary of the following Aboriginal heritage sites:</p> <ul style="list-style-type: none"> • GWHAS01 • GWH 20-2 • GWH 20-3 • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1072 (GWH 9) • 45-4-1071 (GWH 8) • [REDACTED] Site • South Bowenfels Rural Fire Brigade Site • Magpie Hollow Road site • 45-4-1111 (GWH 42) • <u>Hartley Grange 2 (45-4-1190)</u> • <u>'Potential rock engraving 1 GWH.'</u> 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AH07	Community collection	<p>Salvage collection is warranted at those Aboriginal sites in the construction footprint where stone artefacts have been recorded on the surface. Salvage collection is to record MGA coordinates of each artefact by GPS and relevant artefact attributes consistent with the broader archaeological salvage analysis. The results of salvage collection should be collated in an Aboriginal Site Salvage Report (ASSR).</p> <p>Salvage collection will be carried out by a suitably qualified archaeologist. Sites requiring salvage collection include:</p> <ul style="list-style-type: none"> • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1075 (GWH 12) • 45-4-1074 (GWH 11) • GWH 20-3. 	Contractor	Prior to construction
AH08	Salvage excavation	<p>Salvage excavation will be carried out by a suitably qualified archaeologist (refer to Section 1.6 of the Code of Practice) to define the western limit of artefact distribution in accordance with the requirements outlined in Section 10.2 of Appendix G of the approved project REF for the following sites:</p> <ul style="list-style-type: none"> • GWH 20-2 • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1072 (GWH 9) • 45-4-1071 (GWH 8) • [REDACTED] Site 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> South Bowenfels Rural Fire Brigade Site Magpie Hollow Road site. 		
AH09	Aboriginal heritage sites	An Aboriginal Heritage Impact Permit (AHIP) will be required under Section 90 of the NP&W Act before any known Aboriginal heritage sites are impacted.	Transport project manager	Prior to construction
AH09	Aboriginal heritage sites	Aboriginal site information recording forms (ASIRF) are to be completed for each site and submitted to OEH to be updates on AHIMS.	Transport project manager	Prior to construction
AH10	Unexpected finds	<p>The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) Transport's <u>Unexpected Heritage Items Procedure (2022b)</u> will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>	Contractor	Prior to construction Construction
Non-Aboriginal Heritage				
NH01	Discovery of historical heritage materials features or deposits	<p>If at any time during the construction of the proposal <u>modified project</u>, historical heritage materials, features and/or deposits are located, the Transport Standard Management Procedure: Unexpected Heritage Items (unexpected finds protocol) (Transport for NSW 2019) Transport's <u>Unexpected Heritage Items Procedure (2022b)</u> will be implemented. The works will not re-commence until the requirements of the procedure have been satisfied.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NH02	Discovery of human remains	<p>In the event that construction activities reveal possible human skeletal material (human remains), the Transport Standard Management Procedure: Unexpected Heritage Items (unexpected finds protocol) (Transport for NSW 2019) <u>Transport's <i>Unexpected Heritage Items Procedure</i> (2022f)</u> will be implemented.</p> <p>These guidelines have been developed in consultation with Heritage NSW and are consistent with the requirements of the Skeletal Remains: Guidelines for Management of Human Skeletal Remains under the Heritage Act (NSW Heritage Office 1998).</p>	Contractor	Construction
NH03	Inadvertent impacts by contractors during construction	<p>Historical heritage awareness training will be provided for contractors prior to the commencement of construction works to ensure understanding of known and potential heritage items that may be impacted or otherwise encountered during the proposed works.</p> <p>This training will include specific mention of the procedure required in the event unexpected heritage finds or human remains are encountered.</p>	Contractor	Construction
NH04	Direct impacts to heritage fabric/ within an item's heritage curtilage	<p>Design consideration should will be given to the heritage item and proposed works with critical assessment of the necessity of the proposed impacts for the following items:</p> <ul style="list-style-type: none"> Road culvert and retaining wall at Emoh (LEP A027) Bowenfels Presbyterian Cemetery (LEP A030) <p>If the impacts cannot be mitigated through design, additional justification will be required to inform the item's Statement of Heritage Impact.</p>	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
NH05	Direct impacts to heritage fabric	<p>An archival recording of the heritage item will be carried out, in accordance with the guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Council of NSW 2006) at the following sites:</p> <ul style="list-style-type: none"> • Billesdene Grange (LEP I023) • Section of Coxs River Road (unlisted) • Lyndoch Orchard (LEP I019) • Bridge over the River Lett (unlisted) • Historical bullock track and creek crossing (unlisted) • Road culvert and retaining wall at Emoh (LEP A027) <p>Dependant on the nature and complexity of the heritage item and the potential impact of the proposed works, the archival recording may also include additional primary or archival research, and additional digital data capture methods such as 3D scanning.</p>	Contractor Transport project manager	Prior to construction
NH06	Proposed works within the curtilage of an SHR listed heritage item	<p>Options to reduce the construction footprint within the SHR curtilage is to be considered at the following items:</p> <ul style="list-style-type: none"> • Hartley Historic Village (SHR 00992/LEP I043) • Fernhill (SHR 00225/LEP I043) <p>An archival recording of the heritage item will be carried out, in accordance with the guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Council of NSW, 2006).</p> <p>The appropriate heritage permits must be obtained prior to construction. This will be an approval under either Section 60 or subsection 57(2) of the Heritage Act.</p>	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		Either application will require the approval of the NSW Heritage Council or its delegate.		
NH07	Changes to, or exacerbation of existing, water runoff and drainage in proximity to a heritage item	<p>An assessment of existing drainage and water runoff on the item will be completed for the following items:</p> <ul style="list-style-type: none"> House (LEP I021) Meads Farm (LEP I020) <p>Options to mitigate drainage or runoff issues through the installation of drainage infrastructure or other modifications will be explored during detailed design.</p>	Contractor Transport project manager	Detailed design
NH09	Removal of old, rare or otherwise significant trees or vegetation	<p>The remnant orchard trees at Lyndoch Orchard (LEP I019) will be examined by a qualified arborist and assessed for significance and horticultural value.</p> <p>Potential for propagation or preservation of any rare, old, or otherwise significant examples or varieties will be carried out if feasible.</p>	Transport project manager	Prior to construction
NH10	Construction (cut or fill) of large road cuttings, embankments, or batter slopes	<p>Where possible, new batter slopes and embankments will be blended with existing topography near:</p> <ul style="list-style-type: none"> Rosedale (LEP I024) Meads Farm (LEP I020) Old Roman Catholic Cemetery (LEP A015) Hartley Historic Village (SHR 00992/LEP I043) Fernhill (SHR 00225/LEP I043) <p>Where the construction requires vegetation removal, embankment design should aim to be of an obtuse angle such that revegetation or new landscape planting is possible</p>	Contractor Transport project manager	<p>Detailed design</p> <p>Prior to construction</p> <p>Construction</p>

No.	Impact	Environmental safeguards	Responsibility	Timing
NH11	Removal of visually significant vegetation or areas of existing mature trees	<p>Revegetation and landscaping is to consider plantings to match the existing landscape (trees replacing trees, grasses replacing grasses) at the following items:</p> <ul style="list-style-type: none"> • Rosedale (LEP I024) • Billesdene Grange (LEP I023) • Harp of Erin (LEP I028) • Meads Farm (LEP I020) • Old Roman Catholic Cemetery (LEP A015) • Fernhill (SHR 00225/LEP I043) • Old Catholic Cemetery (LEP A029). <p>Landscaping of new works elements should not introduce plantings of tall height species if they did not previously exist in that location. This should aid in maintaining an open landscape where suitable and screening vegetation where it currently exists.</p>	Contractor Transport project manager	Detailed design Construction
NH12	Structures not expected to be sensitive to vibration impacts, but need this to be confirmed prior to construction	<p>The need for dilapidation survey will be confirmed for the following items, with consideration to the proposed works and expected construction plant to be used in their proximity, in order to confirm whether they would be sensitive to vibration impacts during construction:</p> <ul style="list-style-type: none"> • Billesdene Grange (LEP I023) • Log Cabin Farmhouse Village Shop (unlisted) • House (LEP I021) • Lyndoch Orchard (LEP I019) • Old Roman Catholic Cemetery (LEP A015) 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> St John the Evangelist's Anglican Church (LEP I029) Stone and Timber Cottage (LEP I045) Bowenfels National School Site (SHR 00761/LEPI054). 		
NH13	Structures considered to be sensitive to vibration impacts during construction	<p>A dilapidation report will be prepared prior to construction for each of the following sensitive heritage item to assess, on a case-by-case basis, whether the fabric would be sensitive to vibration impacts during construction or operation:</p> <ul style="list-style-type: none"> Rosedale (LEP I024) Nioka (LEP I025) Harp of Erin (LEP I028) House (LEP I021) Meads Farm (LEP I020) Hartley Historic Village (SHR 00992/LEP I043) Bridge over the River Lett (unlisted) Fernhill (SHR 00225/LEP I043) Emoh (Emu Store/Corderoy's Store) (LEP I051) Road culvert and retaining wall at Emoh (LEP A027) Umera (Bowenfels Inn, Tricks House) (LEP I052) Ben Avon (former Royal Hotel) (LEP I053) Old Catholic Cemetery (LEP A029) Somerset House (LEP I057) Parsonage Farm (LEP I058) 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Presbyterian Church and Sessions Hall (LEP I059) • Bowenfels Presbyterian Cemetery (LEP A030) • Caldwells House (LEP I061). <p>Vibration monitoring will be carried out on sensitive heritage items for at least the period of construction.</p> <p>Monitoring would continue at least 12 months after the completion of works to determine if ongoing impacts are occurring i.e. identify any operational damage attributable to the proposal <u>modified project</u>.</p> <p>Surfacing and construction methods in proximity to sensitive heritage items will be in accordance with the Transport criteria for construction adjacent to sensitive heritage buildings.</p> <p>The dilapidation report for each cemetery would involve archival recording/photographs showing the present state of monuments, followed by an assessment of any tilting of headstones or cracking of slabs that may be attributable to roadworks.</p>		
NH14	Vibration impacts during construction	<p>Where a heritage item is deemed sensitive to vibration impacts, the more stringent German Standard guideline values (DIN 4150) will be followed when assessing minimum safe distances and determining allowable plant and its maximum vibration level.</p> <p>This may require a greater safety buffer to be maintained between the heritage item and a particular vibration-intensive construction equipment.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NH15	Ground disturbance in an area of low archaeological potential	<p>Test excavations will be required at the following sites prior to ground disturbance works and will be carried out in accordance with the requirements of an Excavation Permit Exemption under s139(4) of the Heritage Act:</p> <ul style="list-style-type: none"> • Harp of Erin (LEP I028) • Hartley Historic Village (SHR 00992/LEP I043) • Archaeological potential on unidentified Lot (unlisted). <p>Test excavations and/or monitoring of ground disturbance works will be carried out by appropriately qualified archaeologist.</p>	Contractor	Prior to construction
NH16	Ground disturbance in an area of moderate archaeological potential	<p>Test excavations will be required prior to ground disturbance at the following sites, and will be carried out in accordance with the requirements of a s140 permit under the Heritage Act:</p> <ul style="list-style-type: none"> • Ben Avon (LEP I053) • Former Bowenfels Lockup (unlisted) • Bowenfels Presbyterian Cemetery (LEP A030) • <u>Unidentified lot (unlisted).</u> <p>For works within the SHR curtilage, the excavations would <u>also</u> require approval under s60 of the Heritage Act. Where test excavations are proposed, an archaeological research design and methodology will be prepared in accordance with Archaeological Assessments: Archaeological Assessment Guidelines (NSW Heritage Office, 1996a).</p>	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NH17	Disturbance of an area of high archaeological potential	<p>Archaeological investigation will be completed under appropriately qualified supervision to expose, investigate, and record the Billesdene Grange causeway fabric.</p> <p>A detailed archival recording of the causeway and Billesdene Grange (LEP I023) frontage to the Great Western Highway will be completed prior to works.</p> <p>Investigation will include structural assessment by a heritage structural engineer in order to determine the structural capability of the causeway, the probable impacts from the road construction and required compaction, and any required additional management or mitigation measures. <u>It should also include advice regarding the acceptable limits of vibration, which in turn will inform potential additional management measures.</u></p> <p><u>Transport's <i>Unexpected Heritage Items Procedure</i> (2022b) will be implemented for archaeological investigations within this area.</u></p>	Contractor	Prior to construction
NH18	Disturbance of an area with the potential for human remains	<p>An assessment of archaeological potential on <u>unidentified Lot (unlisted)</u> is to be completed, including a detailed survey of the lot and area of potential, in order to assess the landform and identify any surface features, and remote sensing of an appropriate method. <u>Archaeological investigations will need to include non-invasive investigations such as GPR to ascertain the likelihood of human remains being present.</u></p> <p>Based on the results of the survey and remote sensing, an archaeological research design should be prepared for management of the site and. It should include f <u>Further research should to try and endeavour to ascertain the potential identity of the deceased and may if required</u></p>	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>subsequently include genealogical research to locate any of their descendants.</p> <p><u>If human remains are found, these will need to be exhumed and reburied in line with Transport's <i>Unexpected Heritage Items Procedure</i> (2022b).</u></p> <p>If the archaeological assessment identifies potential features, complete a test excavation. If the results are inconclusive, then the area to be impacted should be monitored during the removal of topsoil by an appropriately qualified archaeologist. This work would require a s139 exception <u>under the <i>Heritage Act 1977</i></u> and should be completed with the support of an <u>physical</u> anthropologist in case potential human remains are identified.</p>		
NH19	Properties unable to be accessed	<p>Further assessment in the detailed design phase will be completed at the following locations in order to physically inspect these items and amend the desktop assessment of the items presented in this report:</p> <ul style="list-style-type: none"> • Billesdene Grange (LEP I023) • House (LEP I021) • Meads Farm (LEP I020) • Archaeological potential on unidentified Lot (unlisted) • Fernhill (SHR 00225/LEP I043) • Emoh (I051) • Umera (LEP I052). 	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
Soils and surface water				
SW01	Erosion and sedimentation of soils/ surface water quality	<p>A Construction Soil and Water Management Plan (CSWMP) will be developed as a subplan to the CEMP and will outline measures to manage water quality impacts associated with construction work. The CWSMP will provide:</p> <ul style="list-style-type: none"> • An Erosion and Sediment Control Plan (ESCP) including measures to mitigate erosion and sediment transport both within the construction footprint and offsite including requirements for the preparation of erosion and sediment control plans for all progressive stages of construction and the implementation of erosion and sediment control measures including the use of sediment basins • Erosion and sediment control measures which would be implemented and maintained in accordance with <i>Managing Urban Stormwater – Soils and Construction, Volume 1</i> (Landcom, 2004) and <i>Volume 2D</i> (DECC, 2008) • Specified secure and bunded areas within ancillary facilities for refuelling, maintenance and washdown of construction plant, equipment, and vehicles • Measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation • Measures to manage waste including classification and handling of spoil. • Measures to manage tannin leachates • Measures to manage accidental spills including requirement to maintain materials such as spill kits, an 	Contractor	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>emergency response procedures and regular visual water quality checks when working near waterways</p> <ul style="list-style-type: none"> Controls for sensitive receiving environments which may include but not be limited to designation of 'no go' zone for construction plant and equipment (where application). 		
SW02	Erosion and sedimentation of soils/ surface water quality	A soil conservation specialist will be engaged for the duration of construction of the proposal <u>modified project</u> to provide advice on the planning an implementation of erosion and sediment control including review of the Construction Soil and Water Management Plan and Erosion and Sediment Control Plan.	Contractor Transport project manager	Prior to construction Construction
SW03	Neutral or Beneficial Effect (NorBE) assessment for water quality	<p>A further NorBE assessment will be carried out during detailed design to confirm the location, size and type of water quality basins required for operation of the proposal <u>modified project</u>. This will include, but not be limited to, an assessment of the following to demonstrate achievement of NorBE:</p> <ul style="list-style-type: none"> The quantity of runoff associated with the construction and operational phase The quality of runoff proposed to be discharged to existing waterways through cross and longitudinal drainage. <p>MUSIC modelling carried out for this assessment will be made available to WaterNSW for review.</p>	Contractor	Detailed design
SW04	Water reuse	A water reuse strategy will be developed as part of the CEMP for both construction and operation to reduce reliance on potable water.	Contractor	Detailed design Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Any water from sediment basins will be checked to ensure compliance with <i>ANZG (2018) Water Quality Guidelines</i> for proper reuse.		
SW05	Water balance	Changes to existing surface water flows and the need for a water balance assessment will be determined during detailed design. This will be carried out should there be any potential impact to the quantity of surface runoff that is currently received at various private farm dams located at the downstream end (within about 500 metres) of the proposed road corridor-(as quantified based on an average yearly runoff yield assessment at each of the affected farm dams). Where feasible, changes would be minimised to avoid impacts to adjacent property owners and maintain existing flow to private dams.	Transport project manager	Detailed design
SW06	Surface water quality impacts	A surface water quality monitoring program will be developed in accordance with the <i>Guidelines for Construction Water Quality Monitoring</i> (RTA, 2003). The program will monitor surface water quality prior to, and during, construction.	Contractor Transport project manager	Prior to construction Construction
SW07	Surface water quality impacts	An Acid Sulfate Rock Management Plan (ASRMP) will be prepared to provide information on the mitigation and management of acid sulfate rock disturbed as part of the construction works.	Contractor	Detailed design Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
Groundwater				
GW01	Evaluation of hydraulic conductivity test data	<p>Once groundwater monitoring bores associated with the current geotechnical drilling program have been installed and slug tested, the hydraulic conductivity assumptions adopted for the Groundwater report (JAJV, 2021) will be reviewed in light of the test data. If test data shows hydraulic conductivity to deviate significantly from the assumed values in this report, then re-assessment of potential groundwater impacts and groundwater inflow rates will be required.</p> <p>A hydrogeologist will review the hydraulic conductivity test data once available and determine whether re-assessment of potential groundwater impacts/ groundwater inflow rates with revised hydraulic conductivity assumptions is required.</p>	Transport project manager	Prior to construction
GW02	Groundwater monitoring program	<p>Groundwater monitoring will be carried out to acquire appropriate baseline data and to provide a basis by which the proposal <u>modified project's</u> impact on groundwater can be monitored. This would include:</p> <ul style="list-style-type: none"> • Reviewing groundwater level measurement by data logger at all 26 scheduled proposal monitoring bores <u>for the modified project</u>. • Prior to commencement of construction, a groundwater quality sampling round should be carried out at the 26 scheduled proposal monitoring bores <u>for the modified project</u>. The analytes should comprise field parameters, major ions (chloride, sulphate, sodium, potassium, magnesium, calcium, carbonate and bicarbonate) and dissolved heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, iron and manganese) • During construction, continuation of groundwater level measurement by data logger at all 26 scheduled 	Transport project manager	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		proposal monitoring bores <u>for the modified project</u> . The data should be downloaded and reviewed quarterly. Quarterly groundwater quality sampling rounds at select (locations and quantity to be confirmed at end of baseline period, prior to construction) proposal monitoring bores <u>for the modified project</u> . The tested analytes should be the same as in pre-construction. The data should be reviewed after each sampling round.		
Hydrology and flooding				
HF01	Operational flooding impacts	All cross-drainage structures including culverts and bridges will be constructed to cater for the 100-year ARI <u>one per cent AEP</u> local and regional storm events to minimise upstream afflux.	Contractor	Detailed design
HF02	Operational flooding impacts	During detailed design, the height of the proposed road embankment adjacent to Boxes Creek will be reviewed or alternative designs considered to eliminate or reduce potential PMF impact.	Contractor	Detailed design
HF03	Operational flooding impacts	Additional flood modelling will be carried out during detailed design. If residual risk of embankment stress remains adjacent to Boxes Creek, a dam safety check would be carried out and further mitigation such as a debris catch upstream would be considered.	Contractor	Detailed design
HF04	Operational flooding impacts	An eastwards shift of the Kelly Street service road will be considered during detailed design to mitigate potential flooding impacts at this location.	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
HF05	<u>Hydrology and flooding</u>	<u>Where existing drainage lines may be impacted during construction of the proposed modification an alternative (diversion) path of equal capacity will be established prior to commencing works.</u>	<u>Design</u>	<u>Prior to construction</u> <u>Construction</u>
HF06	<u>Hydrology and flooding</u>	<u>The Contractor will consult the most current available flood mapping for the purposes of construction design.</u>	<u>Contractor</u>	<u>Prior to construction</u>
Landscape character and visual impact				
LV01	Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the final detailed proposal <u>modified project</u> design and implemented as part of the CEMP.</p> <p>The Urban Design Plan will present an integrated urban design for the proposal <u>modified project</u>, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls and bridges to ensure that they blend with the surrounding environment • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape works taking account of related environmental • Controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. 	Contractor Transport project manager	Detailed design Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> • Beyond the Pavement (Transport for NSW, 2020b) • Landscape and design guideline (Roads and Maritime Services, 2018) • Bridge Aesthetics (Transport for NSW, 2019). 		
LV02	Landscape character and visual impact	<p>Detailed design of the proposal <u>modified project</u> will consider, where feasible and reasonable:</p> <ul style="list-style-type: none"> • Opportunities to reduce the construction footprint • Minimising the number of ancillary facilities required • Using visually recessive materials to minimise the visual dominance of the road • Investigating opportunities to reduce the bulk of structures • Minimising vegetation clearing and maximising revegetation and planting opportunities, particularly in high sensitivity areas where screening is required • Opportunities of planting in highway medians and glare guards to reduce headlight glare from incoming highway traffic, local road traffic and local residents • Ensuring residual land is developed to complement the existing landform • Opportunities to incorporate pedestrian and cycle connections. 	Contractor Transport project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
LV03	Landscape character and visual impact	Landscape planting and maintenance will be in accordance with the Lithgow City Council Weed List and include indigenous species endemic to the area. Locally collected seeds or bioregionally-sourced indigenous seeds and plants will be used where feasible.	Contractor Transport project manager	Detailed design Construction
LV04	Lighting	The design of temporary and permanent lighting will be carried out in accordance with AS 1158.1.1:2005 <i>Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements</i> and will avoid unnecessary light spill on adjacent residents or sensitive receivers.	Contractor Transport project manager	Detailed design Construction
LV05	Landscape character and visual impact	During construction, the following measures will be implemented: <ul style="list-style-type: none"> • Where reasonable and feasible provide suitable barriers to screen views from adjacent sensitive areas during construction • Return temporary works areas, such as ancillary facilities, to at least their pre- construction condition progressively throughout the works, where feasible, or once construction is complete • Identify, protect and retain existing trees located within the ancillary facility areas • Temporary lighting should be screened or diverted to reduce unnecessary light spill. 	Contractor Transport project manager	Construction
<u>LV06</u>	<u>Landscape character and visual impact – General</u>	<u>Site levels and grades for the project would integrate with the surrounding terrain to assist with the visual assimilation of the project into the surrounding landscape where practicable</u>	<u>Contractor</u>	<u>Detailed design</u>

No.	Impact	Environmental safeguards	Responsibility	Timing
<u>LV07</u>	<u>Landscape character and visual impact – General</u>	<u>Engineered slopes would have gradients no steeper than 3H:1V where possible to maximise the establishment of vegetation and allow for appropriate maintenance. The bulk of the modified project's designed batters are 2H:1V, in line with Transport's standards. Property acquisitions and land take is planned on 2H:1V fill batters, cut batters in softer cut materials, and 0.5H:1V for harder rock cuttings.</u>	<u>Contractor</u>	<u>Detailed design</u>
<u>LV08</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Opportunities to provide vegetation by seeding and direct shrub and tree planting to mitigate the scale of the proposed infrastructure, reinstate the vegetation character of the area, frame views, and provide amenity along the road corridor would be considered. New vegetation will be established progressively during construction.</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Detailed design</u>
<u>LV09</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Avoidance of formal rows of trees or blocks of shrub and grass plantings as these would be uncharacteristic within both the Little Hartley landscape setting.</u>	<u>Contractor</u> <u>Transport project manager</u>	<u>Detailed design</u>
<u>LV10</u>	<u>Landscape character and visual impact – Tree planting</u>	<u>Carrying out appropriate soil analysis and identification of soil preparation requirements for landscaping treatments in accordance with the Batter Surface Stabilisation Guideline (Roads and Maritime Services, 2015).</u>	<u>Contractor</u>	<u>Construction</u>
<u>LV11</u>	<u>Landscape character and visual impact – Construction</u>	<u>Existing trees to be retained within the construction footprint would be identified, protected and maintained. Efforts to retain trees within proposed construction ancillary facilities would reduce the impact on views and landscape character at operation.</u>	<u>Contractor</u>	<u>Detailed design</u>

No.	Impact	Environmental safeguards	Responsibility	Timing
Socio-economic				
SE01	Community consultation	<p>A Community Communication Strategy (CCS) will be prepared for the proposal <u>modified project</u> to facilitate communication with the local and regional communities including relevant Government agencies, Councils, adjoining landowners and businesses, residents, motorists and other relevant stakeholders that may be affected by the proposal <u>modified project</u>. The strategy will:</p> <ul style="list-style-type: none"> • Identify people or organisations to be consulted during the delivery of the proposal <u>modified project</u> • Set out procedures and mechanisms for the regular distribution of information about the proposal <u>modified project</u> • Outline mechanisms to keep relevant stakeholders updated on construction activities, schedules and milestones • Outline avenues for the community to provide feedback (including a 24-hour, toll free proposal <u>modified project</u> information and complaints line) or to register complaints and through which Transport will respond to community feedback • Outline a process to resolve complaints and issues raised. 	Contractor Transport project manager	Prior to construction Construction
SE02	Business impacts	Access will be maintained to local businesses near to construction works. Where temporary access changes are proposed, these will be agreed with the affected business owner.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SE03	Business impacts	Signage will be provided to key business locations such as Little Hartley and Hartley Historic Village during construction.	Contractor	Construction
SE04	Business impacts	Ongoing consultation will be carried out with local business owners at Little Hartley, Hartley Historic Village, Hartley and South Bowenfels that may be impacted during construction in accordance with Community Communication Strategy.	Contractor	Construction
SE05	Emergency vehicle access	Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency (e.g. for South Bowenfels Rural Fire Brigade and Lithgow Hospital).	Contractor	Construction
SE06	Local access changes	Local communities and road users will be notified about access changes prior to implementation.	Contractor	Construction
Property and land use				
PL01	Leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard in consultation with the landowner.	Contractor	Construction
PL02	Property	All partial and full acquisitions and associated property adjustments will be carried out in accordance with the requirements of the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> , <i>Property Acquisition – A guide for residential owners</i> (NSW Government, 2021a) and <i>Property Acquisition – A guide for residential tenants</i> (NSW Government, 2021b). This will include the provision of monetary compensation determined in accordance with the provisions of the Act.	Transport project manager	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
PL03	Property	Property adjustments for the proposal <u>modified project</u> will be completed in consultation with property owners.	Contractor Transport project manager	Prior to construction Construction
PL04	Property	Existing property access will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners.	Contractor Transport project manager	Construction
Contamination				
CN02	Management of lowrisk contamination impact	<p>A Contaminated Land Management Plan (CLMP) will be prepared. The CLMP will include:</p> <ul style="list-style-type: none"> Control measures to manage identified areas of elevated total coliforms, including surface soils in the vicinity of BH06, BH07, SS13, SS22 and BH15 containing elevated total coliforms Control measures to manage potential contamination in agricultural areas from including limiting soil contact, use of correct personal protective equipment and education of contractors Control measures to manage identified elevated cadmium and zinc in groundwater in the vicinity of GW01 and appropriately manage inflows prior to discharge or disposal Control measures to manage potentially impacted groundwater (where intersected) from septic systems within the Forty Bends to Lithgow section 	Contractor	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Management of groundwater encountered during excavation where dewatering is required as outlined in CN06 • Where coal tar is present, material should be managed/ disposed of off-site in accordance with the NSW Government (2015) Technical Direction 21: coal tar asphalt handling and disposal procedure • Procedures for unexpected contamination as outlined in CN06 • Requirements for the disposal of contaminated waste in accordance with the POEO • Act and the Protection of the Environment Operations (Waste) Regulation 2014. 		
CN05	Residual contamination following construction	Ongoing management and monitoring measures would be documented in an appropriate form, for example an environmental management plan, and implemented for any areas where minor, residual contamination remains following construction.	Contractor	Construction
CN06	Unexpected finds procedure	<p>An 'unexpected finds' protocol should be implemented as part of the CLMP to plan for and accommodate potential contamination impacts. Contingency measures as part of this procedure should include:</p> <ul style="list-style-type: none"> • Stop work procedures: a suitably qualified and experienced consultant should then assess whether material is or is not contaminated • Treat suspected contaminated material as actually contaminated material and employ adequate environmental and safety controls 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Procedures for managing groundwater inflows, particularly in the vicinity of septic tanks, including minimising worker exposure, testing and appropriate disposal. 		
Air quality				
AQ01	Air quality management	<p>An Air Quality Management Plan (AQMP) will be developed as a subplan to the CEMP. In addition to detailing how the measures above should be implemented, the AQMP should also identify:</p> <ul style="list-style-type: none"> Potential sources of air pollution (including odours and dust) during construction Air quality management objectives consistent with any relevant published guidelines Methods to manage works during strong winds or other adverse weather conditions A progressive rehabilitation strategy for exposed surfaces When the air quality, suppression and management measures need to be applied, who is responsible, and how effectiveness will be assessed A monitoring program to record whether the air quality mitigation, suppression and management measures have been applied; and assess the effectiveness of the applied measures. 	Contractor	<p>Prior to construction</p> <p>Construction</p>
AQ02	Dust emissions during construction	Minimise the extent of disturbed and exposed areas, and revegetate finished areas as soon as possible.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ03	Dust emissions during construction	Minimise the drop heights of materials.	Contractor	Construction
AQ04	Dust emissions during construction	Review and where necessary modify or suspend activities during dry and windy weather and background air quality conditions.	Contractor	Construction
AQ05	Dust emissions during construction	Cover or otherwise regularly stabilise (with water sprays or binders) stockpiles.	Contractor	Construction
AQ06	Dust emissions during construction	Regularly water haul routes, minimise vehicle speed onsite and ensure that all loads are covered.	Contractor	Construction
AQ07	Dust emissions during construction	Regularly inspect and remove debris from plant and equipment to avoid the tracking of materials on to the adjacent road network.	Contractor	Construction
AQ08	Dust emissions during construction	To the extent practical, position ancillary sites and stockpiles away from nearby sensitive receivers.	Contractor	Construction
AQ09	Exhaust emissions from plant and equipment used during construction	Inspect all plant and equipment before it is used on-site.	Contractor	Prior to construction Construction
AQ10	Exhaust emissions from plant and equipment used during construction	Ensure all vehicles, plant, and equipment operate in a proper and efficient manner.	Contractor	Construction
AQ11	Exhaust emissions from plant and equipment used during construction	Switch off all vehicles, plant and equipment when not in-use.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ12	Exhaust emissions from plant and equipment used during construction	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	Contractor	Construction
AQ13	Odours and airborne hazardous substances from uncovered contaminated materials	Apply odour suppressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works.	Contractor	Construction
AQ14	Odours and airborne hazardous substances from uncovered contaminated materials	Adhere to relevant requirements for removal and disposal listed in the <i>Work Health and Safety Act 2011</i> , and <i>Work Health and Safety Regulation 2017</i> .	Contractor	Construction
AQ15	Emissions to air and visual impacts from blasting activities	Prior to firing, review and confirm that the blast would not likely result in any dust or fume-related impacts. This should include a review of whether meteorological conditions (ie inversions, wind speeds and directions, stability, time of day, cloud cover, temperature and humidity) are suitable.	Contractor	Construction
AQ16	Emissions to air and visual impacts from blasting activities	Where possible, avoid blasting during early morning and late afternoon when meteorological conditions are typically least favourable in terms of the potential for blast-related impacts.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
Bushfire				
BF01	Emergency access during construction	In the event of a fire, emergency services will be able to gain access via existing Great Western Highway or tracks used for construction activities. Access and egress to/from private properties in bushfire prone areas adjoining the construction corridor will be maintained, with advice on any access changes provided to RFS in advance of the bushfire season.	Contractor	Construction
BF02	Hot works	Works that have potential to generate sparks or heat and ignite fires will be subject to the contractor's hot works safety management procedures. Hot works will not be carried out on total fire ban days except where permission has been given by the RFS. Construction equipment and contractor's vehicles will carry fire extinguishers or knapsacks to help extinguish any small fires that may be ignited by construction activities.	Contractor	Construction
BF03	Hazardous materials storage	Storage of hazardous and flammable materials should follow environmental protection guidance and be located in areas with low radiant heat exposure in the event of a bushfire. Any hazardous fuel storage areas should be free of vegetation or any other combustible materials that could contribute to a fire ignition.	Contractor	Construction
BF04	Emergency management	On site bushfire emergency management arrangements will be addressed through the construction contractor's site emergency management plan. This plan will specify notifications to emergency services in case of fire, emergency assembly areas and evacuation procedures. If a fire is ignited and cannot be safely contained using fire extinguishers or other materials at hand, construction crews will dial 000 and seek emergency service assistance.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BF05	Operational bushfire risks	<p>Grass within the highway corridor should be inspected and maintained at the commencement of the fire season (and through the fire season, if required) to reduce fuel loading and the potential for fire ignition and to create a low bushfire fuel zone in the immediate vicinity of the road.</p> <p>Woody vegetation in the vicinity of the road should also be actively managed to remove dead plants. Roadside trees should be inspected for stability and safety following any fire event to minimise the risk posed to road users.</p>	Transport project manager	Operation
BF06	Operational access	Design will incorporate the need for safe emergency vehicle access at all times.	Transport project manager	Operation
BF07	Fire weather signage	Roadside signage should be erected at either end of the proposal <u>modified project</u> that informs road users of the daily fire weather forecast (i.e. the daily Fire Danger Rating). On days of highly elevated fire danger (extreme or catastrophic fire danger), additional advice should be posted that advises road users to reconsider the need for travel.	Transport project manager	Operation
Waste				
WM01	Waste management	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the project <u>modified project</u> Classification of wastes and management options (reuse, recycle, stockpile, disposal) Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions 	Contractor	Prior to construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Procedures for storage, transport and disposal Monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the Environmental Procedure - Management of Wastes on Transport for NSW Land (Roads and Maritime Services, 2014) and relevant Transport for NSW Waste Fact Sheets.</p>		
WM02	Waste management	All wastes will be managed and disposed of in accordance with the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Waste) Regulation 2014	Contractor	Construction
WM03	Waste disposal	Excavated material will be assessed for reuse as backfill material as part of the proposal <u>modified project</u> . If material is unable to be used as general fill, structural backfill or onsite mounding material it would be appropriately tested and classified against the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014) and Addendum 1 (NSW EPA, 2016) prior to being disposed of off-site.	Contractor	Construction
WM04	Green waste	Where possible and suitable for use, cleared vegetation will be used as mulch or coarse woody debris for site erosion and sedimentation controls or rehabilitation.	Contractor	Construction
WM05	Fill material	Any required additional fill material will be sourced from appropriately licensed facilities and/ or other construction projects wherever possible. Additional fill material will be sourced and verified as suitable for use in accordance with relevant EPA and Transport guidelines.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
Sustainability, greenhouse gas and climate change				
GH01	Greenhouse gas emissions	Detailed modelling will be carried out to ensure that cut and fill balances are managed to minimise any unnecessary movements of material.	Contractor	Detailed design
GH02	Greenhouse gas emissions	Review opportunities to specify biofuel use on construction plant and equipment based on site for long periods.	Contractor	Detailed design
GH03	Greenhouse gas emissions	Review opportunities to use alternative materials in construction, such as fly ash as a supplementary cementitious material (to replace traditional Portland cement) and reclaimed aggregate.	Contractor	Detailed design Construction
GH04	Greenhouse gas emissions	Specify high recycled content in steel use (where technically possible and cost effective).	Contractor	Detailed design
GH05	Flooding	Findings of the CCRA will be used to inform further design considerations, mitigation measures and management plans regarding flooding in and around the proposal <u>modified project</u> alignment.	Contractor	Detailed design
GH06	Bushfire risk	Findings of the CCRA will be used to inform bushfire risk management measures and management plans.	Contractor	Detailed design
GH07	Climate projections	Adopt consideration of climate projections, flooding and bushfire risks when developing the detailed design and material consideration.	Contractor	Detailed design
Cumulative				
CU01	Cumulative impacts	Ongoing coordination and consultation will be carried out with nearby projects as required.	Contractor Transport project manager	Prior to construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CU02	Cumulative impacts	The CEMP will be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Contractor	Construction
CU03	Cumulative impacts	Opportunities for further design refinements will be considered during detailed design to reduce potential impacts where feasible.	Contractor	Detailed design
CU04	Dust, exhaust and other emissions during construction	To the extent practical, plan the construction of the various segments of the proposal <u>modified project</u> to avoid situations where sensitive receivers may be affected by emissions to air from multiple work areas.	Contractor	Prior to construction Construction

7.3 Licensing and approvals

All relevant licences, permits, notifications, and approvals needed for the modified project when they need to be obtained are listed in Table 7-2.

Table 7-2 Summary of licensing and approval required

Instrument	Requirement	Timing
Protection of the Environment Operations Act 1997 (s43)	Environment protection licence (EPL) for scheduled activities [if known, describe the applicable scheduled activities, e.g. road construction/ extractive activities/ crushing, grinding or separating, etc.] from the EPA.	Prior to start of the activity.
Fisheries Management Act 1994 (s220)	Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Agriculture and Western NSW.	Prior to start of the activity.
National Parks and Wildlife Act 1974 (s90)	Aboriginal heritage impact permit from the Chief Executive of OEH.	Prior to start of the activity. Procured for the approved project; to be amended.
Water Management Act 2000	A water supply works approval to construct a work	Prior to start of the activity.
Water Management Act 2000	A water use approval to use the water.	Prior to start of the activity.
Heritage Act 1977	A section 60 permit or subsection 57(2) permit for works that have (or have the potential to have) a minor impact on the heritage significance of a State Heritage item.	Prior to start of the activity.
Heritage Act 1977	A section 140 excavation permit to disturb or excavate any land in NSW that is likely to contain archaeological relics.	Prior to start of the activity.
Heritage Act 1977	A section 139(4) excavation permit exemption.	Prior to start of the activity.

A summary of the heritage approvals required for specific heritage items relevant to the proposed modification is provided in Table 7-3.

Table 7-3 Summary of heritage approvals required

Heritage item (Register and ID)	Requirement
Billesdene Grange (LEP I023)	<p>Under the TISEPP, impacts to a local heritage item which are more than negligible or minor, will require consultation with Lithgow City Council. Any response received within 21 days must be taken into consideration in the addendum REF.</p> <p>A detailed archival recording of the causeway and Billesdene Grange frontage to the Great Western Highway will be completed prior to works.</p>
Possible rubbish dump and grave site (both on Unidentified lot) (Unlisted)	<p>As an area of identified archaeological potential (including potential for human remains), the archaeological investigation would require a permit exception under s139 of the Heritage Act and the proposed works would require approval under s140 of the Heritage Act prior to construction.</p>
Fernhill (SHR 00225/ LEP I043)	<p>Works within the SHR curtilage will require approval from the Heritage Council prior to construction under Section 60 or subsection 57(2) of the Heritage Act.</p> <p>A detailed archival recording of the possible bullock track will be completed prior to works.</p>
Possible bullock track (Unlisted)	<p>Although not currently listed, best practice requires that the heritage values of the item should be managed appropriately.</p> <p>Information regarding the proposed impacts to the heritage item should be submitted with this assessment to Transport for their internal comment and approval as the determining authority.</p> <p>A detailed archival recording of the possible bullock track will be completed prior to works.</p>

8 Conclusion

This chapter provides the justification for the modified project taking into account its biophysical, social, and economic impacts, the suitability of the site, and whether or not the proposed modification is in the public interest. The modified project 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 2021.

8.1 Justification

When the approved project REF was written, it described and assessed impacts relating to the concept design of the Little Hartley to Lithgow Upgrade as it was in 2021, which included indicative tie-in to the Great Western Highway Blackheath to Little Hartley Upgrade. Since this work, the design for the Great Western Highway Blackheath to Little Hartley Upgrade has been developed further. Now, this proposed modification has been proposed to provide a functional interface between the approved project and the Great Western Highway Blackheath to Little Hartley Upgrade. This involves changes to the surface road works between Little Hartley at the base of Victoria Pass to around 100 metres east of Coxs River Road to tie into the Great Western Highway Blackheath to Little Hartley Upgrade surface works and tunnel alignment.

Design development, construction planning and ongoing stakeholder consultation has resulting in a number of design refinements for the approved project. These design refinements have been assessed as the proposed modification in this addendum REF. The proposed modification would provide improved constructability and additional long-term operational benefits for the modified project. These benefits would include:

- Improved safety, separation of traffic, and connectivity with the existing road network, particularly the existing Great Western Highway, and the upgraded highway
- Improved integration of ancillary infrastructure, including active transport connections, access arrangements for local properties, and carparking
- Improved environmental management infrastructure, particularly in relation to surface water management
- Improved efficiency and delivery of the modified project, and reduction in overall cost.

An assessment of environmental impacts is presented in Chapter 6 of this addendum REF. It concluded that the majority of impacts attributed to the construction and operation of the proposed modification would be consistent with what was concluded in the approved project REF.

Any additional impacts associated with the proposed modification would be related to additional land required for the increased construction boundary. These would include impacts to biodiversity, non-Aboriginal heritage, landscape and visual, and property and land use. These changes in impacts are not considered significant in relation to what was concluded in the approved project REF and would be managed with the safeguards and management measures outlined in Chapter 7 of this addendum REF, which include some new and modified measures.

The proposed modification would result in long term positive impacts. These impacts relate to access, connectivity, and safety.

Overall, the proposed modification is considered to be justified. It has been developed to best meet the objectives and development criteria outlined in Section 2.3 (Proposal objectives and development criteria) of the approved project REF, whilst minimising the construction impacts. It provides additional, beneficial operational impacts to the approved project.

8.1.1 Social factors

As documented in Chapter 6 of this addendum REF, the proposed modification would have some minor, short-term, socio-economic impacts as a result of the changes in disturbance area that would occur during construction. The combined effect of construction noise, vibration, and dust, local property acquisition, property access changes, lighting, construction traffic, and the establishment and use of modified ancillary sites and the construction footprint for the proposed modification would result in a general loss of amenity for a number of residents, motorists, and workers. Negative impacts of the proposed modification would include:

- Increase in the area where vegetation would be cleared, resulting in the loss of an additional of 1.18 hectares of native vegetation
- Changes in landscape character and views of the area due to the presence of construction infrastructure and lighting
- Increase in construction traffic and disruption to local access, plus a temporary loss of parking from the existing Berghofers car parking area during construction
- Increase in construction noise, with additional construction noise receivers likely to experience clearly audible to moderately intrusive impacts
- Increase in construction dust emissions associated with earthworks, vegetation clearance, blasting, and use of construction equipment and vehicles.

The majority of impacts would be no greater than what was concluded in the approved project REF and would be managed in accordance with the mitigation measures presented in the approved project REF. Additional mitigation measures have been proposed in Chapter 7 of this addendum REF which would be implemented to minimise adverse impacts specific to the proposed modification.

Once operational, the proposed modification would support the long-term objectives of the modified project, and be considered to have an overall long term positive impacts on access, connectivity, and safety for local and regional communities, business, and industry.

8.1.2 Biophysical factors

Throughout the options development process for the proposed modification, an important consideration has been to minimise potential impacts on biodiversity, particularly the removal of native vegetation. The proposed modification includes amendments to the construction footprint and additional construction ancillary facilities which would involve the removal of an additional 1.18 hectares of native vegetation compared to the approved project REF. This includes the following PCTs which may serve as potential habitat for threatened fauna species:

- 0.03 hectares of PCT 766: Carex Sedgeland of the slopes and tablelands (listed as Endangered under the BC Act) (low condition). This PCT is associated with the TEC, Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, Southeast Corner, South-eastern Highlands and Australian Alps bioregions (listed as Endangered within the BC Act)

- 0.21 hectares of PCT 1103: Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion (listed as Endangered under the BC Act) (moderate condition). This PCT is associated with the TEC, Tableland Basalt Forest in the Sydney Basin and South-eastern Highlands Bioregions (listed as Endangered within the BC Act)
- 0.94 hectares of PCT 1615: Monkey Gum – *Eucalyptus blaxlandii* shrubby open forest on basalt of the Sydney Basin (low to high condition).

Construction of the proposed modification may increase the risk of injury and mortality to threatened fauna species, increase fragmentation through vegetation removal and the realignment of the Great Western Highway, and aid in the spread of weeds, pests, and infections. These impacts are consistent with the approved project REF and would be appropriately managed through approved environmental safeguards.

The proposed modification would involve a number of cuttings, one of which is anticipated to intercept the groundwater table. The maximum groundwater drawdown within the immediate area of the cut is estimated to be around 3.6 metres. The zone of influence of the cut (up to 62 metres) is not predicted to intersect other areas of groundwater impact, and therefore there is no cumulative impact associated with this cut. Groundwater impacts are expected to be no greater than what was predicted for the equivalent area of the approved project. No revised or additional groundwater safeguards and management measures are proposed as a result of the proposed modification.

Construction and operational impacts associated with surface water quality, hydrology, and flooding of the proposed modification are no greater than what was concluded in the approved project REF. The existing measures are considered adequate to manage potential surface water quality, hydrology, and flooding impacts of the modified project during operation.

8.1.3 Economic factors

The proposed modification would provide improved road safety and accessibility, thus impacting positively on the businesses in the surrounding suburbs and locality. This aligns with the objectives of the approved project.

The proposed modification would require a larger area of property acquisition, and a reduced area of temporary property leasing required compared to the approved project. Property acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, *Property Acquisition – A guide for residential owners (NSW Government, 2021a)*, and *Property Acquisition – A guide for residential tenants (NSW Government, 2021b)*.

Similar to the approved project, the proposed modification would contribute to the NSW Future Transport Strategy 2056 state-wide outcome for a strong economy. The proposed modification supports this outcome by enabling growth in economic activity, including the movement of freight.

The number of people to be employed for the construction of the modified project would be commensurate with those required for the approved project. The Great Western Highway Upgrade Environment and Sustainability Policy presented in Section 6.15 of the approved project REF identifies that local employment and skills development are a key focus of the policy. This includes increasing local employment, adopting the Infrastructure Skills Legacy Program or similar outcomes and embracing Aboriginal Participation in Construction (APIC) Policy targets.

8.1.4 Public interest

The public interest is best served through the equitable distribution of resources, and investment in public infrastructure that fulfils the need of the majority. The modified project represents a cost-efficient investment in public infrastructure that would maximise the long-term social and economic benefits, while minimising the long-term negative impacts on communities and the environment. By improving local and regional transport facilities, the modified project would better enable movement of people, goods, and services.

The proposed modification would result in some additional short-term impacts on amenity, access, and transport during construction. In addition, the clearing of approximately 1.18 hectares of native vegetation would be required to construct the proposed modification. Mitigation measures would be implemented to manage and reduce the short-term impacts.

There are a number of Commonwealth and State strategic plans that specifically aim to improve safety and efficiency of the road network. The modified project is consistent with these plans including the State Infrastructure Strategy and the Future Transport Strategy among others.

8.2 Objects of the EP&A Act

The objects of the EP&A Act in relation to the proposed modification are considered in Table 8-1.

Table 8-1 Consideration of 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.	<p>Development of the proposed modification has considered potential impacts to all environmental resources, including air, water, land and biodiversity, which may be affected by the development of the proposed modification. Wherever possible, the design of the proposed modification has avoided and minimised impacts, and safeguards have been developed to further reduce and mitigate impacts on the environment.</p> <p>The proposed modification would improve the social and economic welfare of the community by improving access, connectivity, and safety for local and regional communities.</p> <p>The proposed modification will contribute to the operation of the approved project and a broader program of works on the Great Western Highway, thereby continuing traffic safety and efficiency improvements, which are promoting social and economic welfare of the community.</p>
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	<p>Ecologically sustainable development for the proposed modification is considered in Section 8.3. The consideration of the principles of ecologically sustainable development was facilitated throughout the design of the proposal and the safeguards developed in this REF.</p>

Object	Comment
1.3(c) To promote the orderly and economic use and development of land.	<p>The proposed modification would support the objectives of the approved project and form an important element in the Great Western Highway Upgrade Program throughout the Blue Mountains in NSW. It would assist in the coordination of the orderly economic use and development of land for the region and along this significant freight transport corridor.</p> <p>Due to the extended construction boundary, the proposed modification may impact on additional areas of land zoned as RU1 Primary Production and R5 Large Lot Residential in the Lithgow City Council LEP. Impacts to land use and future development of land have been minimised where possible; however, changes to existing land uses would occur.</p>
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposed modification.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats.	<p>Potential impacts to native plants and animals including threatened species, populations, and ecological communities and their habitats are considered in Section 6.1.</p> <p>The proposed modification would result in the clearing of an additional 1.18 hectares of native vegetation. However, the vegetation clearing would not significantly impact threatened species, populations, or ecological communities or their habitats. Offsetting under the No Net Loss guidelines and Biodiversity Offset Strategy would be required for the modified project.</p> <p>Safeguards and management measures would be implemented to manage impacts to biodiversity and cleared areas would be appropriately revegetated at the completion of work.</p>
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	<p>Impacts of the proposed modification on Aboriginal and Non-Aboriginal Heritage are assessed in Sections 6.4 and 6.5.</p> <p>Construction work for the proposed modification may directly impact six Aboriginal heritage sites and may indirectly impact one other. Implementation of management measures, described in Section 6.4, would sufficiently mitigate any impacts to Aboriginal heritage items. Operational impact on Aboriginal heritage is consistent with the approved project.</p> <p>Construction of the proposed modification may impact on seven listed non-Aboriginal heritage sites and four currently unlisted sites. Implementation of management measures, described in Section 6.5, would sufficiently mitigate any impacts to heritage items. The operation</p>

Object	Comment
	<p>of the proposed modification would have a greater impact on the Billesdene Grange heritage item as Service Road 1 would be brought closer to it; however, mitigation measures presented in the approved project would sufficiently manage any additional impacts.</p>
<p>1.3(g) To promote good design and amenity of the built environment.</p>	<p>The proposed modification has been designed in accordance with the urban design objectives and principles, as outlined in Section 2 of the approved project REF.</p> <p>Impacts upon urban design, landscape character, and visual amenity have been considered in Section 6.8. Whilst construction infrastructure would be an uncharacteristic addition to the quiet, rural valley setting, impacts relating to construction would be consistent to the approved project. Changes in landscape character at Little Hartley between the approved project and modified project would be negligible. The potential impacts upon landscape character and changes in views would be managed through the implementation approved and updated mitigation measures.</p>
<p>1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.</p>	<p>Not relevant to the proposed modification.</p>
<p>1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.</p>	<p>Not relevant to the proposed modification.</p>
<p>1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.</p>	<p>The proposed modification process has involved consultation with relevant stakeholders. Consultation carried out to date and proposed for the future is outlined in Chapter 5.</p>

8.3 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 proposed modification.

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.

8.3.1 The precautionary principle

This principle states: *“If there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.”*

When designing the proposed modification, various alternatives and options were considered which aimed to reduce the risk of serious irreversible impacts on the environment. The design of the proposed modification and construction methodology considered issues raised by stakeholders during consultation, and a range of addendum specialist studies were carried out for key issues to provide accurate and impartial information.

As per the approved project REF, a CEMP would be prepared before construction starts. This requirement would ensure the modified project achieves a high level of environmental performance. No mitigation measures or management mechanisms would be postponed because of a lack of information.

8.3.2 Intergenerational equity

The principle states: *“the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.”*

The proposed modification would not impact on the health, diversity, and productivity of the local environment or communities in a way that would disadvantage future generations. The proposed modification would improve the social and economic welfare of local and regional communities by improving access, connectivity, and safety.

The proposed modification would contribute to the operation of the approved project and a broader program of works on the Great Western Highway, thereby continuing traffic safety and efficiency improvements, which are promoting social and economic welfare of the community.

8.3.3 Conservation of biological diversity and ecological integrity

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

The principle of conservation of biological diversity and ecological integrity requires the maintenance and improvement of genes, species, populations, and communities, as well as the ecosystems and habitats to which they belong, to ensure their survival. A thorough assessment of the existing local environment was undertaken to identify and manage any potential impacts of the proposal on local biodiversity (refer to Section 6.1 (Biodiversity)).

The proposed modification would result in the additional removal of approximately 1.18 hectares of native vegetation, including the following PCTs:

- 0.03 hectares of PCT 766: *Carex* Sedgeland of the slopes and tablelands (listed as Endangered under the BC Act) (low condition)
- 0.21 hectares of PCT 1103: Ribbon Gum – Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands Bioregion (listed as Endangered under the BC Act) (moderate condition)
- 0.94 hectares of PCT 1615: Monkey Gum – *Eucalyptus blaxlandii* shrubby open forest on basalt of the Sydney Basin (low to high condition).

These plant community types could potentially serve as habitat for threatened fauna species including, but not limited to: *Asterolasia buxifolia*, Purple Copper Butterfly (*Paralucia spinifera*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), and Koala (*Phascolarctos cinereus*).

As the proposed modification would require the removal of native vegetation and potential fauna habitat from the study area, Transport are required to offset these impacts on biodiversity. The offsets required for the proposal were calculated using the BAM calculator. An additional number of ecosystem credits may be required to offset indirect impacts; these would be in addition to BAM credit obligations.

Biodiversity offsetting thresholds have been reached under the No Net Loss Guidelines, and offsets or conservation measures are required. A Biodiversity Offset Strategy is to be developed to outline how the proposal would address the offsetting requirements of these residual impacts and will include offsets for key fish habitat determined in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) (DPI (Fisheries), 2013).

All impacts to vegetation and species will be offset under the Biodiversity Offset Strategy. A Tree and Hollow Replacement Plan written as per the Tree and Hollow Replacement Guidelines would be prepared to address the impacts prior to the commencement of work.

8.3.4 Improved valuation, pricing and incentive mechanisms

This principle is defined as: “*Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as* ai) *polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.”

This addendum REF has considered the environmental consequences of the proposed modification and identified mitigation measures to manage potential adverse impacts. The requirement to implement these mitigation measures would result in an economic cost to Transport and would increase the capital and operating costs of the modified project. The costs of the generation and management of waste and pollution would be captured in any waste disposal charges for construction activities. This signifies that environmental resources have been given appropriate valuation.

The proposed modification has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the modified project is being developed with an environmental objective in mind.

8.4 Conclusion

This addendum 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 modification.

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, populations and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification, as described in the addendum REF, best meets the project objectives, but would still result in some impacts, including: construction noise and vibration, changes to access and traffic delays during construction, land acquisition and property adjustments, visual and landscape changes and loss of around 1.18 hectares of native vegetation. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts.

The proposed modification would support the objectives of the approved project and form part of the broader Great Western Highway Upgrade Program that aims to reduce congestion and deliver safer, more efficient, and reliable journeys for those travelling in, around and through the Blue Mountains, whilst also better connecting communities in the Central West. On balance, the proposed modification is considered justified. With the effective implementation of identified environmental mitigation measures, the potential residual environmental impacts of the proposed modification are considered manageable, and the modified project would be in the public interest.

Significance of impact under NSW legislation

The proposed modification would not result in a significant change to the findings of the approved project REF and would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an Environmental Impact Statement to be prepared, and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. An addendum BDAR has been prepared as an addendum to the approved project BDAR. The proposed modification is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposed modification would not likely cause 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 Government Department of Agriculture, Fisheries and Forestry is not required.

9 Certification

This addendum review of environmental factors provides a true and fair review of the proposed modification 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 proposed modification.

Scott Jeffries
Technical Director
AECOM
Date: 21 June 2023

I have examined this addendum review of environmental factors and accept it on behalf of Transport for NSW.

Van Bardzhamian
Project Director
Date:

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Terms and acronyms

Term / Acronym	Description
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
The addendum REF	The addendum to the approved project REF that assesses the environmental impact of the proposed modification
AEI	Areas of Environmental Interest
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AHMP	Aboriginal Heritage Management Plan
AIP	Aquifer Interference Policy
ANZG	<i>Australia and New Zealand Guidelines for Fresh and Marine Water Quality</i>
APIC	Aboriginal Participation in Consultation
The approved project	The approved Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project
The approved project REF	The REF prepared for the approved Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project (Transport, 2021a)
The approved project construction footprint	Construction footprint for the approved Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
AWS	Automatic weather station
BAM	Biodiversity Assessment Areas
BC Act	<i>Biodiversity Conservation Act 2016 (NSW).</i>
BDAR	Biodiversity Development Assessment Report
bgl	Below ground level
Biosecurity Act	<i>The Biosecurity Act 2015 (NSW)</i>
Blackheath to Little Hartley upgrade project	The proposed Great Western Highway Upgrade Program – Blackheath to Little Hartley (Central Section) project. The EIS for this project was submitted in January 2023.
CEMP	Construction / Contractor's environmental management plan
CO	Carbon monoxide

Term / Acronym	Description
The construction footprint for modified project	The construction footprint for the proposed modified Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project that includes all modifications assessed in this addendum REF
DECC	Department of Environment and Climate Change
DPE	Department of Planning and Environment
DPI	Department of Planning and Industry
DUAP	Department of Urban Affairs and Planning
EC	Ecosystem credits
EIA	Environmental impact assessment
EIS	Environment impact statement
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environmental Protection Licence
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GDE	Groundwater dependant ecosystem
GWH	Great Western Highway
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
HIA	Heritage Impact Assessment
IBRA	Interim Biogeographically Regionalisation of Australia
ICOMOS	Australia International Council on Monuments and Sites
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
KTP	Key Threatening Process
LALC	Local Aboriginal Land Council
LCVIA	Landscape Character and visual Impact Assessment

Term / Acronym	Description
LCZ	Landscape Character Zones
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
The modified project	The proposed modified Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project that includes all modifications assessed in this addendum REF
MNES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
MW	Megawatt
NCA	Noise catchment area
NML	Noise management level
NO ₂	Nitrogen Dioxide
NorBE	Neutral or beneficial effect
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
OEH	Office of Environment and Heritage
OTM	Operational Traffic Model
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PADs	Potential Archaeological Deposit
PCB	Purple Copper Butterfly (<i>Paralucia spinifera</i>)
PCT	Plant community type
PFOS	Perfluoro-octane sulfonic acid
PM _{2.5}	Particulate matter with a diameter of 2.5 µm
PM ₁₀	Particulate matter with a diameter of 10 µm
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
The proposed modification	Modification to the approved Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) project including refinements to the alignment and layout of the proposed new Great Western Highway, connections with and upgrades to the existing

Term / Acronym	Description
	Great Western Highway, ancillary infrastructure and amendments to the construction footprint and construction ancillary facilities.
RAP	Registered Aboriginal Party
REF	Review of environmental factors
ROL	Road Occupancy Licence
Roads and Maritime	NSW Roads and Maritime was dissolved by the Transport Administration Amendment Bill in August 2019, all function are now managed by Transport for NSW
RTA	Roads and Transport Authority
SC	Species credits
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SES	State Emergency Services
SHR	State Heritage Register
TEC	Threatened ecological community
TISEPP	<i>SEPP (Transport and Infrastructure) 2021</i>
TMP	Traffic management plan
Transport	Transport for New South Wales
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Transport for NSW.
The Upgrade Program	<p>The delivery of 34 kilometres of four lane divided highway along the Great Western Highway between Katoomba and Lithgow. Split into:</p> <ul style="list-style-type: none"> • Great Western Highway Upgrade – Medlow Bath (Medlow Bath Upgrade) (approved) • Great Western Highway East – Katoomba to Blackheath (Katoomba to Blackheath Upgrade) (approved) • Great Western Highway Blackheath to Little Hartley Upgrade (currently in planning) • Great Western Highway Upgrade Program – Little Hartley to Lithgow (West Section) (Little Hartley to Lithgow Upgrade) (approved).
VP	Viewpoint
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>