Great Western Highway, Blackheath to Little Hartley

Scoping Report

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Executive summary

Introduction and need

The NSW Government is investing $2.5 billion towards upgrading the Great Western Highway between Katoomba and Lithgow to a four lane carriageway (the upgrade program). Once completed, the upgrade program will 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.

As part of the upgrade program Transport for NSW is now proposing an upgrade to the Great Western Highway between Blackheath and Little Hartley (the project). The development and evaluation of options for the project is continuing with the following options currently being progressed for further assessment:

- A single long tunnel between Blackheath and Little Hartley, bypassing both Blackheath and Mount Victoria
- Combination of two separate tunnel bypasses of Blackheath and Mount Victoria with a surface road upgrade between Blackheath and Mount Victoria.

A previous proposal to provide combination of surface road upgrades, new bridges / viaducts and a tunnel between Mount Victoria and Little Hartley was identified in the 2013 concept design, on the alignment shown in the Blue Mountains Local Environmental Plan 2015 and Lithgow Local Environmental Plan 2014. This option is no longer being progressed due to advances in tunnel technology and following further investigations.

The project (and the broader upgrade program) is needed to support regional economic development by providing a more efficient link between the Central West of NSW (Bathurst, Orange, Parkes, Dubbo) and the Sydney motorway network for freight, tourist and general traffic. There is also an opportunity to further improve road safety and address existing amenity issues.

Planning and assessment process

Transport for NSW, as the proponent, has formed the view that the project is likely to significantly affect the environment. On this basis, the project is declared to be State significant infrastructure (SSI) under section 5.12 (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by reason of the operation of clause 14 and clause 1 of Schedule 3 of the State Environmental Planning Policy (State and Regional Development) 2011.

The project is therefore subject to Division 5.2 of the EP&A Act and requires the preparation of an environmental impact statement (EIS) and the approval of the Minister for Planning and Public Spaces.

Transport for NSW is also seeking a declaration under Section 5.13 of the EP&A Act that the project is critical infrastructure, recognising that the project essential for the State for economic, environmental or social reasons.

Key environmental issues

Based on preliminary environmental investigations that have been carried out to date, and feedback received from the community and other stakeholders, key assessment issues for the project have been identified as:

- Transport and traffic, including road safety
- Air quality, including in-tunnel and ambient air quality

- Noise and vibration
- Socio-economic, land use and property (including impacts on the Blue Mountains National Park)
- Urban design, landscape character and visual amenity
- Biodiversity
- Geology, groundwater and ground movement
- Cumulative impacts.

Proposed scope of the environmental impact statement

The environmental impact statement would be prepared in accordance with the EP&A Act and in particular in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

In general terms this would include:

- A detailed description of the project including its components, construction activities and potential staging
- A comprehensive assessment of the potential impacts on the key environmental issues including a description of the existing environment, assessment of potential direct and indirect and construction, operation and staging impacts
- Description of measures and strategies to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor the potential impacts
- Identification and response to issues raised by stakeholders and the community.

Contents

1 INTRODUCTION 1-1

1.1 Overview of the project 1-1

1.2 Related development 1-3

1.3 Statutory process 1-3
1.3.1 Environmental Planning and Assessment Act 1979 1-3
1.3.2 National Parks and Wildlife Act 1979 1-3
1.3.3 Approvals not required, consistent approvals and approvals which cannot be refused 1-4
1.3.4 NSW legislation and regulations that may still be applicable 1-4
1.3.5 Environment Protection and Biodiversity Conservation Act 1999 1-6
1.3.6 Native Title Act 1993 1-6

1.4 Purpose of this report 1-7

2 BACKGROUND 2-1

2.1 Regional context 2-1

2.2 Strategic context and project need 2-1
2.2.1 Consistency with strategic plans and policy 2-1
2.2.2 Project need 2-5

2.3 Project objectives 2-6

2.4 Preferred options 2-7

2.5 Community and stakeholder engagement 2-8
2.5.1 Engagement carried out 2-8
2.5.2 Engagement to be carried out 2-10

3 PROJECT DESCRIPTION 3-12

3.1 Overview of key elements 3-12

3.2 Major project features 3-15
3.2.1 Tunnels 3-15
3.2.2 Surface road upgrades 3-15
3.2.3 Pedestrian and cyclist infrastructure 3-15
3.2.4 Ancillary operational facilities 3-15

3.3 Construction 3-15
3.3.1 Timing and duration 3-15
3.3.2 Construction methodology 3-16
3.3.3 Construction hours 3-17
3.3.4 Construction sites and compounds 3-17

4 KEY ENVIRONMENTAL ISSUES 4-1

4.1 Overview 4-1

4.2 Transport and traffic 4-1

4.2.1 Overview 4-1
4.2.2 Summary of issues 4-3
4.2.3 Proposed further assessments 4-4

4.3 Air quality 4-4
4.3.1 Overview 4-4
4.3.2 Summary of issues 4-5
4.3.3 Proposed further assessments 4-6

4.4 Noise and vibration 4-6
4.4.1 Overview 4-6
4.4.2 Summary of issues 4-6
4.4.3 Proposed further assessments 4-7

4.5 Socio-economic, land use and property 4-8
4.5.1 Overview 4-8
4.5.2 Summary of issues 4-10
4.5.3 Proposed further assessments 4-11

4.6 Urban design, landscape character and visual amenity 4-12
4.6.1 Overview 4-12
4.6.2 Summary of issues 4-13
4.6.3 Proposed further assessments 4-14

4.7 Biodiversity 4-14
4.7.1 Overview 4-14
4.7.2 Summary of issues 4-18
4.7.3 Proposed further assessments 4-19

4.8 Geology, groundwater and ground movement 4-19
4.8.1 Overview 4-19
4.8.2 Potential impacts 4-20
4.8.3 Proposed further assessments 4-20

4.9 Cumulative impacts 4-21
4.9.1 Overview 4-21
4.9.2 Summary of issues 4-21
4.9.3 Proposed further assessments 4-22

5 OTHER ENVIRONMENTAL ISSUES 5-23

5.1 Overview 5-23

5.2 Aboriginal heritage 5-23
5.2.1 Overview 5-23
5.2.2 Potential impacts 5-24
5.2.3 Proposed further assessments 5-24

5.3 Non-Aboriginal heritage 5-25
5.3.1 Overview 5-25
5.3.2 Potential impacts 5-27
5.3.3 Proposed further assessments 5-27

5.4 Spoil and waste management 5-27
5.4.1 Overview 5-27
5.4.2 Potential impacts 5-28
5.4.3 Proposed further assessments 5-28

5.5 Soils, hydrology and surface water quality 5-29
5.5.1 Overview 5-29

5.5.2 Potential impacts 5-32
5.5.3 Proposed further assessments 5-32

5.6 Greenhouse gases, climate change risk and adaption 5-33
5.6.1 Overview 5-33
5.6.2 Potential impacts 5-34
5.6.3 Proposed further assessments 5-35

5.7 Sustainability 5-36

6 CONCLUSION 6-37

7 REFERENCES 7-1

Figures

Figure 1-1: Overview of the project extent 1-2
Figure 2-1: Movement and place framework 2-3
Figure 3-1: Separate tunnel bypasses of Blackheath and Mount Victoria 3-13
Figure 3-2: Long tunnel option 3-14
Figure 4-1: Landscape character zones – Katoomba to Mount Victoria 4-12
Figure 4-2: Plant communities along the project extent 4-16
Figure 5-1: Listed heritage items along the project extent 5-26

Tables

Table 1-1: Overview of related development 1-3
Table 1-3: Other NSW legislation and regulations of potential relevance 1-5
Table 2-1: Great Western Highway Upgrade Program objectives 2-6
Table 4-1: Key social and demographic information 4-8
Table 4-2: Plant community types along the project extent 4-14
Table 4-3: Threatened flora records near potential surface road works 4-17
Table 4-4: Threatened fauna records near potential surface road works 4-17
Table 5-1: AHIMS sites near proposed surface works 5-23
Table 5-2: Soil landscapes within the investigation area 5-29

Appendices

Appendix A: Requirements of the Environmental Planning and Assessment Regulation 2000

Appendix B: Community Consultation Summary Report – corridor options

Appendix C: Blackheath Co-Design Committee: consultation process and outcomes report

Appendix D: Community Consultation Summary Report – route options

1 Introduction

1.1 Overview of the project

The NSW Government is investing $2.5 billion towards upgrading the Great Western Highway between Katoomba and Lithgow to a four lane carriageway (the upgrade program). Once completed, the upgrade program will 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.

There have already been important safety improvements delivered through the safety upgrade program along the Great Western Highway at Blackheath, Mount Victoria and Forty Bends. This work has seen improved road surfaces, intersection upgrades, and lane widening delivered as part of the $250 million investment by the Australian and NSW governments.

The upgrade program represents the next stage in the improvement of the Great Western Highway. Planning and development work that has already occurred includes:

- Identification and announcement of a preferred route for the Great Western Highway Upgrade between Mount Victoria and Lithgow in May 2010.
- Development and public display of a concept design for the Mount Victoria and Lithgow section in 2012 and finalisation of the concept design in April 2013. The preferred corridor was subsequently reserved via SP2 Infrastructure zoning in the Blue Mountains Local Environmental Plan 2015 and the Lithgow Local Environmental Plan 2014.
- Consultation with the community in Medlow Bath between June and August 2020 on a strategic design for the duplication of the Great Western Highway in the town centre and start of minor works in January 2021 to provide safety improvements by widening the highway at Bellevue Crescent and Foy Avenue while designs are refined for the full duplication of the Great Western Highway through Medlow Bath.
- Consultation with the community in Blackheath in October and November 2020 regarding route options for a highway upgrade (refer to Section 2.5.1 and Appendix D for detail).

As part of the upgrade program Transport for NSW is now proposing an upgrade to the Great Western Highway between Blackheath and Little Hartley (the project). The development and evaluation of options for the project is continuing with the following options currently being progressed for further assessment:

- Comprehensive long tunnel between Blackheath and Little Hartley, including connections for access to Blackheath
- Combination of two separate tunnel bypasses of Blackheath and Mt Victoria and a surface road upgrade between Blackheath and Mount Victoria.

A previous proposal to provide combination of surface road upgrades, new bridges / viaducts and a tunnel between Mount Victoria and Little Hartley was identified in the 2013 concept design, on the alignment shown in the Blue Mountains Local Environmental Plan 2015 and Lithgow Local Environmental Plan 2014. This option is no longer being progressed due to advances in tunnel technology and following further investigations.

The extent of the project is shown in Figure 1-1 below while a more detailed description of project options and key features is provided in Chapter 3 (Project description).

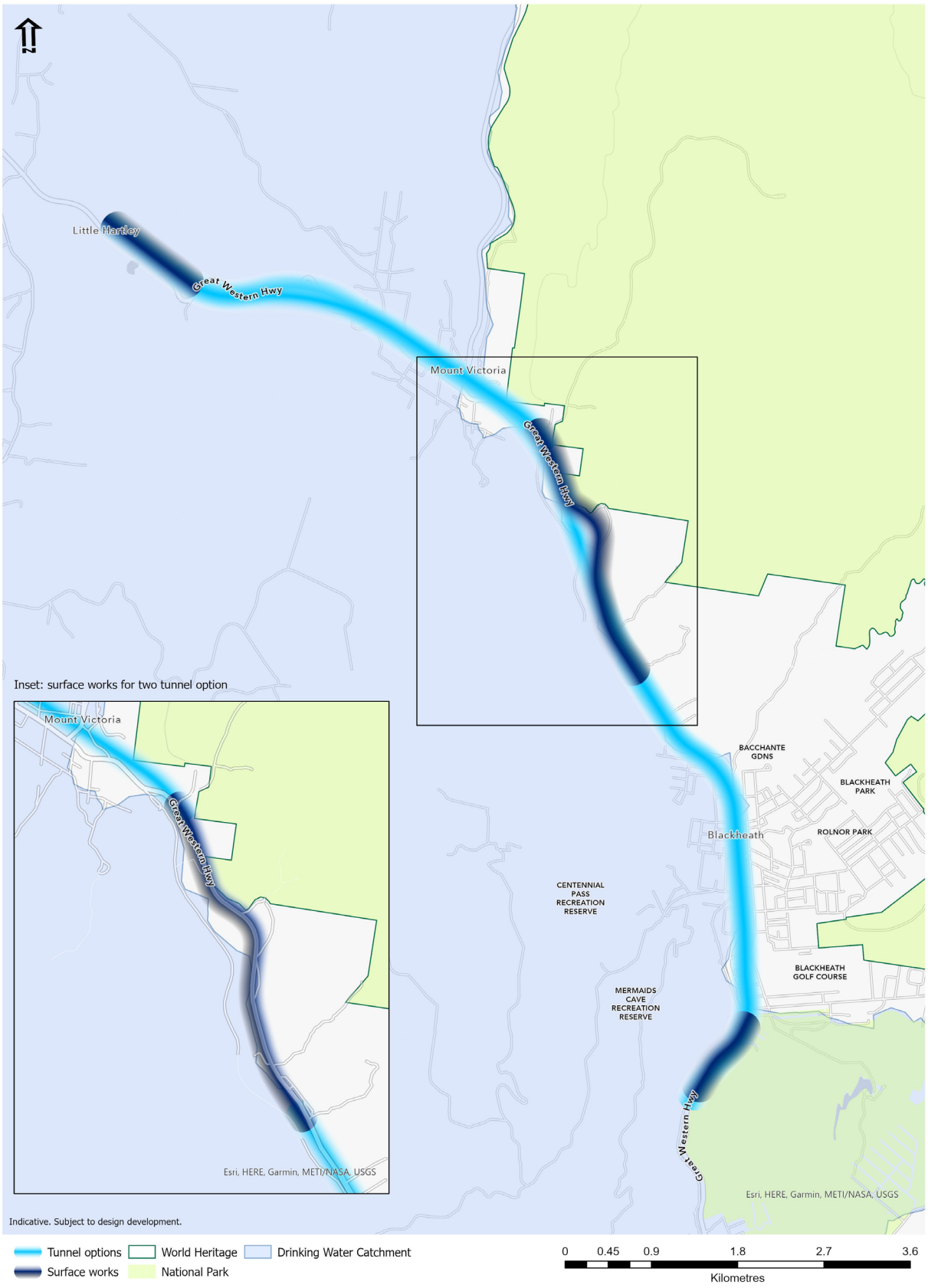

Figure 1-1: Overview of the project extent

1.2 Related development

The project forms part of a larger upgrade program for the Great Western Highway between Katoomba and Lithgow. Table 1-1 identifies the broad program sections and the proposed planning approval pathway for each.

Table 1-1: Overview of related development

Section	Likely planning approval pathway#
Katoomba to Medlow Bath	• Part 5, Division 5.1 (Review of Environmental Factors)
Medlow Bath	• Part 5, Division 5.1 (Review of Environmental Factors) • Immediate safety upgrades are being carried out at Bellevue Crescent and Foy Avenue. The early safety upgrades are being delivered in response to community feedback.
Medlow Bath to Blackheath	• Part 5, Division 5.1 (Review of Environmental Factors) • May be combined with Katoomba to Medlow Bath section
Little Hartley to Lithgow	• Part 5, Division 5.1 (Review of Environmental Factors) • Single or multiple projects.

Preliminary only

Other related development, if not captured as part of the project, may include power supply for the operation of the tunnel and other utility works.

1.3 Statutory process

1.3.1 Environmental Planning and Assessment Act 1979

Transport for NSW, as the proponent, has formed the view that the project is likely to significantly affect the environment. On this basis, the project is declared to be State significant infrastructure (SSI) under section 5.12 (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by reason of the operation of clause 14 and clause 1 of Schedule 3 of the State Environmental Planning Policy (State and Regional Development) 2011.

Accordingly, the project is subject to Division 5.2 of the EP&A Act and requires the preparation of an environmental impact statement (EIS) and the approval of the Minister for Planning and Public Spaces.

Transport for NSW is also seeking a declaration under Section 5.13 of the EP&A Act that the project is critical infrastructure.

1.3.2 National Parks and Wildlife Act 1979

The project may affect some parts of the Blue Mountains National Park, which is reserved land under the *National Parks and Wildlife Act 1979*. The revocation of reserved land under the Act requires an Act of Parliament (in the case of regional parks see section 47ZB of the Act). The process for the revocation of reserved land is outlined in *the Revocation, recategorisation and road adjustment policy* (Office of Environment and Heritage, 2017).

1.3.3 Approvals not required, consistent approvals and approvals which cannot be refused

Section 5.23 of the EP&A Act specifies approvals that are not required for approved State significant infrastructure under Part 5 Division 5.2 of the EP&A Act. Those approvals that may otherwise be required for the project if not for it being State significant infrastructure include:

- Permits under sections 201, 205 and 219 of the *Fisheries Management Act 1994*
- Approvals under Part 4 or excavation permits under section 139 of the Heritage Act 1977
- Aboriginal heritage impact permits under section 90 of the *National Parks and Wildlife Act 1974*
- Various approvals under the *Water Management Act 2000*, including water use approvals under section 89, water management work approvals under section 90 and activity approvals (other than aquifer interference approvals) under section 91.

In addition, Division 8 of Part 6 of the *Heritage Act 1977* does not apply to prevent or interfere with the carrying out of the State significant infrastructure.

Section 5.23 of the EP&A Act also identifies directions, orders or notices cannot be made or given so as to prevent or interfere with the carrying out of approved critical State significant infrastructure. These are:

- Interim protection orders (within the meaning of the *National Parks and Wildlife Act 1974*
- Orders under Division 1 (Stop work orders) of Part 6A of the *National Parks and Wildlife Act 1974* or Division 7 (Stop work orders) of Part 7A of the *Fisheries Management Act 1994*
- Remediation directions under Division 3 (Remediation directions) of Part 6A of the National Parks and Wildlife Act *1974*
- Orders or directions under Part 11 (Regulatory compliance mechanisms) of the *Biodiversity Conservation Act 2016*
- Environment protection notices under Chapter 4 of the *Protection of the Environment Operations Act 1997*
- Orders under section 124 of the *Local Government Act 1993*.

Section 5.24 of the EP&A Act identifies approvals or authorisations that cannot be refused if they are necessary for carrying out approved State significant infrastructure and must be substantially consistent with the Part 5, Division 5.2 approval. Statutory approvals or authorisations of potential relevance to the project include:

- An Environment Protection Licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*
- A consent under section 138 of the *Roads Act 1993*.

1.3.4 NSW legislation and regulations that may still be applicable

Environmental planning related legislation and regulations that may still be applicable to the project are identified in Table 1-3.

Table 1-2: Other NSW legislation and regulations of potential relevance

Legislation	Requirement
Aboriginal Land Rights Act 1983	Aboriginal land councils can claim Crown land which, if granted, is transferred as freehold title. 'Claimable Crown lands' includes Crown lands that are not lawfully used or occupied and that are not needed, nor likely to be needed, for an essential public purpose. In accordance with Section 42B of the *Aboriginal Land Rights Act 1983*, land vested in an Aboriginal Land Council can only be acquired by Transport for NSW through an Act of Parliament.
Biosecurity Act 2015	Under this Act, all plants 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
Contaminated Land Management Act 1997	This Act outlines the circumstances in which notification to the Environment Protection Authority is required in relation to the contamination of land. This may become relevant during construction and/or operation the project.
Crowns Land Management Act 2016	This Act sets out the requirements for the management of Crown land in NSW, including where councils and other organisations can deal with Crown land. The project may affect several parcels of Crown land. Land would need to be managed in accordance with the objectives of this Act as relevant.
Heritage Act 1977	Under Section 146 of this Act, If a relic is discovered or located, the Heritage Council must be notified 'of the location of the relic, unless it is believed on reasonable grounds that the Heritage Council is aware of the location of the relic'.
Land Acquisition (Just Terms Compensation) Act 1991	This Act would apply to the acquisition of land required for the project.
Protection of the Environment Operations Act 1997	An environment protection licence is required for scheduled activities or development work listed by the Act. Schedule 1 lists activities that require a licence and relevantly includes road construction that meets the scale criteria identified in the provision. Section 120 of the Act prohibits the pollution of waters. Air pollution-related sections 124 to 126 (Chapter 5, Part 5.4, Division 1) of the Act require activities to be conducted in a proper and efficient manner, while section 128 (Chapter 5, Part 5.4, Division 1) of the Act requires that all necessary practicable means are used to prevent or minimise air pollution. Pollution of land and waste is covered by Part 5.6 of the Act. It defines offences relating to waste and sets penalties and establishes the ability to set various waste management requirements via the Protection of the Environment Operations (Waste) Regulation 2014.
Protection of the Environment Operations (Waste) Regulation 2014	This Regulation provides for exemptions from environment protection licencing for certain resource recovery activities and establishes tracking and reporting requirements for the transport of waste. Any waste generated must be tracked and recorded in accordance with the requirements of the Regulation.
Water NSW Act 2014 and Water NSW Regulation 2020	The southern part of the project near Evans Lookout Road is within a declared catchment area under the *Water NSW Act 2014* and within a declared Schedule 1 special area under the Water NSW Regulation

Legislation	Requirement
	2020. Under section 50 of the *Water NSW Act 2014*, notice would need to be given to the relevant minister in relation to any road upgrade proposal within the special area.

1.3.5 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) establishes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas.

Under the EPBC Act, a referral to the Commonwealth Department of Agriculture, Water and the Environment is required for proposed 'actions' that have the potential to significantly impact on any matter of national environmental significance or the environment of Commonwealth land (including leased land).

Current matters of national environmental significance are:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Nationally listed threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

The significance of impacts in relation to these matters will be considered during the environmental impact assessment process and a decision will be made as to whether the project is referred to the Commonwealth Department of Agriculture, Water and the Environment. As part of the design development process, Transport for NSW is seeking to avoid direct impacts on the Greater Blue Mountains World Heritage Area.

1.3.6 Native Title Act 1993

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

A search of the Native Title Tribunal Native Title Vision website was undertaken and identified one Indigenous Land Use Agreement affecting the project extent as follows:

- Gundungurra Area Agreement (NI2014/001) Registered 27/02/15

Transport for NSW would provide notice of the project to NTSCORP under section 24KA of the Act and would invite comment on the project.

1.4 Purpose of this report

Transport for NSW has prepared this scoping report to support a State significant infrastructure application under section 5.15 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The requirements of clause 192 of the Environmental Planning and Assessment Regulation 2000 for applications seeking approval of the Minister for Planning and Public Spaces to carry out State significant infrastructure are addressed in Attachment A to this report.

The purpose of this scoping report is to assist the formulation of environmental assessment requirements by the Secretary of the Department of Planning and Environment under section 5.16 of the EP&A Act. The scoping report does the following:

- Describes the project
- Sets the strategic context for the project and explains why it is needed
- Identifies relevant statutory requirements
- Considers the potential environmental issues for the project
- Identifies key environmental issues for the project, the level of assessment and the assessment approach.

The scoping report and Secretary environmental assessment requirements would inform the preparation of an environmental impact statement for the project. The form and content of the environmental impact statement would be in accordance with clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

2 Background

2.1 Regional context

The project is in the upper Blue Mountains and Central Tablelands west of Sydney. It is within the Blue Mountains and Lithgow local government areas (LGAs) and traverses the suburbs of Blackheath, Mount Victoria, Katoomba and Little Hartley. The project is about 110 kilometres west of the Sydney CBD and about 75 kilometres east of Bathurst.

The Great Western Highway is about 200 kilometres long and provides the main transport link through the Blue Mountains for access between the Central West of NSW (Bathurst, Orange, Parkes and Dubbo) and the Sydney motorway network for freight, tourist and general traffic. The Darling Causeway links the highway with Bells Line of Road / Chifley Road to the east. The Main Western Railway line runs generally parallel to the Great Western Highway to Mount Victoria (with stations at Blackheath and Mount Victoria) and serves an important role for passenger and goods transport. Other infrastructure includes 66,000 volt and 133,000 volt electricity transmission lines which cross or run parallel to the project alignment.

The Blue Mountains National Park and the Blue Mountains World Heritage Area are located generally to the east of the Main Western Railway line and the existing Great Western Highway alignment. The Mid Coxs River Catchment is generally to the west of the existing Great Western Highway while the Grose River Catchment is to the east. A large part of the project is within the declared drinking water catchment for Sydney.

The dominant land uses near the project location are bushland conservation (including National Parks Estate and the World Heritage Area), rural, residential, commercial and transport. Low density and medium density residential areas and commercial land uses are mainly located in the town centres of Blackheath, Mount Victoria and Little Hartley (all of which included numerous non-Aboriginal heritage items).

The project location has a long history of Aboriginal occupation and there are a number of previously recorded Aboriginal sites, mainly towards the north west of the project extent. The nearest Aboriginal place is the Upper Kedumba River Valley - The Gully site near Katoomba.

More recent non-Aboriginal heritage values are associated with the construction of the Great Western Highway, the railway and early settlements.

Further information on the environmental aspects relevant to the project is provided in Chapter 6 while provides an overview of the regional context.

2.2 Strategic context and project need

2.2.1 Consistency with strategic plans and policy

Future Transport Strategy 2056

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

Future Transport 2056 outlines six state-wide outcomes to guide investment, policy and reform and service provision. They provide a framework for planning and investment aimed at harnessing rapid change and innovation to support a modern, innovative transport network. The proposal directly aligns with the following state-wide outcomes:

- A strong economy – The transport system powers NSW's future $1.3 trillion economy and enables economic activity across the state. The proposal supports this outcome enabling growth in economic activity and supporting the future development of the Port Macquarie health and education precinct
- Safety and performance – Every customer enjoys safe travel across a high performing, efficient network. The proposal supports this outcome through safety improvements at intersections the implementation of contemporary design standards.

The project would also provide an opportunity to directly support the following regional customer outcomes:

- Customer Outcome 3 – The appropriate movement and place balance is established enabling people and goods to move efficiently through the network whilst ensuring local access and vibrant places – The movement and place framework is discussed further below
- Customer Outcome 4 – Supporting centres with appropriate transport services and infrastructure – The project would support the access between Sydney and the Central West of NSW, including the various towns and urban centres along the alignment
- Customer Outcome 7 – A safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056 – The project would improve safety via the separation of carriageways and the implementation of contemporary design standards.

Movement and place framework

Future Transport Strategy 2056 introduces the movement and place framework which aims to allocate road space in a way that improves the liveability of places. The framework has been subsequently refined in the Practitioner's Guide to Movement and Place (Department of Planning, Industry and Environment, 2020).

The framework identifies the need to prioritise different customer groups, depending which street environment they are travelling. These environments are described below and their place in the framework is illustrated in Figure 2-1:

- Civic spaces (was "places for people") are streets at the heart of our communities and have a significant meaning, activity function, or built environment. They are often in major centres, our tourist and leisure destinations, and our community hubs. These streets are often pedestrian priority, shared spaces.
- Local streets are the majority of streets within transport networks and often have important local place qualities. Activity levels are less intense, however, these streets can have significant meaning for local people.
- Main streets (was "vibrant streets") have both significant movement functions and place qualities. Balancing the functions of these streets is a common challenge.
- Main roads (were "movement corridors", and "motorways") are routes central to the efficient movement of people and freight. They include motorways, primary freight corridors, major public transport routes, the principal bicycle network, and key urban pedestrian corridors. Place activity levels are less intense, however, these roads and routes can have significant meaning to local people.

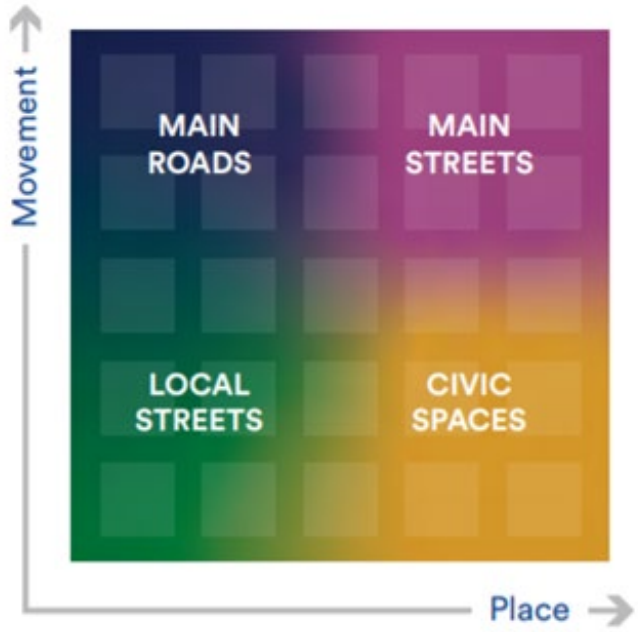

Figure 2-1: Movement and place framework

The project would provide an opportunity, through options selection and the design development process, to balance the movement function of the Great Western Highway with the place functions of the Blackheath and Mount Victoria.

Regional NSW Services and Infrastructure Plan

The Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018) is the NSW Government's blueprint for transport in regional NSW from now until 2056 and outlines the vision and customer outcomes that the government will use to go about its detailed transport planning in each region and also support its future decision making.

The identified vision for regional NSW is a safe, efficient and reliable network of transport services and infrastructure that recognises and reinforces the vital role of regional cities as hubs for services, employment and social interaction for their surrounding communities.

The regional customer outcomes outlined in the Regional NSW Services and Infrastructure Plan are the same as those identified in NSW Future Transport Strategy 2056, and as noted above, the project directly supports several of these customer outcomes.

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

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

Road Safety Plan 2021

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

The proposal is consistent with the directions set out in Road Safety Plan 2021 because it would improve safety through the separation of carriageways and the implementation of contemporary design standards.

Tourism and Transport Plan

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

The plan includes the following four customer outcomes:

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

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

Central West and Orana Regional Plan 2036

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

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

NSW Freight and Ports Strategy

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

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

- Delivery of a freight network that efficiently supports the projected growth of the NSW economy
- Balancing freight needs with those of the broader community and the environment.

Actions of the strategy and task actions relevant to the proposal include:

- Action 2B – Develop and maintain capacity for freight on the road network
  - Task 2B-2 Prioritise road infrastructure investments
- Action 3B – Manage congestion, noise and emission impacts of freight transport
  - Task 3B-1 Recognise costs of congestion.

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

NSW Freight and Ports Plan 2018-2023

The NSW Freight and Ports Plan (NSW Government, 2018) is aligned with NSW Future Transport Strategy 2056 and has the aim of providing a network to move goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry. One of the objectives of the plan is to ensure safe, efficient and sustainable freight access to places. The proposal is consistent with this objective because it would assist safe and efficient freight movements and provide new access for high productivity vehicles.

Another objective of the plan is to increase infrastructure and land use capacity to accommodate growth. This objective is supported by the goal to increase road freight capacity and improve safety across the Great Dividing Range. The specific NSW Government Action relevant to this proposal is to provide capacity enhancements crossing the Blue Mountains, including bypasses of Blackheath and Mount Victoria, and duplication of the Great Western Highway from Katoomba to Forty Bends (10+ years).

2.2.2 Project need

The project (and the broader upgrade program) is needed to provide a more efficient link between the Central West of NSW (Bathurst, Orange, Parkes, Dubbo) and the Sydney motorway network for freight, tourist and general traffic. There is also an opportunity to further improve road safety and resilience, address existing amenity issues and support place making.

Road transport plays a vital role in supporting the Central West and Blue Mountains. Average daily traffic volumes in the corridor vary from around 15,000 to 20,000 vehicles per day near Katoomba to around 8,500 vehicles per day towards Lithgow. A growth rate of 1 per cent per annum is expected between Katoomba and north of Blackheath, while a 2 per cent per annum growth rate is expected from north of Blackheath to Forty Bends.

There is a relatively high proportion of heavy vehicles (between 12 and 24 per cent) and this reflects the fact that the Great Western Highway link to the Central West carries 18,800 tonnes of freight per day (10,300 towards Sydney and 8,500 towards the Central West). The current performance of the corridor affects these freight movements and will constrain access between Sydney and proposed new freight infrastructure (and associated land use changes) in the Central West including the Parkes National Logistics Hub and the Inland Rail Program.

The need for project (and the broader upgrade program) is also underpinned by the need to address the following challenges:

- Socio-economic challenges which are impacted by road and rail connectivity in the region – This includes more difficult access to services and employment opportunities
- Tourism related travel demand – The Great Western Highway sees spikes in demand during weekends and peak holiday periods. This can cause major delays along the corridor such as at Mount Victoria where the steep grades of the Victoria Pass often causes vehicle breakdowns or merging traffic that then lead to traffic jams of 8 kilometres in length and delays of up to 80 minutes. This will only get worse as tourism in the region continues to grow at double digit rates.
- Impediments to heavy vehicle access – The Great Western Highway remains the most viable freight route to and from the Central West, however, impediments to heavy vehicle access (both physical and policy) limit the use of HPV's which could provide lower freight costs, safety benefits and have lower emissions. Enabling access for B-doubles and PBS level 2 vehicles could reduce truck volumes from a 30% increase in 2036 on 2016 levels to a 5 per cent increase.
- Road safety – Steep grades, tight curves and less than desirable clear zones create safety risks to customers with one crash occurring nearly every week between Katoomba and Lithgow.

- Vulnerability to closure – The Great Western Highway is vulnerable to closure and contraflow measures cannot be established due to the single lane alignment, resulting in major delays in the event of an incident. On average an incident occurs every 4 days that affects traffic in both directions . The highway is also susceptible to closure during natural disasters and extreme weather events which are becoming increasingly prevalent with climate change – particularly with the Blue Mountains being amongst the riskiest environment for bushfire inNSW.
- Steep grades due to topography – Victoria Pass is more than double the recommended maximum gradient for roads of this type and has a costs due to the adverse impacts on vehicles. In addition, the corridor has lower level of traffic performance (as measured by level of service) than the target minimum. Limited overtaking opportunities and intersection capacity contribute to this performance, increasing travel time and driver frustration caused by 84 per cent of time spent behind slow-moving vehicles in some sections.
- Amenity – Many townships have developed along the alignment of the Great Western Highway. Given the highway also serves as a main street the levels of through traffic and high proportions of heavy vehicle volumes (12-24 per cent of vehicles) make short car, cyclist and pedestrian trips for local users difficult. This contributes to noise and emissions that impair amenity for local communities. Crossing from east to west at Blackheath for example means navigating the train tracks and the highway and this can be cumbersome particularly on weekends and in holiday periods.

Provision of dual carriageway would provide travel time savings and would bring this section of the highway up to a similar standard to other sections of the highway which have already been upgraded. Without an upgrade travel times would deteriorate level of service at and between intersections would deteriorate to unacceptable levels (i.e. level of service E or F).

An upgrade also presents an opportunity to address the safety, resilience and amenity issues discussed above. The program objectives are outlined in Section 2.3.

2.3 Project objectives

Transport for NSW has identified six program objectives for the upgrade program, as outlined in Table 2-1. The program objectives focus on meeting customer needs and take into consideration the diversity of customers served by the corridor and the complexity of their travel patterns.

Table 2-1: Great Western Highway Upgrade Program objectives

Objective	Sub-objectives
Improve economic development, productivity and freight accessibility in and through the Blue Mountains, Central West and Orana regions	• Support economic recovery in the short term, economic development in the medium term and economic sustainability in the long term within the Blue Mountains, Central West and Orana regions through better transport connectivity • Improve the efficiency and safety of freight movement through the Blue Mountains to better link Central West and Orana region economies with domestic and international markets • Improve access and connections to tourism facilities in the Blue Mountains, Central West and Orana region
Improve the resilience of the corridor between Katoomba and Lithgow to ensure continuity and	• Enable continuity of services along the corridor between Katoomba and Lithgow including during events that disrupt regular network operations

Objective	Sub-objectives
safety of transport and essential services	• Provide capacity to meet future population growth in the Blue Mountains, Central West and Orana regions • Futureproof the corridor for emerging transport technologies and innovative solutions
Improve transport network performance and efficiency along the corridor between Katoomba and Lithgow to meet the needs of all our customers	• Blue Mountains, Central West and Orana regional centres, social infrastructure and other services and for all customers • Improve the overall reliability and capacity of the transport network between Greater Sydney, and the Central West and Orana • Minimise peak period congestion through the Blue Mountains • Build on and maximise the efficiency of existing infrastructure
Improve the overall safety of the corridor for all transport users between Katoomba and Lithgow	• Reduce road crashes via safer physical infrastructure • Keep all our transport users safe by minimising potential conflicts between light and heavy vehicles, pedestrians, cyclists and local traffic • Improve road infrastructure that contributes to the safety and welfare of heavy vehicle drivers and the community
Enhance the liveability and be sensitive to the unique environmental and cultural assets along the corridor between Katoomba and Lithgow	• Better balance of local and through traffic along the Katoomba and Lithgow corridor to provide a better overall customer experience • Improve the liveability of town centres west of Katoomba and through to the Central West and Orana region • Minimise potential impacts to the unique environmental, cultural and social value of the Blue Mountains
A value for money, sustainable and deliverable solution	• Solution that is affordable and value is delivered by maximising project benefits at optimal cost • Deliverability and opportunities for optimisation via staging

2.4 Preferred options

A broad range of strategic options were assessed for their ability to meet the identified need and program objectives. Key findings were:

- Due to the Great Dividing Range's topography and National Parks there are limited alternative routes that do not have significant cost and environmental impacts.
- One of the alternative corridor options considered was upgrading the Bells Line of Road. This was found to have challenging terrain and significant impacts on the World Heritage Area. Traffic modelling also indicates that traffic would not migrate from the Great Western Highway to the Bell's Line of Road once completed, hence the upgrade of the Bell's Line corridor would not sufficiently reduce volumes on the Great Western Highway.
- One of the alternative mode options considered was upgrading the Main Western Railway Line. This was found to require significant investment east of Penrith and west of Lithgow yet would not service all customer categories nor provide an alternative route for traffic during emergencies.

Within the Great Western Highway corridor, many variations of design were considered with 35 in total considered as part of the project development process. These varied by alignment and method of construction.

There were four shortlisted road corridor options for the upgrade of the Great Western Highway between Katoomba and Lithgow:

- Minimum Scope Option: Widens and upgrades 21 kilometres of the corridor in two sections (between Katoomba and Blackheath and Little Hartley and Lithgow) to four lanes. This option would address strategic challenges related to congestion at Blackheath by removing the Bundarra Street level crossing and replacing it with a new rail underpass but does not include improvements to the steep grades at Mount Victoria.
- Surface Upgrade Option: Upgrade the entire 34 kilometre Katoomba to Lithgow corridor to four lanes by widening the existing highway. Addresses strategic challenges related to congestion at Blackheath by removing the Bundarra Street level crossing and replacing it with a new rail underpass. Bypass of Mount Victoria village and Victoria Pass with a new bridge/tunnel underpass route to the north of Mount Victoria.
- Tunnel Option: Widens and upgrades the entire 34 kilometre Katoomba to Lithgow corridor to four lanes, incorporating separate tunnels under Blackheath and Mount Victoria / Victoria Pass to address strategic challenges of congestion and freight access.
- Long Tunnel: Widens and upgrades the entire Katoomba to Lithgow corridor to four lanes, incorporating a new long tunnel from Blackheath to Little Hartley.

The shortlisted options were assessed against the following key objectives:

- Economic development, productivity and recovery
- Resilience and future-proofing
- Network performance
- Safety
- Movement, place and amenity
- Value for money
- Deliverability

The long tunnel option ranked the highest when scored against the above criteria and the program objectives.

Options evaluation is continuing for the section of the Great Western Highway between Blackheath and Little Hartley. The main focus is on development of the long tunnel option, however the dual short tunnels underneath Blackheath and Mount Victoria are also still undergoing consideration. This is considered further in Chapter 3.

2.5 Community and stakeholder engagement

2.5.1 Engagement carried out

Strategic corridor consultation

In November 2019, the preferred strategic corridor for the proposed upgrade was placed on public display and community feedback was sought. This included the previously reserved corridor from Mount Victoria to Lithgow and a new corridor between Katoomba and Mount Victoria.

This was the first of many consultation activities that were planned throughout the program development, with the aim was to gather early feedback from the community on key values and priorities, as well as to address any concerns or questions the community had about Great Western Highway upgrade program, before progressing to the refinement route options and features within the corridor.

The upgrade proposal was displayed to the community between Thursday 7 November and Monday 16 December 2019 at locations including Katoomba, Oberon, and Bathurst and Orange libraries.

The display locations and website link were included in advertisements in the Central Western Daily, Bathurst Western Advocate, Lithgow Mercury, Blue Mountains Gazette and Oberon Review. They were also advertised on the NSW Roads Facebook page. Twelve community information sessions were held in Katoomba, Medlow Bath, Blackheath, Mount Victoria, Hartley and Lithgow, and were attended by 1045 people. The community was invited to view the proposed corridor at the following staffed information sessions which provided an opportunity to learn more, ask questions and have their say.

During the consultation period, Transport for NSW received 1759 pieces of feedback from members of the community, businesses and stakeholders. Of this feedback, 446 were forms (hard and soft copy), 756 were via email and 557 were pinned comments on the online map. Issues raised by the community fell into the following broad categories:

- Consideration of other options
- Environment
- Road use
- Property and business
- Community consultation
- Budget and costs
- Construction impacts
- Requests for information

The Community Summary Report included in Appendix B summarises and responds to issues raised by the community during the strategic corridor consultation.

Blackheath Co-Design Committee

As a result of the initial feedback Transport for NSW established the Blackheath Co-Design Committee to discuss and refine route options for upgrading the Great Western Highway through Blackheath.

The Committee was made up of Great Western Highway Upgrade Program team members, stakeholder group representatives, selected community representatives, as well as representatives from the Blue Mountains City Council and emergency services.

The Committee was not a decision-making body, but the outcome of the Blackheath Co-Design Committee views are an important input into the Government's decision-making process for determining a preferred route option and design.

After five meetings and additional site tours the Blackheath Co-Design Committee assessed six broad route options, including a new tunnel alignment suggested by the Committee. The routes were assessed against the following criteria:

- Improve safety
- Minimise impacts to the environment
- Enhance amenity, connectivity and liveability

- Resilience
- Improve congestion and travel time reliability.

The Committee's unanimously preferred option is for a long tunnel underneath Blackheath. This is reflected in the options currently under consideration (refer to Chapter 3).

A report on the Blackheath Co-Design Committee process and findings has been produced by independent facilitators KJA, and is included as Appendix C. The minutes of each Committee meeting are also available at nswroads.work/greatwesternhighway.

Route options consultation

In October and November 2020, Transport for NSW consulted with the community in Blackheath regarding route options. A Consultation Summary Report has been prepared which summarises the consultation activities carried out and identified and responses to the issues raised and is included in Appendix D).

2.5.2 Engagement to be carried out

Additional engagement regarding tunnel options

As the benefits and cost effectiveness that could be gained from a longer tunnel with a gentler gradient have become clearer, the project has progressed investigations into a tunnel between Blackheath and Little Hartley.

The Minister for Regional Transport and Roads announced investigations into this tunnel option, including the reinvestigation of the previously endorsed tunnel bypass of Mount Victoria, likely deviation from the adopted LEP route and relocation of the tunnel portal in Hartley Valley, as part of the April 2021 release of the Blackheath route options consultation.

A strategic design for the project will be made available for public exhibition and consultation in October 2021. This consultation will be coordinated with the Review of Environmental Factors exhibition and consultation for the east and west sections of the upgrade program to be undertaken at that same date.

The project team are also beginning one-on-one consultation with landowners affected by the relocated portal in Hartley Valley.

Engagement proposed during the preparation of the Environmental Impact Statement

General project information and feedback mechanisms would continue to be available during design development and preparation of the Environmental Impact statement. These mechanisms would be complemented with direct community and stakeholder engagement activities focused on:

- Providing information and project updates at key stages during design development
- Engagement with affected landowners and community groups about the project and key design decisions that may impact them
- Engagement and coordination with transport and other infrastructure providers, particularly around project interfaces and in relation to cumulative impacts
- Engagement with regulatory agencies to ensure a complete and robust Environmental Impact Statement.

Key phases of engagement activities would include:

- Around the making of the State significant infrastructure application to which this scoping report relates
- Around key design decision points

- Generally during the preparation of the Environmental Impact Statement
- Around the time of public release of the Environmental Impact Statement for comment.

Public exhibition of Environmental Impact Statement

The minimum statutory period for public exhibition of the Environmental Impact Statement is 28 calendar days, as stated in Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW) (EP&A Regulation).

Advertisements would be placed in newspapers to advise of the public exhibition and where the Environmental Impact Statement can be viewed, as well as details on proposed community consultation activities and information sessions.

Consultation activities during the public exhibition of the Environmental Impact Statement would include:

- Environmental Impact Statement summary document, and a digital Environmental Impact Statement
- Information sessions (both in person and via online engagement tools)
- Newsletter letterbox drop and digital availability
- Electronic newsletter
- Project website and online forums
- Displays at local councils
- Stakeholder meetings (either in person or via online engagement tools).

The community and stakeholders will have an opportunity to provide submissions on the Project during the exhibition period.

Consultation during construction

Should the project be approved, the project team would continue to consult with the community and key stakeholders during construction. In general, this consultation would involve:

- Ongoing consultation with key stakeholders, local councils and other government agencies
- Provision of regular updates to the nearby community
- Development and implementation of a community complaints and response management system.

3 Project description

3.1 Overview of key elements

Transport for NSW proposes to construct and operate an upgrade of the Great Western Highway between Blackheath and Little Hartley (the project), which would comprise:

- Either long-twin tunnels (one for each direction) between Blackheath and Little Hartley or shorter twin tunnels under Blackheath and under Mount Victoria
- Works to connect the tunnels to the existing road network south of Blackheath and near Little Hartley
- For the short tunnels option, works to connect tunnels to the existing road network north of Blackheath and south of Mount Victoria
- For the short tunnels option, surface widening to four lanes between Blackheath and Mount Victoria
- Decommissioning of the heavy vehicle inspection station north of Blackheath (near Mount Boyce) and the provision of suitable alternative facilities along the highway (locations to be confirmed)
- Surface drainage, utilities and service connections and modifications
- New and upgraded pedestrian and cyclist infrastructure around surface connections
- Ancillary operational facilities as required possibly including a motorway control centre, ventilation and air supply facilities, groundwater and drainage management and treatment systems, signage, fire and life safety, lighting emergency evacuation and emergency smoke extraction infrastructure

The project forms part of the larger Great Western Highway Upgrade Program to provide four lanes for the entire length of highway between Mount Victoria and Lithgow.

The design of the project is currently being developed, taking into account the outcomes of community and stakeholder engagement and environmental investigations. The options being considered during design development are shown in Figure 3-1 (separate tunnel bypasses of Blackheath and Mount Victoria) and Figure 3-2 (long tunnel option).

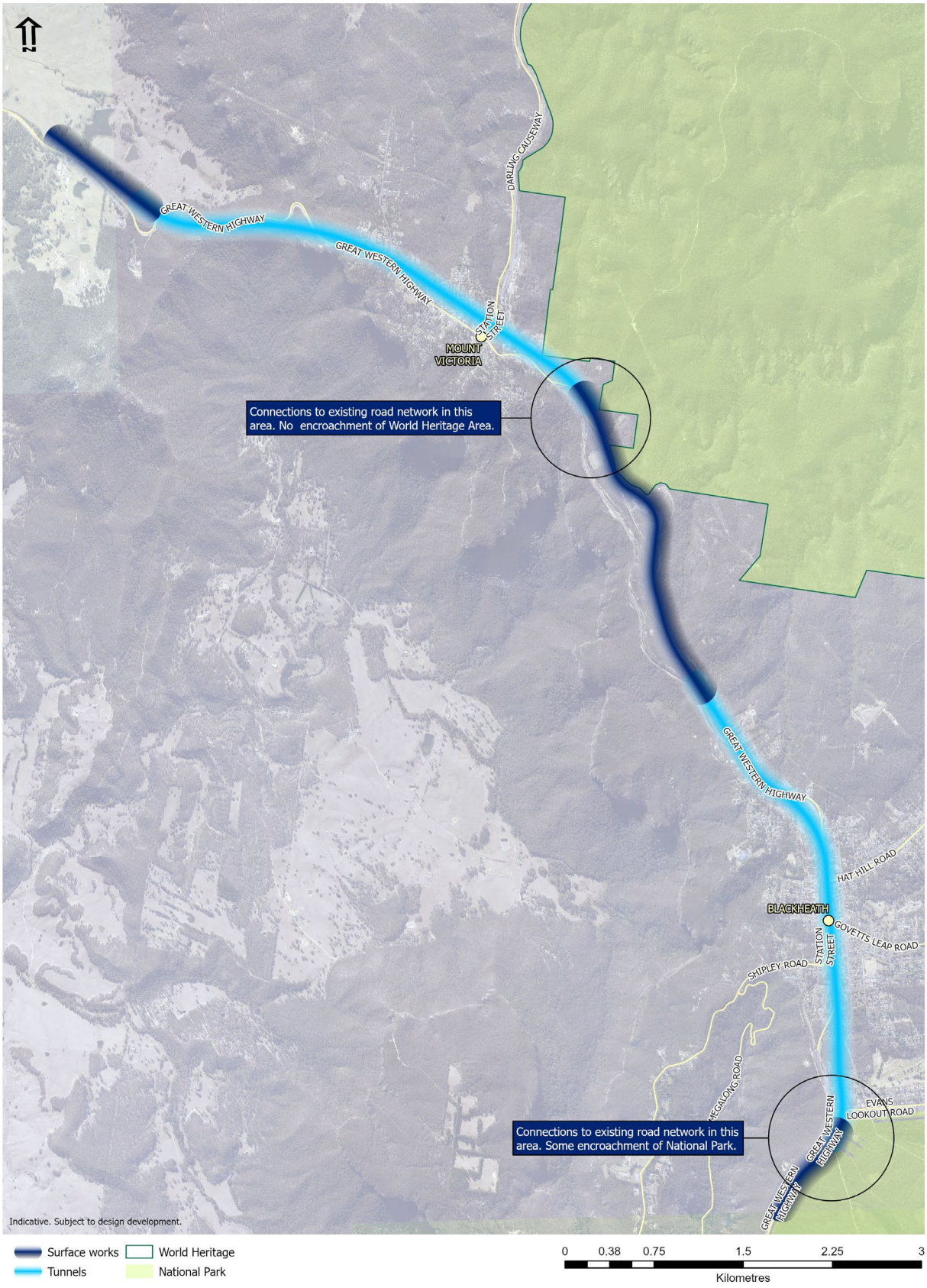

Figure 3-1: Separate tunnel bypasses of Blackheath and Mount Victoria

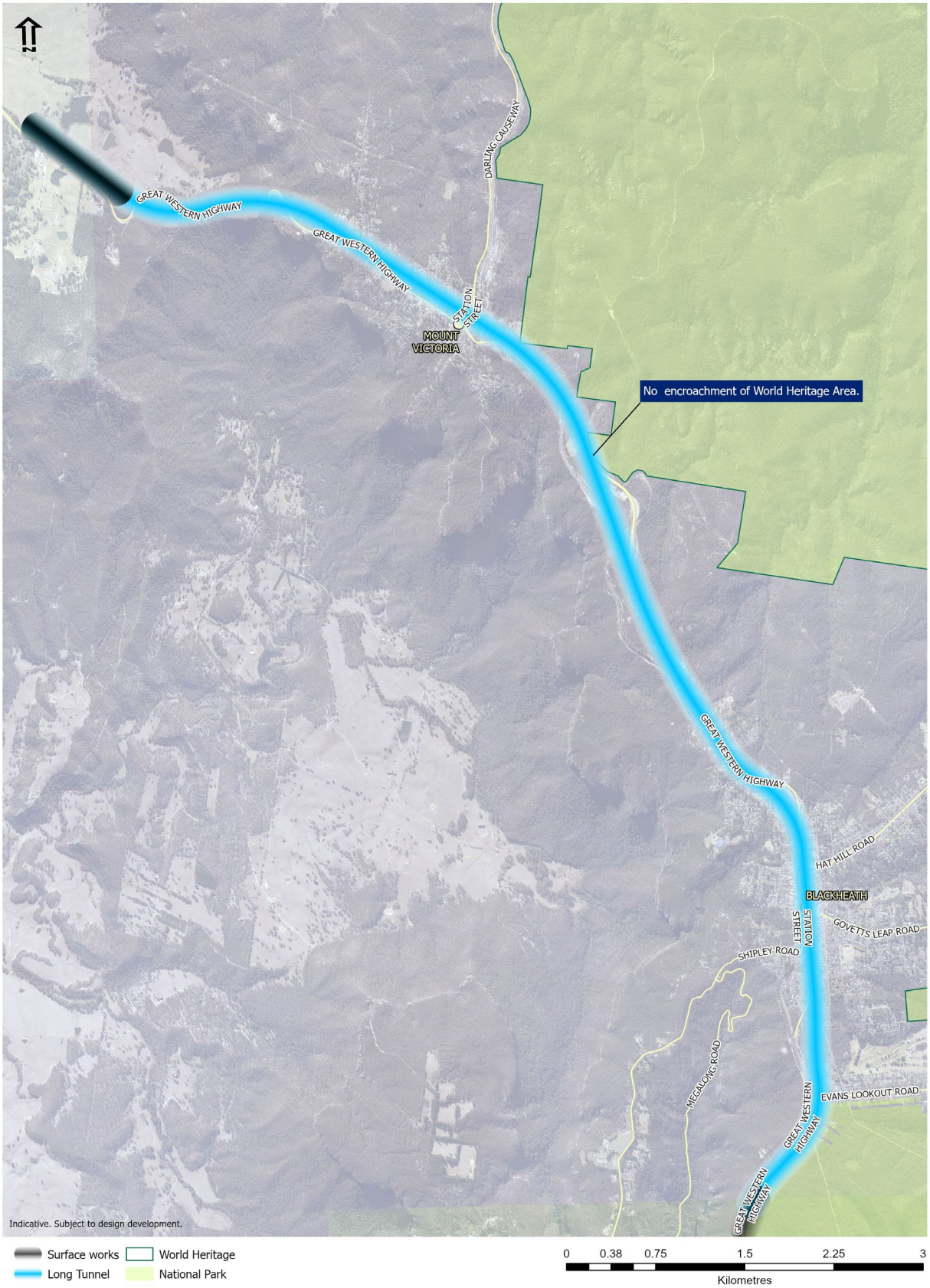

Figure 3-2: Long tunnel option

3.2 Major project features

3.2.1 Tunnels

The twin tunnels for the short tunnels option would be around 4.1 kilometres long (for both the Blackheath and Mount Victoria tunnels). The twin tunnels for the long tunnel option would be around 10.2 kilometres long. Tunnel ramps (including new portal structures) would be built to provide connections to and from surface roads.

The tunnels would be designed to accommodate service and freight vehicles, including over height vehicles. The tunnels would be provided with ventilation (method to be determined), lighting, signage and electronic visual surveillance and safety communication systems to allow communication with drivers.

The tunnel ventilation systems, including the number and location of ventilation outlets, are currently being developed as part of the project design. The ventilation systems would be designed to achieve acceptable in-tunnel and ambient air quality. Ventilation facilities would be located to minimise impacts on the surface, including avoiding sensitive environments and minimising the need for acquisition and property impacts.

Tunnel portal structures would be constructed at tunnel entry / exit points.

3.2.2 Surface road upgrades

Surface road works are required at the tunnel portals to connect to the existing road network. The short tunnels option includes more extensive surface road works including upgrading of the existing highway (generally on the current alignment) between Blackheath and Mount Victoria.

3.2.3 Pedestrian and cyclist infrastructure

Where the project affects existing pedestrian and cyclist infrastructure, new or upgraded facilities would be included in the project design to deliver an equivalent or better outcome than currently exists.

3.2.4 Ancillary operational facilities

Other ancillary works that are likely to be required as part of the project:

- Noise mitigation works such as noise barriers
- Landscape treatments and planting
- Changes to existing embankments and cuttings
- Adjustments to drainage systems
- New and upgraded lighting and signage
- Utility protection or relocation.

3.3 Construction

3.3.1 Timing and duration

The project is expected to take around four to five years to construct. A more detailed construction program, including anticipated staging of construction activities, would be included in the Environmental Impact Statement.

3.3.2 Construction methodology

Construction methodologies are currently being considered as part of the design development for the project. This includes whether mined tunnels would be constructed with roadheaders or tunnel boring machines or a combination.

Roadheaders are made up of rotating cutting heads mounted on a boom or similar structure. They can be used to cut away rock in a desired shape and tunnel cross sectional area. Tunnel boring machines are larger, and comprise a rotating circular cutting wheel that excavates rock to produce a circular tunnel cross sectional area.

Geology and geotechnical conditions are the key factors that determine whether roadheaders or tunnel boring machines are most appropriate for construction of tunnels. Other factors that would influence this decision include:

- Size and availability of surface access sites for tunnelling – tunnel boring machines usually require larger access and support sites than roadheaders
- The need for intermediate surface construction and access sites - depending on the length of tunnel, roadheaders may require intermediate surface construction and access sites. Tunnel boring machines can usually construct much longer tunnels without the need for intermediate surface access points.
- Spoil generation and handling – due to their larger cross sectional area, tunnel boring machines usually produce more spoil than roadheaders
- Availability of land for precast concrete segment production and storage – this is required for the lining of bored tunnels
- Construction cost – tunnel boring machines are usually more expensive to operate than roadheaders.

Indicative construction activities and methodologies would be comparable to other recent motorway tunnel projects and would include:

- Establishment of construction compounds including demolition, fencing, installation of site facilities, relocation and protection of utilities, installation of acoustic measures, and construction of temporary buildings
- Potential power supply upgrades to support both construction and operation
- Construction of mainline tunnels, interchanges and surface roads
- Management and haulage of spoil during tunnelling
- Installation of tunnel ventilation systems (method to be determined)
- Management and treatment of groundwater inflows to tunnels
- Modification and construction of structures, such as portals, retaining walls, pedestrian paths, cycleways, culverts, noise barriers, fencing, lighting and signage
- Modifications to surface roads including widening, drainage works, signage and line marking
- Tunnel fitout and utilities connections.

The project would not include some preliminary works, including surveys, test drilling, test excavations, geotechnical investigations or other tests, surveys, sampling or investigation for the purposes of the design or assessment of the project. These activities are subject to separate assessment and are proceeding prior to the approval of the project.

3.3.3 Construction hours

Where feasible and reasonable, construction activities would be carried out during standard construction hours. Two main components of the project that may require works outside standard construction hours include:

- Tunnelling, tunnel spoil handling and transport. Subject to any road network constraints for transport, this is expected to occur 24 hours per day seven days per week.
- Works affecting or adjacent to live traffic lanes on the Great Western Highway.

Continuous works can substantially reduce the construction program relative to standard construction hours. In most cases, tunnelling would be carried out at significant depths below the surface and would not lead to surface impacts.

Other construction activities that may be required outside of standard construction work hours include:

- Transport of large plant, equipment, prefabricated structures or materials
- Utility installations or relocations to minimise utility downtime or to prevent adverse impacts to the relevant utility, road network or other sensitive service or site
- Works required to be conducted out of standard hours for emergency or safety reasons
- Works that can be constructed without impacting sensitive receivers, or where (following consultation with affected receivers) works are conducted to reduce the total duration of impacts from the proposed activity.

3.3.4 Construction sites and compounds

The location and size of ancillary construction facilities (such as site offices, worker amenities and stockpiling areas) would be developed as part of the concept design and Environment Impact Statement. Construction compound locations would be identified to minimise surface impacts. Where feasible and reasonable this would include:

- Locating the construction compound sites as close as possible to project construction areas
- Avoiding sensitive environmental and community locations
- Maximising opportunities for direct access to arterial roads for construction traffic, and avoiding the need to use local residential streets if possible
- Minimising property disturbance and acquisition requirements, particularly in residential areas.

4 Key environmental issues

4.1 Overview

Key issues are those that may have high or moderate impacts (actual or perceived) and assessment is necessary to determine the level of potential impact and to develop appropriate measures to mitigate and manage the impacts.

The outcomes of the preliminary environmental investigations indicate the following key environmental issues will require further detailed assessment and may require project specific impact mitigation measures.

- Traffic and transport
- Air quality
- Noise and vibration
- Socio-economic
- Land use and property
- Urban design, landscape character and visual amenity
- Biodiversity
- Geology, groundwater and ground movement
- Cumulative impacts

A number of other environmental issues have also been identified. These issues are outlined in Chapter 5 and are considered to be of lesser consequence taking into consideration the project scope, the existing environment and the implementation of standard management and safeguard measures. It is expected that these other environment issues would not likely be key issues; however the potential impact of these other environmental issues would be assessed further in any future environmental impact statement for the project

4.2 Transport and traffic

4.2.1 Overview

The Great Western Highway is about 200 kilometres long connecting Bathurst and the Central West and Orana regions to Sydney across the Great Dividing Range via the Blue Mountains. Serving as a main street for several townships along its route and carrying more than half of the road freight transported between the Central West and Sydney, the Great Western Highway is critical in providing connectivity between the Central West and the East Coast for commuters, locals, freight operators, visitors and tourists.

Traffic volumes and performance

Traffic volumes are not distributed equally along the Great Western Highway between Katoomba to Lithgow. Vehicle counts increase heading towards the east with over 20,000 vehicles per day (on average) at Katoomba – Medlow Bath versus approximately 9,000 south of Lithgow. Traffic counts using conducted over a four-week period from mid-September 2018 identified the following traffic volumes (7-day average) within the project extent:

- Blackheath – about 15,000 vehicles per day
- Mount Victoria (west of Darling Causeway) – about 12,500 vehicles per day
- Little Hartley (east of Coxs River Road) – about 12,500 vehicles per day.

Traffic modelling indicates that the two-lane sections of the project extent generally are approaching capacity (level of service E). This is primarily attributable to the low average travel speeds, with road geometry sign posted speed limits, and travel volumes and traffic composition being contributing factors. It is expected that level of service would further deteriorate during event type peaks (such as in holiday periods) where traffic volumes are known to sharply increase.

Intersections generally have good operation (with acceptable delays and spare capacity). However, where there are no traffic signals there can be relatively long delays for movements accessing the main road (Great Western Highway). These movements are typically low volume with approximately 20 – 30 vehicles per hour.

Freight movements

Heavy vehicle traffic increases towards the eastern end of the Katoomba to Lithgow corridor as road freight movements come from and drive towards Sydney. While there is a reliance on the Great Western Highway for through traffic to and from regions west of Lithgow, a significant proportion of heavy vehicle traffic is generated along the Katoomba to Lithgow corridor and moves between locations along this section of the highway. The proportion of heavy vehicles at locations along the project extent is as follows:

- 450 metres east of access to Browntown Oval – about 20 per cent
- 300 metres west of Mount York Road, Mount Victoria – about 24 per cent
- 500 metres east of Coxs River Road, Little Hartley – about 18.5 per cent.

Approximately 30 per cent of road freight within the Blue Mountains is used or produced in the mountains – starting or ending its journey between Lithgow and Katoomba, with a further 14 per cent originating or destined for nearby locations such as Oberon.

Road safety

From 2014 to 2018 there were 194 crashes along the Katoomba to Lithgow corridor, 57 per cent (111 crashes) were casualty crashes and 12 per cent resulted in serious injury. Of these crashes, 80 per cent involved a car and 64 per cent involved a truck.

For the Blackheath to Mount Victoria section of the highway, fatal and serious injury crash rates are higher than the NSW average for similarly classed roads. Through urban areas along the corridor, crashes are often the result of the interaction between local and highway traffic. Local traffic contends with through traffic along the highway to make short trips on and across the highway in order to reach local destinations. These local customers are required to quickly accelerate when turning onto the highway and change lanes in order to turn off the highway, often within a short distance.

Active transport (walking and cycling)

Although the Great Western Highway through Blackheath has a high movement function, it also has a place function, particularly through the town centre.

High traffic volumes between Mount Victoria and Blackheath impair local amenity and clash with active transport users. Along this section of the highway, there are school speed zones at Blackheath and Mount Victoria highlighting the interaction between highway traffic and children (among other areas of pedestrian traffic). Basic pedestrian facilities are available within these towns, however there are points where pedestrian refuges need to be relied on to navigate the highway.

Cyclists have limited facilities when passing through Blackheath and Mount Victoria. Stakeholders have noted that there are pinch points along the highway which lack an appropriate shoulder to protect cyclists. A review of cycling infrastructure along the project extent shows that cycling along this route is predominantly on on-road cycleways and

shoulders. These shoulders vary in width, and in most cases would not be considered a cycle suitable shoulder in 80 kilometre per hour speed zones.

Public transport

Blackheath and Mount Victoria railway stations are located along the project extent and provide access east to Sydney and west to Bathurst via the Intercity Trains Network.

The following bus services operated by Blue Mountains Transit use the investigation area:

- Route 698 – Katoomba to Blackheath
- Route 698V – Katoomba to Mount Victoria

Bus stops are located near Blackheath railway station, and in Blackheath along Evans Lookout Road, Govetts Leap Road and Hat Hill Road. In Mount Victoria bus stops are located near the railway station, on Victoria Street and on Mount York Road.

4.2.2 Summary of issues

Construction

Most of the project is in tunnel and offline from major arterial routes. However, there would be potential surface road works and associated impacts at the following locations:

- Great Western Highway south of Blackheath
- Great Western Highway at Little Hartley..

During the construction of the project, the following impacts may also result:

- Deterioration in traffic performance due to additional heavy vehicle movements. This would mainly affect road network near the tunnel support sites (due to the numbers of vehicle movements to support the delivery of construction materials and removal of spoil). It is expected that most construction sites would have direct access to the Great Western Highway.
- Temporary traffic impacts due to interim road or lane closures
- Temporary changes to the existing pedestrian and cycling network (where present) near construction sites.
- Service adjustments to intercity rail services to allow for construction activities to safely occur within the rail corridor (Darling Causeway connection).

Operation

The project would provide a highway bypass of both Blackheath, Mount Victoria and Victoria Pass and would deliver a modern, dual carriageway standard highway that provides a faster, safer and more efficient highway connection between Central NSW and Sydney. The existing highway would be retained for local access. Specific benefits would include:

- Improved trip reliability and reduced travel times
- Reduced queuing at all intersections along the existing highway
- Access for high productivity vehicles (truck and trailer combinations that carry more mass or volume than traditional smaller freight vehicles) making the movement of freight more efficient
- Improved road safety
- Improved resilience of the transport network to natural disasters such as bushfires
- New and upgraded footpaths and cycleways.

4.2.3 Proposed further assessments

A detailed traffic and transport impact assessment will be carried out as part of the Environmental Impact Statement for the project to determine potential impacts on traffic, transport and access. The following government guidelines will be considered as relevant during the preparation of the traffic and transport impact assessment:

- Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Edition 4.0) (Austroads, 2020)
- Cycling Aspects of Austroads Guides (Austroads, 2017)
- Guide to Traffic Generating Developments (Roads and Traffic Authority, 2002).

The assessment will:

- Identify the existing road network traffic conditions including volumes and intersection performance
- Describe how construction traffic would access the project (including ancillary facilities) and any impacts on the surrounding road network
- Assess construction impacts, including likely construction traffic volumes, peak volume periods, haulage routes, construction compound locations and access, and temporary changes to access
- Identify the future predicted traffic growth
- Provide an assessment of the existing and future traffic and transport environment for a range of operational scenarios including the 'do minimum' option
- Include an assessment operational impacts to the local and regional road network, speed environment, parking and access arrangements, provision for public transport and changes to pedestrian and cyclist facilities
- Include an assessment of road safety
- Identify feasible and reasonable mitigation measures for the construction and operational stages of the project.

4.3 Air quality

4.3.1 Overview

There are no permanent Environment Protection Authority air quality monitoring stations within or near project extent.

Air quality in the area has recently been considered as part of the Blue Mountains and Lithgow Air Watch project, which was a 12-month community initiated research project supported by the NSW Environment Protection Authority and the NSW Department of Planning, Industry and Environment, as well as local stakeholders. The results from the 12-month project between the 1 June 2019 and 31 of May 2020 indicate that outside of the exceptional bushfires of 2019-2020, the air quality in Katoomba (the nearest monitoring station) was generally very good, and compliant with the National Environment Protection (Ambient Air Quality) Measure. During the bushfire period, PM_{10} and $PM_{2.5}$ frequently exceeded their respective 24-hour standards of 50 µg/m^3 and 25 µg/m^3, as well as 34 exceedances of ground level ozone concentrations. Other sources of emissions in Katoomba such as industrial and transport were not discernible, with SO_2, NO and NO_2 readings typically at the limit of detection for the instruments (outside of fire events) (Environment Protection Authority, 2020).

To provide further understanding of current air quality and to assist future environmental assessment, Transport for NSW is currently establishing air quality stations at three locations along the project extent.

The NSW Government has established the Advisory Committee on Tunnel Air Quality (which includes the NSW Chief Scientist & Engineer (Chair) and the NSW Chief Health Officer) to provide advice on national and international practice and experience with motorway tunnels to:

- Enable setting of performance based standards for emissions associated with road tunnels.
- Recommend appropriate monitoring, compliance and reporting mechanisms to support public confidence in the operation of road tunnels.
- Provide ongoing advice to Government on air quality issues arising from the assessment and operation of road tunnels.

The Advisory Committee has published several technical papers addressing a range of issues relevant to air quality including:

- Trends in motor vehicles and their emissions
- Air quality trends
- Health effects of traffic related air pollution
- Road tunnel ventilation systems
- Criteria for in-tunnel and ambient air quality.

The Advisory Committee technical papers provide existing environment, technical guidance and policy framework relevant to the assessment of air quality impacts associated with the road tunnels proposed as part of the project.

4.3.2 Summary of issues

Construction

The construction of the project has the potential for the following air quality related impacts:

- Temporary increases in emissions of gases and particulate matter associated construction vehicles, plant and machinery. This would include temporary ventilation systems within the tunnel during construction.
- Temporary increases in dust which may occur as a result of earthworks, vegetation clearance, use of the ancillary concrete batching plant, heavy vehicle movements, general construction and stockpiling activities.

The potential impacts of increased dust and emissions would depend on the scale and intensity of the construction activity, quantities of the material handled, weather and the proximity of sensitive receivers. Any impacts would be temporary and relatively short duration.

Operation

Ensuring stringent in-tunnel air quality outcomes are achieved is a fundamental design objective for the project. The project's tunnel ventilation systems are being designed to ensure that established in-tunnel air quality criteria are met under all traffic conditions.

Potential local air quality impacts from the project would arise from changes in the distribution of surface traffic (in many cases decreases in traffic volumes) and the ventilation of the tunnel(s).

Surface road related air quality impacts may be experienced where existing surface roads are subject to significant changes in traffic flows or volumes and could result in a potential increase or decrease in near roadside air pollutant concentrations. For example, the reduction

in traffic congestion along surface roads has the potential to deliver air quality improvements to areas along the existing highway.

4.3.3 Proposed further assessments

A detailed air quality impact assessment would be prepared as part of the Environmental Impact Statement. This assessment would identify the potential impacts of both construction and operation of the project. The assessment would be prepared in accordance with Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Environment Protection Authority, 2017).

The assessment would include (as a minimum):

- Qualitative assessment of proposed surface works and worksites with consideration of mitigation and management measures to reduce and minimise the emission of dust, odour and other pollutants during construction.
- Quantitative prediction and assessment of the operational air quality impacts of the project, with consideration of local dispersion conditions, existing background levels of pollutants, managed emissions from the tunnel(s), in-tunnel air quality and changes in vehicle emissions on surface roads.
- Use of background monitoring data from existing air quality monitoring stations, in addition to data collected from project-specific air quality monitoring stations.
- Cumulative local and regional air quality impact assessment.

4.4 Noise and vibration

4.4.1 Overview

Residences within the investigation area are typically, but not exclusively, located within residential zones (R series zones) or the E4 Environmental Living zone. Along the project extent, residences are concentrated in and around the townships of Blackheath, Mount Victoria and Little Hartley, and are generally set back at least 20 metres from the highway. There are also some rural residences outside these townships at the northern project extent. Other noise sensitive receivers include places of worship, a meditation centre and schools

The dominant noise source in the area is road traffic noise. Noise monitoring was previously carried out at three locations in Blackheath between 3 June and 15 June 2015 (Wilkinson Murray, 2015). The results suggest some residences near the existing highway in Blackheath are already acutely affected by road traffic noise at night. Acute noise is a level of road traffic noise of 65 dB(A) or more for the day period of 7am to 10pm or 60 dB(A) or more for the night period of 10pm to 7am and measured as an equivalent continuous noise level (LAeq) 1 metre from the building façade.

4.4.2 Summary of issues

Construction

During construction, the project would result in localised noise and vibration impacts, particularly where surface works would occur for tunnel portals, surface road connections, surface road upgrades (short tunnels option) and ancillary works. Tunnelling could also generate vibration and ground-borne noise impacts on sensitive receivers located close above the project alignment or near work sites.

Construction works during the evening and night time periods would be required, with the potential for tunnelling and associated above ground support activities (including spoil haulage via road) to occur 24 hours per day, seven days per week. For the short tunnels option, a

substantial amount of the surface road upgrade between Blackheath and Mount Victoria may need to occur during the evening and night time periods for safety and operational reasons.

Operation

The project would result in a substantial reduction in surface traffic through Blackheath and Mount Victoria, with these vehicles redistributed to the project tunnel(s). As a result, it is anticipated that the project would result in a reduction in road traffic noise and an improvement in acoustic amenity along those surface roads experiencing reduced traffic volumes.

The main operational noise impacts from the project would arise from traffic using new or upgraded surface road infrastructure or where traffic volumes on surface roads would change as a result of the project. This would include the potential for traffic noise break out from the tunnel portals.

Other sources of operational noise emissions may include ventilation infrastructure, the motorway control centre and other surface ancillary infrastructure.

The project is not anticipated to be an ongoing source of significant vibration during operation.

4.4.3 Proposed further assessments

A construction and operational noise and vibration impact assessment for the project will be carried out as part of the Environmental Impact Statement. The following government guidelines will be considered as relevant during the preparation of the noise and vibration assessment:

- Interim Construction Noise Guideline (Department of Environment, Climate Change and Water, 2009)
- Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016a)
- Noise Policy for Industry (Environment Protection Authority, 2017)
- NSW Road Noise Policy (Department of Environment, Climate Change and Water, 2011).
- Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006)
- Noise Mitigation Guideline (Roads and Maritime Services, 2015a)
- Noise Criteria Guideline (Roads and Maritime Services, 2015b)
- Noise Model Validation Guideline (Roads and Maritime Services, 2016b)

The noise and vibration assessment would include (as a minimum):

- Identification of potentially affected noise and vibration sensitive receivers.
- Development of project-specific construction noise management levels and construction vibration goals.
- Assessment of out of hours work required during construction.
- Assessment of airborne and ground-borne noise and vibration impacts from the construction of the project on identified residential and other sensitive receivers.
- Explanation of how the extent of potential impacts on sensitive receivers have been balanced against the duration of impacts.
- Assessment of road traffic noise from the use of heavy vehicles and equipment during the construction of the project.

- Assessment of noise impacts from the operation of the project on identified residential and other sensitive receivers at the year of opening and 10 years after opening.
- Cumulative assessment of potential construction noise and vibration impacts due to other developments in the vicinity, such as other highway upgrade projects.
- Mitigation and management measures to ensure that impacts are maintained within acceptable limits.

4.5 Socio-economic, land use and property

4.5.1 Overview

Key demographic, social and economic information derived from the 2016 Census for relevant suburbs is outlined below in Table 4-1.

Table 4-1: Key social and demographic information

Category	Suburb	Value
Population	Blackheath	4,395
	Mount Victoria	1,017
	Little Hartley	506
Employment	Blackheath	Labour force 1,939 Unemployed 5.1%
	Mount Victoria	Labour force 448 Unemployed 7.6%
	Little Hartley	Labour force 274 Unemployed 4.0%
Travel to work	Blackheath	Car, as driver 56.6%, Worked at home 12.7% and Train 5.4%
	Mount Victoria	Car, as driver 58.7%, Worked at home 10.7% and Train 6.0%
	Little Hartley	Car, as driver 65.9%, Worked at home 10.2% and Truck 4.7%
Median Weekly household income	Blackheath	$1,077
	Mount Victoria	$1,065
	Little Hartley	$1,388
Requires assistance (age/disability)	Blackheath	6.2%
	Mount Victoria	4.5%
	Little Hartley	2.5%

Socio-economic challenges

The Central West, Orana and Blue Mountains regions of NSW face a number of socio-economic challenges, including:

- An aging population with 18 per cent of the population aged 65 years or above, higher than NSW average (16 per cent).

- Higher levels of socio-economic disadvantage with many local government areas in these regions being amongst Australia's the most disadvantaged
- Limited access to services with specialist health care and higher level educational institutions being located in Sydney or Canberra while health services within the area struggle to attract skilled professionals.
- Limitations on access to employment opportunities with a local workforce that exceeds the locally available jobs, many residents must travel both within and beyond the Study Area for work.
- Less resilient communities with short-term disruptions (e.g. weather events, bushfires and the current COVID-19 pandemic) and longer-term trends (ageing population and climate change) undermining the community's liveability and social and economic resilience.

Community facilities

The project extent and immediate surrounds have a large number of cultural, community and recreational facilities. These include:

- Art galleries
  - The Gallery Blackheath, 44 Govetts Leap Road, Blackheath
  - Hat Hill Gallery, 3 Hat Hill Road, Blackheath
  - Artgitte Studio, 83 Great Western Highway, Blackheath
  - Waragil Studios, 8 Govetts Leap Road, Blackheath
  - Keith Rowe Glass Studio, Unit 7, 134 Station Street, Blackheath
  - Blackheath Art Society, 139a Station Street, Blackheath
- Fire stations
  - Blackheath Fire Station, 220 Great Western Highway, Blackheath
  - Blackheath Bushfire Brigade, 139 Station Street, Blackheath
  - Mount Victoria Rural Fire Station, Patrick Street, Mount Victoria
  - Mount Victoria Fire and Rescue, 31-33 Montgomery Street, Mount Victoria
- Police stations
  - Blackheath Police Station, 119 Wentworth Street, Blackheath
  - Mount Victoria Police Station, 32 Station Street, Mount Victoria
- Blackheath Family Medical Centre, 110 Wentworth St, Blackheath
- Blackheath Early Childhood Health Centre, Phoenix Cottage, The Gardens, Gardiners Crescent, Blackheath
- Blackheath Library, corner of Gardiner Crescent and Great Western Highway, Blackheath
- Blackheath Community Centre, corner Gardiner Crescent and Great Western Highway, Blackheath
- Blackheath Area Neighbourhood Centre, Gardiner Crescent, Blackheath
- Blackheath Masonic Centre Inc, 95 Wentworth Street, Blackheath
- RSL Sub Branch, Blackheath/Mount Victoria, 2 Bundarra St, Blackheath
- Blackheath Baptist Church, 6 Bundarra Street, Blackheath

- 1st Blackheath Scout Group, Scout Hall, 2 Park Lane, Blackheath NSW 2785
- Schools
  - Blackheath Public School, Leichhardt Street, Blackheath
  - Mountains Christian College, 60 Thirroul Ave, Blackheath
- Places of worship
  - St Aidan's Anglican Church, Corner Great Western Highway and Hat Hill Road, Blackheath
  - Sacred Heart Catholic Church, 18 Inconstant Street, Blackheath
  - Presbyterian Church, 123-125 Wentworth Street, Blackheath
  - Blackheath Baptist Church, 6 Bundarra Street, Blackheath
  - Blackheath Uniting Church, 43 Govetts Leap Road
- Vipassana Meditation Centre, 212 Station Street, Blackheath
- Blackheath Pool, Memorial Gardens, Blackheath
- Browntown Oval, Great Western Highway, Outside Mount Victoria.

Land use and local businesses

The dominant land uses along the project extent are bushland conservation (including the Blue Mountains National Park), rural, residential commercial and transport. Low density and medium density residential areas and commercial land uses are mainly located in the town centres of Blackheath Mount Victoria and Little Hartley.

Within Blackheath and Mount Victoria, commercial land uses include cafes, hotels, pubs, a service station and speciality stores.

Between Mount Victoria and Little Hartley, commercial users consisted of isolated, shops and attractions with a likely high reliance on passing trade.

4.5.2 Summary of issues

Construction

During the construction of the project, the following impacts may result:

- Impacts associated with property acquisition, including uncertainty for residents and business owners about the property acquisition process and potential need to relocate
- Impacts on the Blue Mountains National Park, including the need for some national park revocation, in the southern part of Blackheath.
- Impact on local businesses, residents and users of community facilities located close to the construction work and construction compounds due to increased noise and vibration, dust and construction traffic.
- Benefit from a net gain in passing trade (depending on the business location) during construction owing to changes to pedestrian traffic and vehicle access.
- Increase in trade for businesses located close to construction sites or en-route to construction sites, which sell goods to construction workers.
- Benefits for construction related businesses, such as construction recruitment agencies, construction companies and resource suppliers.
- Impacts to agricultural land and businesses from the potential loss of land and related infrastructure.

- Temporary disruptions or access restrictions to road users, including to pedestrians and cyclists.
- Temporary disruptions to access to private properties, businesses and community facilities.
- Direct and indirect employment opportunities for businesses to supply goods, services and materials to the project's construction.

Operation

During the operation of the project, the following impacts may result:

- Improved connectivity between Sydney and the Central West, facilitating better access to employment and services.
- Improved amenity within Blackheath and Mount Victoria and opportunities to reduce severance created by the existing Great Western Highway and associated traffic volumes.
- Benefits to destination-based businesses in Blackheath and Mount Victoria associated with improved amenity.
- Impacts on businesses in Blackheath and Mount Victoria which currently rely on passing trade (due to the bypass effect of the tunnel(s)).
- Fragmentation and severance of agricultural land at the northern project extent.

4.5.3 Proposed further assessments

A socio-economic impact assessment for the project will be carried out as part of the Environmental Impact Statement. The assessment will be consistent with the Environmental Planning and Impact Assessment Practice Note for Socio Economic Assessment (EIA-N05) (Roads and Maritime Services, 2018) and will include:

- Identification of the existing socio-economic environment including social and economic characteristics, community/ recreational facilities or features of community value, and existing land use environment, including details of property ownership.
- Identification of community values attached to nearby places and facilities.
- Property acquisition requirements (and associated impacts) both temporary and permanent.
- Identification and assessment of potential socio-economic impacts associated with the construction and operation of the project including an assessment of:
    - Direct and indirect property impacts.
    - Direct and indirect business and agribusiness impacts including potential loss of trade impacts associated with the provision of town bypasses.
    - Impacts on existing and future land use.
    - Impacts community and recreational facilities.
    - Changes to access and connectivity including access to services and employment.
    - Community concerns and perceptions about changes to air quality and potential health impacts for communities near tunnel portals.
- Identification of potential safeguards and management measures to reduce the socio-economic impacts of the project.

4.6 Urban design, landscape character and visual amenity

4.6.1 Overview

The Great Western Highway Urban Design Framework: Katoomba to Mount Victoria (Roads and Maritime Services, 2019) identifies six landscape character zones between Katoomba and the southern approach to Mount Victoria. These are noted below, and their sensitivity is shown on Figure 4-1.

- Zone 5A: Blackheath Approach (west) – Area of the central high ridgeline of the Blue Mountains Range with dramatic, steep slopes dropping quickly towards the west, with views over the Megalong Valley and towards Mount Tosh and Mount Blackheath.
- Zone 5B: Blackheath Approach (east) – Defines the southern entry into Blackheath and comprises a well-established residential area with predominantly single storey, free standing homes, varying in age and design style.
- Zone 6A: Blackheath (west) – Occupies the area to the west of the railway line and is situated on undulating land that drops towards the steep Megalong Valley escarpment. The area is dominated predominantly by single and double storey detached homes on large blocks.
- Zone 6B: Blackheath (central) – On a broad plateau that extends towards the Grose Valley. Blackheath developed into a town after the Main Western railway line was built in 1869. The township is the highest in the Blue Mountains dominated by single and double storey buildings, with a number of them listed as local heritage items.
- Zone 7: Blackheath Approach (north) – Transition zone between the Blackheath town centre and the natural landscape area further north is quite disturbed along the road corridor, and there is a high awareness of the railway corridor.
- Zone 8: Highway Pinnacle – Comprises dense bushland vegetation set in a strongly undulating landscape. From the various rest areas there would be views across to the Megalong Valley.

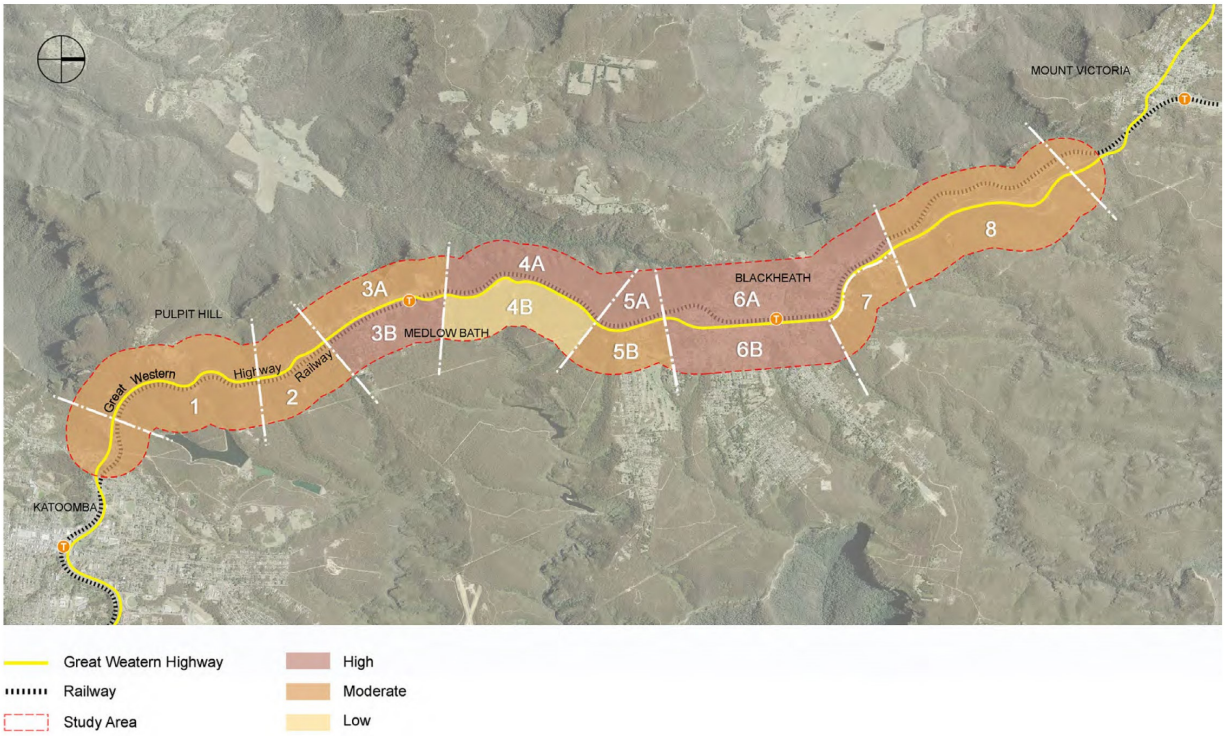

Figure 4-1: Landscape character zones – Katoomba to Mount Victoria

The Great Western Highway Mount Victoria to Lithgow Urban design, Landscape and Visual Assessment (Spakman Mossop Michaels, 2009) divided the area between Mount Victoria and Little Hartley into a number of landscape precincts. Those landscape precincts relevant to the project are:

- Mount Victoria – An extremely steep sloped escarpment acts as a physical barrier from Mitchell's Ridge southwards and west of the town of Mount Victoria. Spectacular views from the west of Mount Victoria town such as Mount Piddington are a major tourist attraction. The ridge contains the peaks of Mount Victoria and Sugarloaf Mountain. The historic Victoria Pass, forming part of the Great Western Highway, descends this escarpment.
- Mount Victoria Township – Characterised by a combination of topography, housing and native and exotic vegetation create enclosed views that are contained within the town. The town is partially visible from the southern end of Darling Pass
- Mount York – Comprises two ridgelines - a long ridgeline terminating with the summit of Mount York with steep cliff sides that are extremely difficult to descend, and the second supporting the historic Lockyer's Road. Primarily natural area valued for its recreational possibilities such as bushwalking along historical tracks and rock climbing, and for almost 360 degree views of the valley.
- Butlers Creek – Small cleared undulating alluvial valley closely surrounded by the vegetated escarpments of Victoria Pass and Mount York. Sparsely populated area of rural pastureland that is highly visible which can be viewed from along the Mount York ridgeline, Great Western Highway, Little Hartley and rural residential Little Hartley. This precinct provides views towards the Mount York ridgeline, Mitchell's Ridge and Hassans Walls.
- Little Hartley – Characterised by flat to undulating topography with a varied vegetation pattern and includes rural residential properties and small businesses spread along the highway. There are a large proportion of heritage listed properties in the area, which contribute significantly to the character of the community.

4.6.2 Summary of issues

Construction

The project would change the urban design and visual amenity of the surrounding landscape though the introduction of new infrastructure and landscaping aspects. Potential landscape and visual amenity impacts during construction would include:

- Visual impacts from active construction areas and the introduction of worksites
- Parking and use of construction plant and equipment
- Temporary impacts to views to or from heritage places
- Vegetation clearing within the project footprint
- Construction traffic management measures such as road barriers and construction lighting
- Fencing, temporary noise barriers and acoustic sheds during construction
- Light spill from worksites during out-of-hours construction.

Operation

Landscape and visual amenity impacts would be limited to surface infrastructure during operation. The internal design of the project tunnels would be developed with the aim of providing a pleasant visual experience for motorists.

Potential positive and negative visual and landscape impacts during operation would include:

- Visual impacts to existing receivers from new infrastructure such as tunnel portals, ventilation facilities, noise barriers and surface roads
- Light spill onto surrounding properties
- Removal existing trees within the project footprint and prior to project landscaping establishment
- Changed views for motorists on new infrastructure and the visual interaction between tunnels and surface roads
- Changed views to and from public land and heritage places
- Opportunities streetscape improvements (carried out by others) through Blackheath and Mount Victoria.

4.6.3 Proposed further assessments

A landscape character and visual amenity impact assessment for the project will be carried out as part of the Environmental Impact Statement. The assessment will be guided by the Guidelines for landscape character and visual impact assessment – Environmental Impact Assessment Practice Note EIA-N04 (Transport for NSW, 2020).

The assessment will:

- Describe the visual character and unique qualities of the area around the project
- Consider the heritage and other social values of the site to establish the potential sensitivity of receivers and visual absorption capacity
- Include a landscape character impact assessment assessing the landscape character zones across the project extent.
- Include a visual impact assessment of the project including views to and from the project, assessment of magnitude of change to existing views and the visual sensitivity of the viewers.
- Identify measures to avoid, minimise and/or mitigate potential impacts.

4.7 Biodiversity

4.7.1 Overview

A desktop environmental assessment including database searches has been conducted to identify biodiversity values along the project extent.

Plant communities

Parts of the investigation area have been cleared for agriculture, infrastructure and urban development, however there are large areas of native vegetation that remain on both sides of the Great Western Highway. Table 4-2 lists the vegetation communities mapped along the project alignment, their conservation status and the extent of vegetation based on currently available mapping.

Table 4-2: Plant community types along the project extent

Map unit (Tozer et al 2010)	PCT No[1]	Plant community type[1]	BC Status[2]	EPBC status[2]
Blue Mountains Heath	708	Blue Mountains Mallee Ash - Dwarf Casuarina heath of the upper Blue Mountains, Sydney Basin Bioregion	Not listed	Not listed
Blue Mountains - Shoalhaven Hanging Swamps	1078	Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	Blue Mountains Swamps in the Sydney Basin Bioregion (Vulnerable)	Temperate Highland Peat Swamps on Sandstone (Endangered)
Blue Mountains Ridgetop Forest	1248	Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion	Not listed	Not listed
Megalong-Tonalli Sandstone Forest	1248	Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains; Sydney Basin Bioregion	Not listed	Not listed
Tableland Grassy Box-Gum Woodland	1103	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands; South Eastern Highlands Bioregion	Critically Endangered White box yellow box Blakely's red gum woodland	Critically Endangered White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Note 1: Estimated from the State Vegetation Type Map (SVTM) or other sources where available. To be confirmed by ecologist during environmental assessment.

Note 2: Preliminary only. Based on information in the Bionet Vegetation Classification System or other sources where available. To be confirmed by ecologist during environmental assessment.

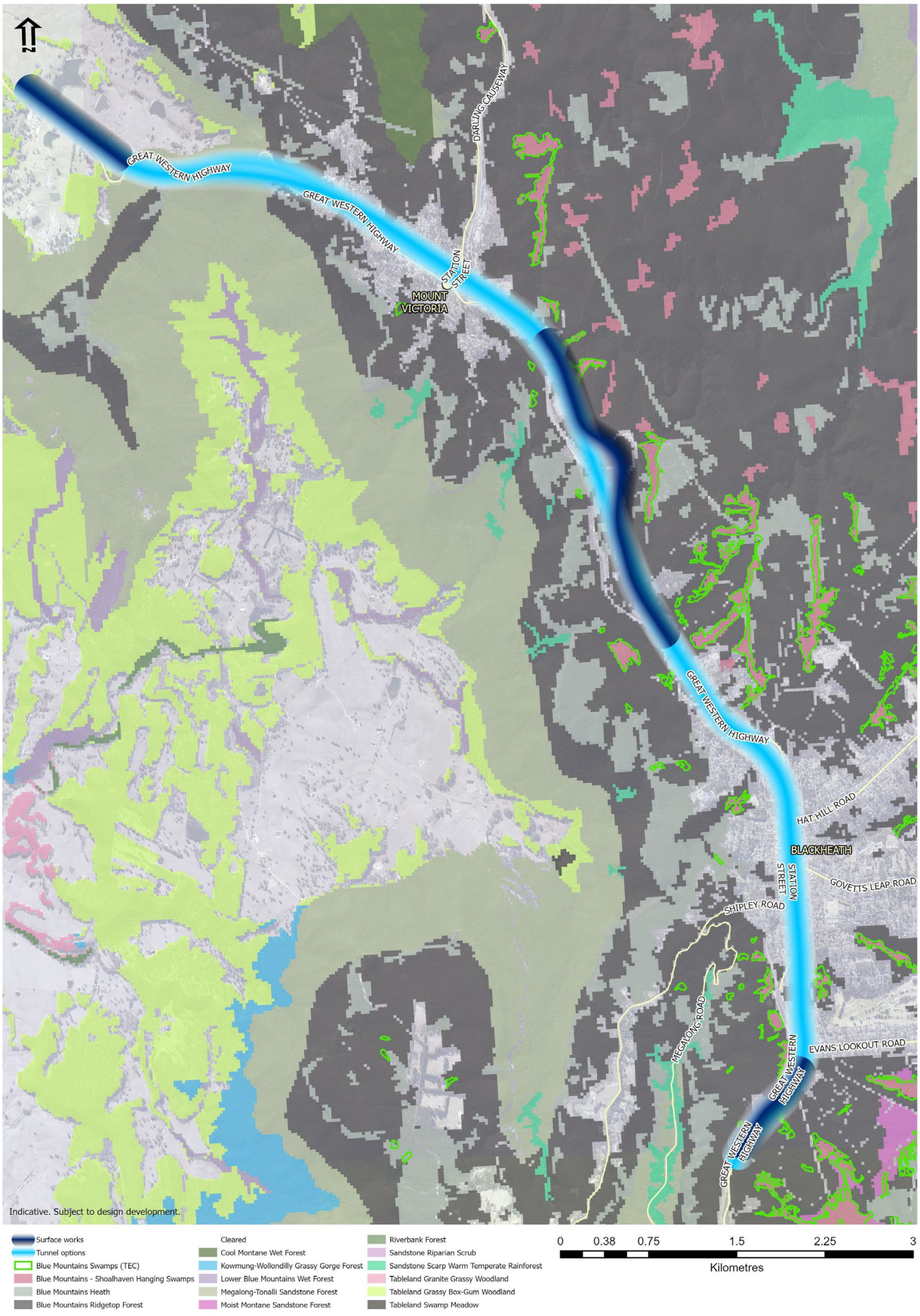

Figure 4-2: Plant communities along the project extent

Threatened flora

A search of the Atlas of NSW Wildlife (14 September 2020) returned 1225 records of 36 threatened flora species within the search area (North: -33.49 West: 150.07 East: 150.37 South: -33.75). Records nearest to areas where surface works could occur are identified in Table 4-3.

Table 4-3: Threatened flora records near potential surface road works

Scientific name	Common name	BC Status	EPBC status
Acrophyllum australe	-	Vulnerable	Vulnerable
Carex klaphakei	Klaphake's Sedge	Endangered	Not listed
Epacris hamiltonii	-	Endangered	Endangered
Persoonia acerosa	Needle Geebung	Vulnerable	Vulnerable

Threatened fauna

A search of the Atlas of NSW Wildlife (14 September 2020) returned 864 records of 47 threatened flora species within the search area (North: -33.49 West: 150.07 East: 150.37 South: -33.75). Records nearest to areas where surface works could occur are identified in Table 4-4.

Table 4-4: Threatened fauna records near potential surface road works

Scientific name	Common name	BC Status	EPBC status
Pseudophryne australis	Red-crowned Toadlet	Vulnerable	Not listed
Eulamprus leuraensis	Blue Mountains Water Skink	Endangered	Endangered
Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Not listed
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered
Petauroides volans	Greater Glider	Not listed	Vulnerable
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable
Petalura gigantea	Giant Dragonfly	Endangered	Not listed

Threatened fish and key fish habitat

A search of data from the NSW Department of Primary Industries, Fisheries Spatial Data Portal (17 September 2020) identified the following:

- Pulpit Hill Creek, Blackheath Creek, Victoria Creek, Grose River and Fairy Dell Creek are identified as a freshwater fish community in poor condition
- Butlers Creek is identified as a freshwater fish community in very poor condition.

Nearby watercourses that are mapped as Key Fish Habitat by the Department of Primary Industries are:

- Pulpit Hill Creek
- Centennial Glen Creek
- Fairy Bower Creek

- Victoria Brook
- Grose River
- Fairy Dell Creek
- Kerosene Creek
- Butlers Creek.

Groundwater dependant ecosystems

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Terrestrial GDEs ecosystems rely on the subsurface presence of groundwater, while aquatic GDEs rely on the surface expression of groundwater (this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs). A search of the Groundwater Dependent Ecosystems Atlas identified the following:

- Small areas of aquatic GDEs corresponding with areas of Blue Mountains Swamps
- Areas of Megalong-Tonalli Sandstone Forest (identified as low potential GDE from national assessments).

Wildlife connectivity

Parts of the investigation area are near large tracts of native vegetation in the Blue Mountains National Park. In these locations, the roadside vegetation has good connectivity to the national park.

The Blue Mountains Western Escarpment wildlife corridor has been noted as a wildlife corridor which traverses the investigation area between Mount Victoria and Little Hartley. This corridor is noted to be generally narrower than the areas to the north and south, indicating its importance in providing a connection to these wider areas. Potential severance of this corridor is therefore an important consideration (Sinclair Knight Merz, 2009).

Across part of the investigation area between Katoomba and Mount Victoria the highway and railway present major barriers to connectivity. There are small pipe culverts (<1m diameter) below the road and railway line that convey drainage, and these would allow limited fauna movements across the road and rail corridors given their small size and considerable length (more than 25 metres).

4.7.2 Summary of issues

The project is unlikely to have extensive impacts on terrestrial biodiversity due to most works occurring underground. Potential impacts may result from:

- Vegetation clearance and loss of fauna habitat associated with surface works for road widening, tunnel portal construction and worksites
- Mortality of fauna during both the construction (vegetation clearing and/or as a result of collisions with construction plant) and operation of the project
- Regional habitat corridors could be directly and indirectly impacted where surface road upgrades are proposed
- Introduction and/or spread of noxious weeds and other invasive species
- Impacts to groundwater levels during construction and operation and associated impacts to groundwater dependent ecosystems (specifically Blue Mountains Swamps)

- Mobilisation of sediments into natural watercourses and urban drainage lines and potential pollution from materials used in the process of construction and operation, resulting in downstream impacts to aquatic species and communities.

4.7.3 Proposed further assessments

A biodiversity assessment will be prepared as part of the Environmental Impact Statement for the project. The following government guidelines will be considered as relevant during preparation of the biodiversity assessment:

- Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance (Commonwealth of Australia, 2013a)
- Commonwealth EPBC 1.2 Significant Impact Guidelines – Actions on, or Impacting upon, Commonwealth Land and Actions by Commonwealth Agencies (Commonwealth of Australia, 2013b)
- Commonwealth Department of the Environment and Energy – Nationally Threatened Ecological Communities and Threatened Species Guidelines (various)
- Commonwealth Department of the Environment and Energy – Survey Guidelines for Nationally Threatened Species (various)
- Biodiversity Assessment Method (Office of Environment and Heritage, 2017)
- NSW Biodiversity Offsets Scheme
- Threatened species survey and assessment guidelines at http://www.environment.nsw.gov.au/ threatenedspecies/surveyassessmentgdlns.htm (various).

4.8 Geology, groundwater and ground movement

4.8.1 Overview

The geology of the investigation area between Katoomba and Mount Victoria comprises Banks Wall Sandstone, which is a slightly lithic quartz sandstone with minor interbedded claystone and horizontal to sub-horizontal bedding. Banks Wall Sandstone is generally a low to extremely low strength rock, readily erodible and potentially unstable in high, steep cutting batters (Roads and Maritime Services, 2018).

West of Mount Victoria the geological units along the project extent are identified by the *Mt Victoria to Lithgow Upgrade. Geotechnical Desktop Study for Route Options Study* (Roads and Traffic Authority, 2009) as including the following (generally from east to west):

- Banks Wall Sandstone
- Burra–Moko Head Sandstone
- Illawarra Coal Measures
- Shoalhaven Group.

Between Katoomba and Mount Victoria, regional groundwater flow is towards the northeast, which coincides with the dip of the rocks, although locally there may be different directions in groundwater flow, particularly due to localised pumping, surface water interactions, and local topography. Recharge to all groundwater systems is primarily sourced from rainfall infiltration to exposed outcrop and residual soils. Groundwater and surface water systems are hydraulically connected; groundwater contributes base flow to surface waters during dry periods and vice versa during wet periods (Roads and Maritime Services, 2018).

Groundwater levels can be expected to vary depending on topography, proximity to creeks, and stratigraphic profile.

Water quality within the aquifers is typically of good quality. Values of pH between rock units are variable, with groundwater in the Narrabeen Group (including Banks Wall Sandstone) tending towards neutral and groundwater within the Illawarra Coal Measures varying from slightly acidic to slightly alkaline. Consistently the Narrabeen Group has better quality groundwater (Roads and Maritime Services, 2018).

There are 22 groundwater works (as identified in the Water NSW groundwater works database) with 500 metres of the project extent (all options). Four are listed as supply obtained, two are listed as equipped, two are listed as abandoned and the status of the remainder is unknown.

4.8.2 Potential impacts

Potential groundwater and geology impacts that could arise from the project include:

- Groundwater drawdown/lowering of the water table due to dewatering during tunnel excavation and/or drawdown incurred by bed cracking or interference with geological features beneath surface-water bodies and drainage lines
- Ground movement and settlement due to tunnelling, excavation and/or groundwater drawdown
- Impacts on groundwater users due to reduced groundwater yields, reduced groundwater quality and/or direct impacts and damage to existing groundwater bores
- Impact on groundwater quality associated with the generation of turbid, saline or contaminated water collected from within the tunnels, which would require disposal; and potential contaminants such as oils and chemicals from construction activities leaking to the water table.
- Potential impacts on groundwater dependent ecosystems would also be considered as part of the biodiversity assessment.

4.8.3 Proposed further assessments

A hydrogeological assessment will be undertaken as part of the Environmental Impact Statement. The NSW Aquifer Interference Policy (Department of Primary Industries, 2012) will be considered as relevant during the preparation of the hydrogeology assessment.

The hydrogeological assessment will:

- Describe the aquifer system(s) traversed by the project
- Identify existing groundwater levels along the alignment and near portals
- Identify sensitive groundwater receivers (registered groundwater bores)
- Discuss the nature and extent of potential impacts on groundwater associated with construction and the ongoing presence of infrastructure including tunnels and excavations. This would take into account existing groundwater levels, the geological context, the extent to which the infrastructure is ‘tanked’ (designed to inhibit the inflow of groundwater) and experience on other projects (including groundwater inflow rates)
- Identify potential impacts on groundwater quality
- Propose monitoring/management measures to address identified impacts.

4.9 Cumulative impacts

4.9.1 Overview

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal as well as interaction with other projects that may be occurring or planned within the locality or the broader region. If the proposal were to be delivered in stages, cumulative impacts would need to be considered based on the program of works.

A search of the Department of Planning, Industry and Environment Major Projects Register did not identify any projects within the Blue Mountains or Lithgow local government areas likely to interact with a future road upgrade within the investigation area. There could however be interaction with other elements of the Great Western Highway Upgrade Program and a proposed upgrade of the Blue Mountains rail line to support new intercity trains and with planned local developments.

4.9.2 Summary of issues

Construction

Potential cumulative impacts arising from the project in combination with other major infrastructure projects include the following:

- Temporary traffic disruption and access changes and the cumulative effect of additional construction traffic on the network
- Air quality and human health impacts from dust generation during construction where projects occur in close proximity and similar timeframes
- Noise and vibration impacts where construction is to occur in a similar location and timeframe
- Incremental / concurrent impacts of water quality in receiving watercourses
- Incremental impacts on biodiversity, including threatened species habitat, movement corridors and threatened ecological communities
- Property acquisition and changes to land use
- Socio-economic benefits arising from employment opportunities and economic growth generated by the construction of major infrastructure projects forming part of the Great Western Highway Upgrade Program
- Generate greenhouse gases which would be cumulative to the greenhouse gases generated by other major and minor infrastructure projects.

Operation

Operation of the project simultaneously with other large road infrastructure projects has the potential to generate cumulative impacts. Such cumulative impacts would be localised and would be largely related to amenity impacts on local residents, the local community and users of recreational areas within and in the vicinity of the project corridor. This may potentially include impacts to local traffic conditions, noise and vibration, air quality and human health, social and economic impacts as well as impacts to visual amenity.

There would also be cumulative benefits associated with the implementation of the broader upgrade program between Katoomba and Lithgow (including reduced travel time, better access to employment and services, and improved road safety)

Cumulative groundwater impacts may also occur and would need to be investigated further as part of the Environmental Impact Statement.

4.9.3 Proposed further assessments

Further assessment of cumulative impacts would be carried out as part of the environmental impact statement. This would include (as a minimum):

- Review of current or planned projects near the project for which construction may occur over a similar period (concurrent or consecutive)
- Specialist studies for the project Environmental Impact Statement will consider the potential for cumulative impacts arising from the project in combination with the impacts of other projects
- Identification of mitigation measures where needed for cumulative impacts.

5 Other environmental issues

5.1 Overview

Other environmental issues listed below are considered to be of lesser consequence taking into account the scope of the project, the existing environment and the implementation of standard and best practice management and mitigation measures. It is considered unlikely that these would be key issues for the project; however, further assessment would be undertaken as part of the Environmental Impact Statement. Any environmental management and safeguard measures required to minimise and mitigate impacts would be documented as part of the Environmental Impact Statement.

5.2 Aboriginal heritage

5.2.1 Overview

Archaeological evidence indicates that Aboriginal peoples have occupied the Blue Mountains for a long period of time, possibly for up to 22,000 years before present. The nature and location of traditional boundaries is unclear, although attempts have been made to define such boundaries. Historical evidence indicates that at the time of Aboriginal-European contact, the Darug occupied the main east-west ridge of the Blue Mountains, the northern Blue Mountains and the Cumberland Plain. To the south were the Gundungurra and to the west were the Wiradjuri (Comber, 2009).

A detailed review of Aboriginal history within the Upper Blue Mountains is provided in *Great Western Highway Upgrade Mt Victoria to Lithgow Phase 2: Corridor Area Investigation – Aboriginal Heritage Assessment* (Comber, 2009). That report was informed by consultation with Aboriginal peoples.

A search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 28 August 2020. Table 5-1 identifies those sites near proposed surface works.

Table 5-1: AHIMS sites near proposed surface works

ID	Name	Context	Features	Status
45-4-1111	Great Western Highway (GWH) 42	Open site	Habitation Structure, Potential Archaeological Deposit	Valid
45-4-1112	Great Western Highway (GWH) 44a	Open site	Artefact, Modified Tree (Carved or Scarred)	Valid
45-4-1122	Mt Victoria Isolated Find 01	Open site	Artefact	Valid
45-4-1121	Mount Victoria Isolated Find 01	Open site	Artefact	Valid
45-4-1080	GWH17 Great Western Highway	Open site	Artefact	Valid
45-4-1079	GWH16 Great Western Highway	Open site	Artefact	Valid
45-4-1078	GWH15 Great Western Highway	Open site	Artefact	Valid

ID	Name	Context	Features	Status
45-4-1076	GWH13 Great Western Highway	Open site	Artefact	Valid
45-4-1077	GWH14 Great Western Highway	Open site	Artefact	Valid
45-4-1074	GWH11 Great Western Highway	Open site	Artefact	Valid
45-4-1075	GWH12 Great Western Highway	Open site	Artefact	Valid
45-4-1081	GWH18 Great Western Highway	Open site	Artefact	Valid
45-4-1098	Great Western Highway (GWH) 21	Open site	Artefact	Valid

5.2.2 Potential impacts

Construction

During the construction of the project, the following impacts may result:

- Direct or indirect impacts to known Aboriginal heritage sites including areas of Aboriginal archaeological sensitivity.
- Potential direct or indirect impacts to unknown or unidentified heritage sites and archaeological items.
- Potential direct or indirect impacts to Aboriginal cultural heritage.

Operation

During the operation of the project, there may be impacts on areas of Aboriginal cultural sensitivity.

The cultural value of the project to Aboriginal peoples has not been determined to date. There could be potential impacts to Aboriginal cultural heritage values due to the placement of the project within the landscape, and the visual impact this may have on areas identified as having cultural significance.

5.2.3 Proposed further assessments

Transport for NSW will prepare an Aboriginal Cultural Heritage Assessment Report in accordance with the Procedure for Aboriginal Cultural Heritage Consultation an Investigation (Roads and Maritime Services, 2011). The assessment will also be carried out in accordance with the following:

- Aboriginal Cultural Heritage Consultation Requirements for Proponents (Department of Environment, Climate Change and Water, 2010a)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (Department of Environment, Climate Change and Water, 2010b)
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (Department of Environment, Climate Change and Water, 2010c).

The assessment will:

- Continue consultation with the local Aboriginal community.

- Identify and investigate Aboriginal archaeological and cultural heritage values and areas/landscapes that are known or predicted to occur by carrying out field survey, test excavations (where required), and consultation with registered Aboriginal stakeholders and Aboriginal knowledge holders as required.
- Assess potential impacts on the identified Aboriginal archaeological and cultural heritage sites and areas/landscapes.
- Identify management measures to reduce the impact of the project on Aboriginal cultural heritage.

5.3 Non-Aboriginal heritage

5.3.1 Overview

The initial construction of the road was carried out by convicts and was finished in 1815. The construction involved burning trees followed by cutting and clearing the timber and grubbing up the stumps. The road was graded, and bridges and culverts were constructed where necessary (Croft and Associates and Meredith Walker, 1983, p. 34).

Settlers travelling along the road from as early as 1818 found it to be a difficult and dangerous passage. As traffic increased and the condition of the road deteriorated, various small deviations were made (Karskens, 1988, p. 1).

The arrival of General Thomas Mitchell as Deputy Surveyor General in 1827 marked the beginning of a radical realignment of the road (Karskens, 1988, p. 50). The most substantial change to the alignment made by Mitchell was the descent from Mount Victoria, with the realignment involving the construction of Victoria Pass, opening in 1832.

By the late 1830s, works along the Great Western Road included bridges, retaining walls and huge cuttings. The road gangs were housed in stockades, established in the 1830s and 1840s at various places along the road. One of these was located at Blackheath, in about the present location of the public school, and operated through to 1849 (Artefact, 2015, p. 39).

Development of the western goldfields increased traffic across the mountains in the 1850s. Construction of the railway line in the 1860s required realignment of the road in places, as the two routes had to share the ridge line. After the opening of the railway, the road was less used, and parts fell into decay. An 1886 description of the road between Wentworth Falls and Blackheath noted that it was in disrepair and disused except for driving cattle along the route (Cultural Resources Management, 2002, p. 31).

The introduction and increasing use of the motor car in Australia after 1905 re-established the importance of roads and at the same time the Blue Mountains became a favoured holiday location. As travel demand increased and new construction methods were developed the road has continued to be upgraded but still closely follows the original alignment.

There are many heritage items of local, state, national and world heritage significance long the project extent. This includes:

- Greater Blue Mountains Area – World Heritage List and National Heritage List
- Blackheath Railway Station Group – State Heritage Register
- Mount Victoria Railway Station Group – State Heritage Register.

The highest density of items is within the townships of Blackheath, Mount Victoria and Little Hartley. The World Heritage listed Greater Blue Mountains Area is to the immediate east and north-east of the project.

There is potential for areas of archaeological potential and significance to be affected, including remains relating to earlier phases of construction of the Great Western Highway.

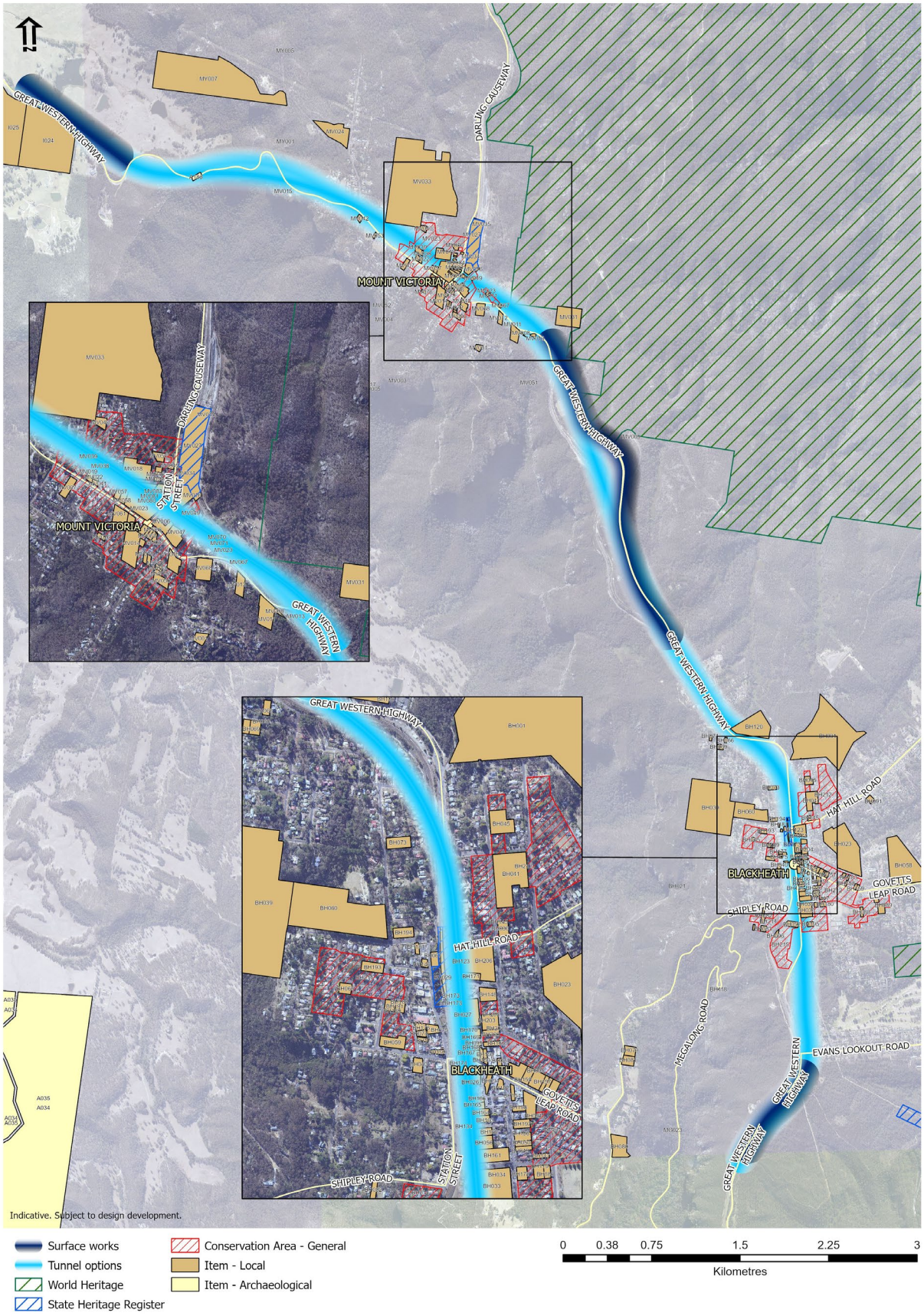

Figure 5-1: Listed heritage items along the project extent

5.3.2 Potential impacts

Construction

During the construction of the project, the following impacts may result:

- Direct impacts such as physical changes to the item or curtilage of known and potential non-Aboriginal heritage sites (although direct impacts on most items would be avoided by placing the road underground)
- Indirect impacts such as visual impacts on curtilage or from vibration on known and potential non-Aboriginal heritage sites.
- There is also the potential for non-Aboriginal heritage items to be discovered during construction. These are likely to be archaeological deposits associated with earlier phases of the area's development.

Operation

During the operation of the project, the following impacts may result in permanent changes to the vistas to and from listed heritage items adjacent to the project (portal locations and sections of surface road upgrade), including heritage landscapes.

5.3.3 Proposed further assessments

A non-Aboriginal heritage assessment would be prepared as part of the environmental impact statement. The assessment would be prepared in accordance with the following guidelines:

- The Burra Charter (Australia ICOMOS, 2013)
- Assessing Heritage Significance (NSW Heritage Office, 2001)
- Statements of Heritage Impact (NSW Heritage Office, 1996)
- Criteria for the assessment of excavation directors (NSW Heritage Council, 2011)
- Assessing significance for historical archaeological sites and relics (NSW Heritage Branch, 2009)

The non-Aboriginal heritage assessment would include (as a minimum):

- Identification of items and areas of heritage significance that would be materially affected by the project during its construction and operation, by field survey and research, including any buildings, works, relics, gardens, landscapes, views, trees or places of heritage significance.
- Assessment of the potential impacts on the values, settings and integrity of heritage areas and items and archaeological resources located near the project, including items both above and below ground and submerged, where such potential exists, the likely significance of those impacts.
- Identification of reasonable and feasible management measures to minimise any impact to known non-Aboriginal heritage sites.

5.4 Spoil and waste management

5.4.1 Overview

The largest volumes of construction waste would be generated during the excavation of tunnels. This waste stream would be unavoidable and would be minimised through beneficial reuse as part of the project where possible. Depending on the construction methodology selected for the project, the spoil waste stream would include soil and rock.

Other waste streams generated during construction of the project would include:

- Demolition wastes from existing structures that require removal
- Other excavated wastes, such as sediment and rock, from dredging
- Vegetation waste from the removal of trees, shrubs and ground covers that are unable to mulched and reused within the project
- Packaging materials such as crates, pallets, cartons, plastics and wrapping materials
- Surplus construction material and general site reinstatement such as fencing, sediment, concrete, steel, formwork and sand bags
- Worksite waste such as liquid wastes from cleaning, repairing and maintenance, waste from spillages, fuel or oil waste, effluent from site amenities and general office wastes
- Waste water from tunnel inflows, worksites and construction processes.

Waste streams generated during operation of the project would include:

- Wastes from operational maintenance and repair activities required over the life of the project.
- The type and volume of wastes generated would be dependent on the nature of the activity, but would predominantly consist of green waste, oil, road materials, as well as contaminated waste resulting from potential fuel spills and leaks
- Waste water from the tunnel deluge systems, which would form part of the fire and life safety systems
- Litter generated by road users.

5.4.2 Potential impacts

Impacts associated with waste generation and management would be mainly associated with the construction of the project. These may include:

- Traffic, air quality, noise and greenhouse gas impacts associated with the transport of significant waste volumes by road
- Potential for environmental impacts from waste handling, storage and disposal
- Contamination of soil or water from disposal of contaminated material
- Social amenity impacts such as visual impacts and odour associated with waste storage and disposal.

5.4.3 Proposed further assessments

Waste generation and management would be considered as part of the Environmental Impact Statement. This would include (as a minimum):

- Opportunities for waste minimisation and reuse through design or construction planning
- Review of the likely waste streams and volumes from construction and operation of the project
- Preparation of a spoil management strategy identifying how spoil generated from tunnelling would be managed during construction including likely volumes, likely nature and classification of excavated material, opportunities for recycling, potential disposal sites, stockpile management, and method(s) and transport routes

- Procedures for assessing, handling, stockpiling and disposing of potentially contaminated materials and wastewater, in accordance with the Waste Classification Guidelines (Environment Protection Authority, 2014)(EPA, 2014)
- Disposal and recycling options for each type of waste (other than spoil), including contingencies for unexpected waste volumes
- Identification of potential environmental or social impacts from the excavation, handling, storage on site and transport of waste particularly in relation to sediment/leachate control, noise and dust.

5.5 Soils, hydrology and surface water quality

5.5.1 Overview

Soils

Soil landscape mapping shows that the project traverses seven soil landscapes (refer to Table 5-2). Soil landscape information has been taken from Soil Landscapes of the Katoomba 1:100,000 sheet (King, 1994).

Table 5-2: Soil landscapes within the investigation area

Soil landscape	Common constraints
Cullen Bullen	High water erosion hazard Mine subsidence district (localised) Rock fall hazard High run-on Rock outcrop (localised) High foundation hazard Moderate-high erodibility (non-concentrated flows)
Deanes Creek	Waterlogging Permanently and seasonally high watertables High run-on High foundation hazard Moderate-high erodibility (non-concentrated flows)
Hassans Walls	Severe rock fall hazard Mass movement hazard Steep slopes Severe foundation hazard Rock outcrop Extreme weather erosion hazard Shallow soils (localised) Non-cohesive soils (localised) High run-on Moderate-high erodibility (non-concentrated flows)
Lithgow	Hardsetting surfaces Mine subsidence district (localised) High run-on Rock fall hazard (localised) Moderate-high erodibility (non-concentrated flows)

Soil landscape	Common constraints
Medlow Bath	Rock outcrop (localised) Shallow soils (localised) Water erosion hazard (localised) Moderate erodibility (non-concentrated flows)
Warragamba	Severe water erosion hazard Steep slopes Shallow soils (localised) Surface movement potential (localised) Mass movement hazard Rock fall hazard Rock outcrop Severe foundation hazard Moderate-high (non-concentrated flows)
Wollangambe	High water erosion hazard Steep slopes (localised) Rock fall hazard (localised) Shallow soils Rock outcrop (localised) High foundation hazard Low-moderate erodibility for topsoils and high erodibility for subsoils (non-concentrated flows)

Acid sulfate materials

Acid sulfate soils include those where the sulfides in the soils have been exposed to air and acid is being generated (actual acid sulfate soil) and those which may form actual acid sulfate soil when drained or exposed to oxidisation processes (i.e. the exposure of iron sulfate minerals such as pyrite to oxygen). Acid sulfate soil occurs predominantly on coastal lowlands, with elevations generally below five metres. The project extent is not mapped as having a risk of acid sulfate soil occurrence.

There is no known occurrence of acid sulfate rock in Banks Wall Sandstone that occurs along the project extent (Roads and Maritime Services, 2018).

Unweathered Shoalhaven Group rocks, which may be intersected at the western extent of the project, represent a risk in terms of acid sulfate rock. These rocks contain iron sulphides that oxidise when exposed in cuttings, producing iron oxides, sulfates and sulphuric acid that represents an environmental hazard through effects on soil fertility, scalding of vegetation and pollution of water courses.

Contamination

A search (updated 20September 2020) of the EPA contaminated land record of notices for the Blue Mountains and Lithgow local government areas, returned no records within or adjacent to the investigation area.

A search of the List of NSW contaminated sites notified to EPA (as of 11 September 2020) returned one record within the investigation area being the Shell Coles Express Service Station in South Bowenfels.

Historical aerial imagery between Katoomba and Mount Victoria shows that most of the investigation area was subject to farming activities, residential and commercial purposes. The main change between 1958 and 2005 was the clearing of vegetation for development

purposes. Sources of contaminants associated with the existing highway in this area include bitumen, vehicle emissions, fuels (from spills and accidents), and sediments within drainage lines. Potential contaminants include heavy metals, BTEX (benzene, toluene, ethylbenzene and xylene) and polycyclic aromatic hydrocarbons (PAH). The railway though this part of the investigation area accommodates freight locomotives and passenger trains. General contaminants associated with the operation of these trains are likely to occur throughout the proposal including fuel and oil spills and brake linings (Arcadis, 2016). Potential contaminants include heavy metals and hydrocarbon compounds.

Potential contamination may also occur near service stations as a result of fuel leaks and/or storage. Three service stations have been identified within the investigation area between Katoomba and Mount Victoria, one in Medlow Bath (north of Bellevue Crescent) and two in Blackheath (north or Leichhardt Street) (Arcadis, 2016). Potential contaminants include petroleum hydrocarbons, BTEX, lead, phenol, metals and PAH.

The *Great Western Highway Upgrade, Mount Victoria to Lithgow – Contaminated Land Working Paper* (Sinclair Knight Merz, 2009) noted the following:

- Current and historical agricultural activities present the potential for heavy metals and pesticide contamination
- Asbestos or asbestos-containing materials may be present in buildings and/or surface or sub-surface fill material
- The Mount Victoria railway, Darling Causeway and existing Great Western Highway present a variety of potential contamination sources such as fill material, asbestos containing material and a variety of contaminants from vehicles and activities associated with road and rail construction and maintenance
- Several former (and current) service stations and/or mechanical workshops present the potential for soil and groundwater contamination
- The former Little Hartley Airfield presents the potential for contamination associated with the use and storage of aviation fuels and electrical equipment oils
- The former Mount Victoria Sewage Treatment Plant presents an area of concern regarding the potential for residual pathogen, heavy metal, and PAH contamination.

Catchments and water

Between Katoomba and Mount Victoria the project extent generally aligns with a ridgeline that runs generally north-south and separates two catchments. Land to the east of the highway is within the Grose River sub-catchment, while land to the west of the highway is within the Mid Coxs River sub-catchment. To the north-west of Mount Victoria, the investigation area is within the Mid Coxs River sub-catchment.

Most of the Grose River sub-catchment, including Cascade Creek Dams, Lake Medlow Dam and Greaves Creek Dam, on the eastern side of the proposal is located within the Blue Mountains National Park. The Coxs River sub-catchment, located on the western side of the proposal, forms part of the larger catchment of Lake Burragorang that is created by Warragamba Dam. All these dams are operated by WaterNSW and supply parts of Greater Sydney, including the Blue Mountains local government area, with drinking water.

Drainage treatments along the existing highway varies. Formal kerb and guttering exists within Blackheath and Mount Victoria, draining into the local stormwater system. Informal drainage is present along the highway outside of suburban areas, where runoff drains off the road surface into surrounding bushland.

5.5.2 Potential impacts

Construction

Construction of the project has the potential for the following soil, water quality and contamination related impacts:

- Exposure of soils during construction resulting in direct erosion impacts. This may lead to dirty water runoff and sedimentation in local watercourses or adjacent land
- Dirty water runoff and sedimentation of local watercourses
- Impacts to soils due to spills or leaks of fuels, oils or hazardous substances from construction work, plant and equipment and/or from vehicle incidents (hydrocarbons and heavy metals)
- Disturbance of contaminated soils, especially if surface work is carried out within land known to be contaminated, or on land which has been identified as potentially contaminated based on current and historic activities. Disturbance of contaminated soils has the potential to result in offsite pollution and ecological or human health impacts
- Exposure/disturbance of acid sulfate rocks resulting in the production of sulfuric acid, which may become bioavailable in the environment and affect local aquatic ecosystems and water quality.

Operation

During operation of the project potential for impacts relating to soil, water quality and contamination would be limited as there would not be ongoing ground disturbance. Impacts may include:

- Impacts to water quality of receiving watercourses due to the discharge of treated groundwater and other waste waters (such as tunnel wash or deluge system water). This could have an impact on the water quality of the receiving waterway, depending on the discharge volumes, treatment and the point of discharge
- Impacts to water quality of receiving watercourses due to increased runoff from roads. This would typically contain oils and greases, petrochemicals and heavy metals as a result of vehicle leaks, operational wear, road wear and atmospheric deposition. Increased flows could also lead to increased potential for scouring of soils and watercourses
- Spills or leaks of fuels and/or oils from vehicle accidents, or from operational plant and equipment.

5.5.3 Proposed further assessments

The Environmental Impact Statement would include an assessment of potential soil, water quality and contamination impacts during construction and operation of the project. The assessment would consider the following guidelines:

- NSW Water Quality and River Flow Objectives
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
- Acid Sulfate Soils Assessment Guidelines (Department of Planning, 2008)
- Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004)
- Managing Urban Stormwater: Soils and Construction, Volume 2 (Department of Environment and Climate Change, 2008)

- Erosion and Sedimentation Management Procedure (Roads and Maritime, 2008)
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (Department of Environment and Conservation, 2004)
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning & Environment Protection Autority, 1998)
- Guidelines for Consultants Reporting on Contaminated Sites (Office of Environment and Heritage, 2000)
- Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (Environment Protection Authority, 2016)
- National Environmental Protection (Assessment of Site Contamination) Measure 1999, as amended 2013.

The assessment would include (as a minimum):

- Identification of waterways that may be impacted by the construction and operation of the project, including assessment of the sensitivity of the receiving environments
- Assessment of the potential impacts to water quality
- Assessment of the risk of erosion and sedimentation
- Assessment of potential impacts involving acid sulfate rocks
- Assessment of potential impacts associated with contaminated land including
    - Review of previous contamination assessments (where available)
    - Review of historical aerial photography and plans to identify potential contamination sources along the project extent
    - Review of publicly available data (web-based information searches)
    - Site inspection to identify potential contamination sources and verify those potential areas of concern identified in the review of historical and available information
    - Recommendations for additional investigations and/or management of potentially contaminated sites which could be encountered during construction.
- Identification of appropriate mitigation and management measures to safeguard the environment during construction and operation.

5.6 Greenhouse gases, climate change risk and adaption

5.6.1 Overview

Greenhouse gas emissions

Transport is a substantial contributor to greenhouse gas emissions in Australia and as such, there is a need to consider how a road infrastructure project may directly or indirectly contribute to greenhouse gas emissions.

Greenhouse gas emissions are reported as tonnes of carbon dioxide equivalent (tCO2-e) and categorised into three different scopes (either scope 1, 2 or 3) in accordance with the Greenhouse Gas Protocol (World Resources Institute, 2014), Intergovernmental Panel on Climate Change and Australian Government greenhouse gas accounting/classification systems.

The three emission categories (known as ‘scopes’) help differentiate between direct emissions from sources that are owned or controlled by a project, and upstream indirect emissions that

are a consequence of project activities, but which occur at sources owned or controlled by another entity. The three greenhouse gas scopes are:

- Scope 1 emissions, also referred to direct emissions
- Scope 2 emissions, also referred to as indirect emissions
- Scope 3 emissions, includes all indirect emissions (not included in scope 2) due to upstream or downstream activities

Climate change

Climate change projections relevant to the project include:

- Potential increases in absolute maximum temperature
- Potential increases in average temperatures and the frequency of heatwaves
- Potentially lower annual average rainfall, increased rainfall intensity during storm events and resultant surface water flooding
- Potential increased carbon dioxide concentrations in the atmosphere, together with increased temperature and periods of heavy rainfall could lead to increases in the carbonation of concrete.

As a consequence of these projections (especially increased temperatures and reduced annual rainfall) there could be potential increases in the number of days where the Forest Fire Danger Index will be greater than 50 (severe)

5.6.2 Potential impacts

Construction

The project would result in the generation of greenhouse gas emissions. The volume of greenhouse gas emissions generated would largely depend on the type and quantity of construction materials used, construction methodologies and equipment used, and the overall design (for example, tunnel depths). Activities that are anticipated to result in the largest quantities of greenhouse gas emissions include:

- Use of electricity for the tunnel boring machines and/or roadheaders
- Combustion of fuel in construction plant, equipment and vehicles
- Disposal of construction waste (indirect emissions would be generated by the decomposition of the waste material at waste handling facilities)
- Use of construction materials with a high embodied energy. For example, construction materials (such as steel and concrete) require a considerable amount of energy to manufacture and transport.

  It would not be possible to completely avoid the generation of greenhouse gas emissions during construction. However, opportunities to reduce the volume of greenhouse gas emissions would be explored and could include:

- Minimising the quantity of fuel and electricity used by construction plant and equipment through the use of biofuels, electricity derived from renewable sources, and energy-efficient work practices (such as using fuel-efficient equipment and avoiding unnecessary idling of construction plant and equipment)
- Minimising the quantity of fuel used in the transport of construction materials and spoil through sourcing such materials from local suppliers and disposing of spoil at nearby facilities

- Minimising the embodied energy of materials used by substituting materials with high embodied energy for a suitable material with a lower embodied energy (for example, using recycled concrete to reduce the volume of 'new' concrete required)
- Minimising onsite electricity consumption by using electricity derived from renewable sources
- Offsetting a proportion of the project electricity needs through the generation or purchase of 'green power'

Overall, the emission of greenhouse gas during construction is expected to be similar to other infrastructure projects of a similar nature and scale.

Climate change risks during construction would primarily be associated with the occurrence of severe weather events, such as the increased frequency and severity of rainfall events placing increased pressure on erosion and sediment control measures and/or resulting in the flooding of the tunnels and/or construction sites.

These risks are anticipated to be adequately managed with standard management measures, such as increasing the capacity of erosion and sediment controls and minimising construction impacts on the capacity of existing stormwater drainage systems.

Operation

Operation of the project would generate greenhouse gas emissions through the following activities:

- Fuel consumption by vehicles using the road
- Fuels and materials used in maintenance activities
- Electricity used to power tunnel systems including tunnel ventilation, lighting and electronic equipment.
- Some reductions in greenhouse generation may also be attributable to the project due to improvements in traffic flow and reduced congestion.

Direct climate change risks during operation include:

- Increased risk of flooding impacts to road and tunnel infrastructure, with resulting risks to operations (such as preventative closure or total asset failure) and health and safety risks
- Increased frequency and severity of bushfires
- Drainage and stormwater impacts
- Increased risk of road closures
- Increased risk of landslips and erosion
- Increased rate of deterioration of road pavements due to changes in subgrade moisture content.

Indirect climate change risks during operation include disruptions to energy supply as a result of higher temperatures leading to excessive demand and increased severity and frequency of bushfires and intensity of extreme wind, lightning, bushfire and extreme rainfall events.

5.6.3 Proposed further assessments

A greenhouse gas and energy assessment for project will be included in the Environmental Impact Statement. The assessment will:

- Identify the potential greenhouse gas emissions from the project

- Identify mitigation and management measures to reduce potential emissions of greenhouse gas.

The Environmental Impact Statement will include a climate change adaptation assessment for the project. The following government and industry guidelines will be considered as relevant during the preparation of the climate change adaptation assessment for the project:

- Commonwealth Scientific and Industrial Research Organisation's Climate Change in Australia Technical Report 2015
- ISO 31000-2018; Risk Management – Principles and Guidelines
- AS 5334:2013 – Climate Change Adaptation for Settlements and Infrastructure – A risk based approach
- Australian Rainfall and Runoff Guidelines: A guide to flood estimation 2019
- Transport for NSW Climate Risk Assessment Guidelines (9TP-SD-081 Version 3.0, 2018).

The climate change adaptation assessment for the project will:

- Identify possible climate related impacts with an emphasis on any that are projected to undergo a substantial change
- Identify project components that may be vulnerable to the climate change impacts
- Identify possible current and future controls that may increase the resilience of particular project components to climate impacts
- Recommend what should be considered, and how to establish if further information is needed, to adequately assess climate change risk.

5.7 Sustainability

The development of the concept design for the Proposal would be undertaken in accordance Transport for NSW Sustainable Design Guidelines – Version 4.0 (Transport for NSW, 2017). The guidelines introduce a range of sustainability outcomes initiatives to improve the sustainability performance of transport infrastructure and reinforce an ongoing commitment to sustainability. More specifically, the guidelines seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure projects, grouping sustainability into seven key themes:

- Energy and greenhouse gases
- Climate resilience
- Materials and waste
- Biodiversity and heritage
- Water
- Pollution control
- Community benefit.

Proposals are rated using the reporting tool that accompanies the guidelines, with scoring based on a weighted points-based system. Each sustainability requirement has between 1 and 5 performance levels (P1 to P5 with P1 being the minimum). Scores are generated using the performance levels and a weighting for each sustainability requirement which reflects its importance as identified by the guidelines.

6 Conclusion

Transport for NSW is seeking approval to an upgrade to the Great Western Highway between Blackheath and Little Hartley (the project). It would include:

- Either long-twin tunnels (one in each direction) between Blackheath and Little Hartley or shorter twin tunnels under Blackheath and under Mount Victoria
- Works to connect the tunnels to the existing road network south of Blackheath and near Little Hartley
- For the short tunnels option, works to connect tunnels to the existing road network north of Blackheath and south of Mount Victoria
- For the short tunnels option, surface widening to four lanes between Blackheath and Mount Victoria
- Decommissioning of the heavy vehicle inspection station north of Blackheath (near Mount Boyce) and the suitable alternative facilities along the highway (locations to be confirmed)
- Surface drainage, utilities and service connections and modifications
- New and upgraded pedestrian and cyclist infrastructure around surface connections
- Ancillary operational facilities as required possibly including a motorway control centre, ventilation and air supply facilities, groundwater and drainage management and treatment systems, signage, fire and life safety, lighting emergency evacuation and emergency smoke extraction infrastructure.

Transport for NSW has formed the opinion that the impacts of the project on a range of environmental issues would be likely to significantly affect the environment and require the preparation of an environmental impact statement under the EP&A Act. Accordingly, the project is State significant infrastructure under Division 5.2 of the EP&A Act. Approval from the Minister for Planning and Public Spaces is required for the project.

The key environmental issues identified for the project include:

- Traffic and transport
- Air quality
- Noise and vibration
- Socio-economic, land use and property
- Urban design, landscape character and visual amenity
- Biodiversity
- Geology, groundwater and ground movement
- Cumulative impacts

The environmental impact statement will include the following:

- A detailed description of the project including its components, construction activities and potential staging
- A comprehensive assessment of the potential impacts on the key issues including a description of the existing environment, assessment of potential direct and indirect and construction, operation and staging impacts

- Description of measures to be implemented to avoid, minimise, managed, mitigate, offset and/or monitor the potential impacts
- Identification and addressing of issues raised by stakeholders.

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Glossary and abbreviations

Term	Meaning
BTEX	Benzene, toluene, ethylbenzene and xylene
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	*Environment Potection and Biodiversity Conservation Act 1979*
GDE	Groundwater dependent ecosystems
PAH	Polycyclic aromatic hydrocarbons
SSI	State Significant Infrastructure

Appendix A

Requirements of the Environmental Planning and Assessment Regulation 2000

Clause 192 of the Environmental Planning and Assessment Regulation 2000 requires that an application for approval of the Minister to carry out State significant infrastructure must include:

a. Details of any approval that would, but for section 5.23 of the Act, be required for the carrying out of the State significant infrastructure

b. Details of any authorisations that must be given under section 5.24 of the Act if the application is approved

c. A statement as to the basis on which the proposed infrastructure is State significant infrastructure, including, if relevant, the capital investment value of the proposed infrastructure.

Approvals that would otherwise apply

Approvals that may be required to carry out the SSI, if not for section 5.23 of the EP&A Act, include:

- Permits under Sections 201, 205 and 219 of the Fisheries Management Act 1994
- Approvals under Part 4 or excavation permits under Section 139 of the Heritage Act 1977
- Aboriginal heritage impact permits under Section 90 of the National Parks and Wildlife Act 1974
- Various approvals under the Water Management Act 2000, including water use approvals under Section 89, water management work approvals under Section 90, and activity approvals (other than aquifer interference approvals) under Section 91.

Authorisations if the application is approved

Authorisations that may be required for the project under section 115ZH of the EP&A Act include:

An environment protection licence (EPL) under Chapter 3 of the *Protection of the Environment Operations Act 1997*

Consent under Section 138 of the Roads Act 1993 from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a road.

State significant infrastructure statement

Clause 14(1) of State Environmental Planning Policy (State and Regional Development) 2011 provides that development is declared to be State significant infrastructure pursuant to section 5.12(2) of the Act if it is permissible without development consent under Part 4 of the Act under a State environmental planning policy; and is specified in the categories of development in Schedule 3.

State Environmental Planning Policy (Infrastructure) (ISEPP) permits development 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 project is for a road and road infrastructure facilities, and is to be carried out by Transport for NSW, the project is permissible without development consent under Part 4 of the EP&A Act.

Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011 provides that general public authority activities for infrastructure or other development that (but for Division 5.2 of the EP&A Act and within the meaning of Part 5 of the Act) would be an activity for which the proponent is also the determining authority, and would, in the opinion of the proponent, require an environmental impact statement to be obtained under the EP&A Act.

For the project, Transport for NSW has formed the opinion that the impact of the project is likely to significantly affect the environment and would require an environmental impact statement to be obtained under Section 5.7 of the EP&A Act.

On this basis the project is State significant infrastructure. Approval from the Minister for Planning and Public Spaces is required under section 5.14 of the EP&A Act.

Appendix B

Community Consultation Summary Report – corridor options

Appendix C

Blackheath Co-Design Committee: consultation process and outcomes report

Appendix D

Community Consultation Summary Report – route options

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Customer feedback
Transport for NSW
Locked Bag 928,
North Sydney NSW 2059

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