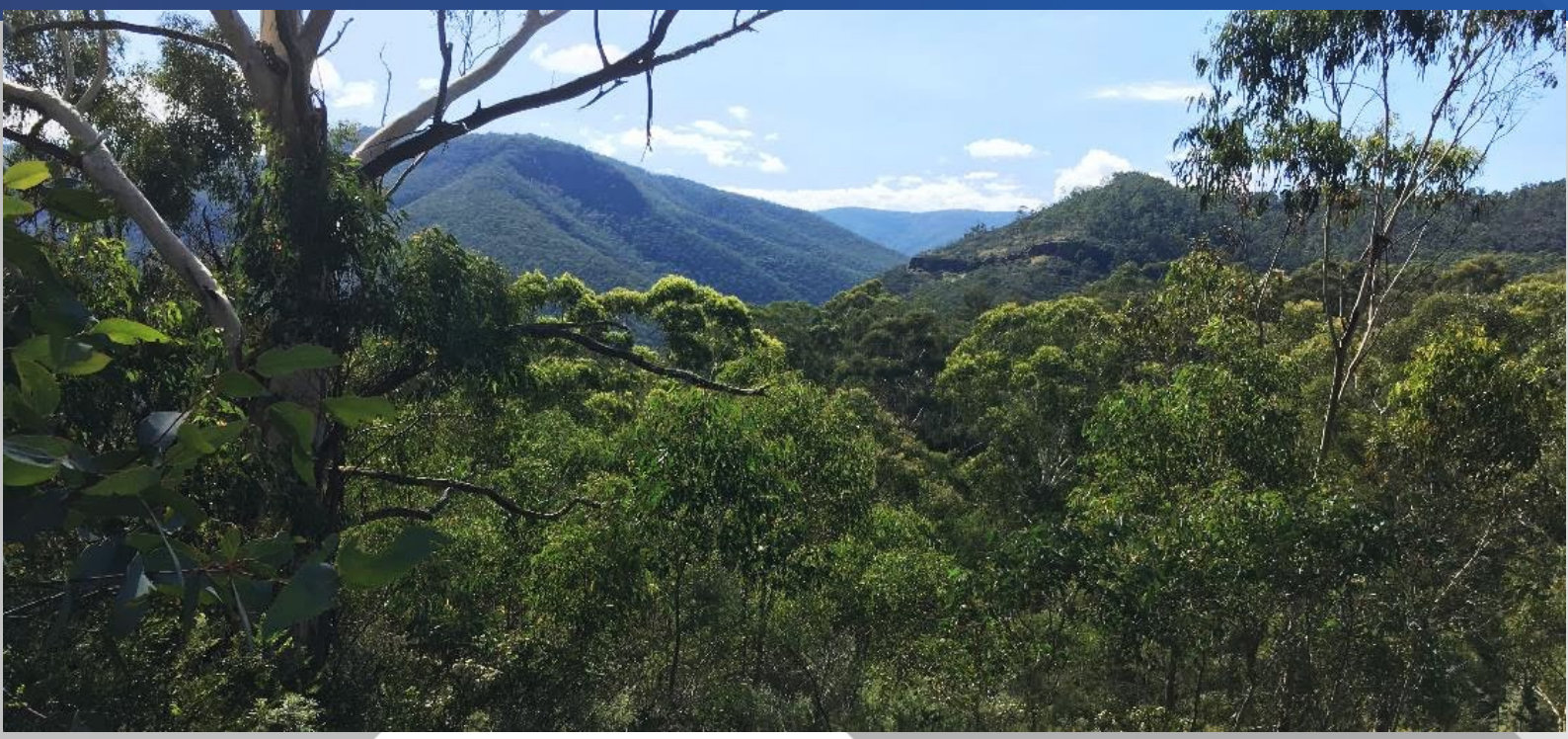
# Appendix D Traffic and transport impact assessment

Snowy 2.0 Transmission Connection Project

Environmental Impact Assessment

( February 2021)



# Snowy 2.0 Transmission Connection Project

## Traffic and Transport Impact Assessment

Rev 6

December 2020

**TransGrid**

## Contents

## List of figures



## List of photos



## List of tables

# Executive Summary

This report details the traffic impact assessment for Snowy 2.0 Transmission Connection Project (the project). The project would involve the construction and operation of an overhead transmission connection and substation to connect the proposed Snowy 2.0 pumped hydro and generation project (Snowy 2.0) to the National Electricity Market.

The key findings of the assessment are:

- Based on the existing and forecast construction traffic volumes, the additional construction traffic movements are not expected to significantly impact the existing road network on roads forming part of the proposed haulage route.
- There is expected to be minimal impact on the existing public transport network, active transport network and road safety during construction. No impacts to access for management and emergency management activities are expected and access will be maintained throughout construction.
- The substation would comprise up to three 500/330 kV 3-phase or up to nine single-phase transformers. Under the single-phase transformer option, each of the nine single-phase transformers would be transported separately to the substation site on an over-dimension vehicle under police escort. Other OSOM vehicles may also be required for the delivery of equipment but the total number of OSOM movements is expected to be low. The road network impacts associated with OSOM vehicles would be minimal due to the low number of movements and the final haulage route would be determined and carried out by a suitable contractor.
- Traffic and transport impacts of cumulative construction alongside Snowy 2.0, Snowy 2.0 Segment Factory and the Bellettes Landfill Expansion are also expected to have a minimal impact on surrounding road network performance, public transport network, active transport network and road safety.
- The road safety audit identified that sections of the haulage route were of poor road condition including loose material, water ponding, vertical drops and unprotected non-frangible hazards in the clear zone of the carriageway and pavement damage including potholes, shoves, edge break and polishing. Road improvements should be considered at these locations to improve safety outcomes for construction vehicles and local traffic. Additional construction traffic has the potential to impact road condition on roads forming part of the proposed haulage route. To minimise these impacts, a Road Dilapidation Report will be prepared and approved prior to and following construction of the project. Any impacts identified as caused by the project will be rectified as specified in existing road maintenance agreements.
- Operational traffic would generally be limited to only light vehicles and small to medium plant accessing the substation site and transmission line corridor to carry out routine inspections and maintenance of equipment and access tracks. As such, traffic generation during operation is anticipated to be significantly less than traffic generation during construction and cumulative construction, with minimal impacts on the surrounding road network performance, public transport network, active transport network and road safety. No impacts to road access are anticipated.

Overall, the traffic and transport impact of construction and operation of the project would be minimal. A site-specific Construction Traffic Management Plan, prepared as part of the Construction Environmental Management Plan for the project, would be prepared and implemented to minimise the potential impacts of construction on transport and traffic.

# 1. Introduction

## 1.1 Overview

TransGrid is the manager and operator of the major high-voltage electricity transmission network in New South Wales (NSW) and the Australian Capital Territory (ACT).

TransGrid is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of an overhead transmission connection and substation (the project) to enable the grid connection of the Snowy 2.0 pumped hydro generation project (Snowy 2.0).

The Snowy 2.0 Transmission Connection Project (the project) has been declared Critical State Significant Infrastructure (SSI) under the *State Environmental Planning Policy (State and Regional Development) 2011* and is subject to assessment and determination by the NSW Minister for Planning and Public Spaces. This traffic and transport impact assessment has been developed to support the Environmental Impact Statement (EIS) for the project.

## 1.2 Purpose of this technical report

This technical report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued for the project on 1 November 2019 by the Planning Secretary of the NSW Department of Planning, Industry and Environment (DPIE).

The SEARs relevant to this traffic and transport impacts are presented in **Table 1-1.**

Table 1-1 Secretary's environmental assessment requirements – traffic and transport

| Requirement | Where addressed |
|---|---|
| An assessment of the transport impacts of the project on the capacity, condition, safety and efficiency of the local, national park and State road network, including a road safety audit of the proposed haulage route | **Section 5.** The road safety audit is summarised in **Section 5.1.10** and provided in **Appendix A**. |
| A strategy to enable regular and emergency management activities to be carried out on site within the Kosciuszko National Park during the project | **Section 5.1.11** |
| A strategy for managing these impacts having regard to existing road maintenance agreements (Original) | **Section 6.1** |

## 1.3 Structure of the document

The report has been structured into the following sections:

- **Section 1** introduces the project and purpose of this technical report
- **Section 2** provides a description of the project
- **Section 3** outlines the methodology adopted in this technical report
- **Section 4** provides an overview of the existing traffic and transport environment
- **Section 5** details the construction and operational impacts of the project
- **Section 6** outlines management measures to be considered to mitigate the traffic and transport impacts of the project
- **Section 7** provides conclusions and summary of findings of the traffic and transport assessment.

# 2. Description of the project

## 2.1 Project components

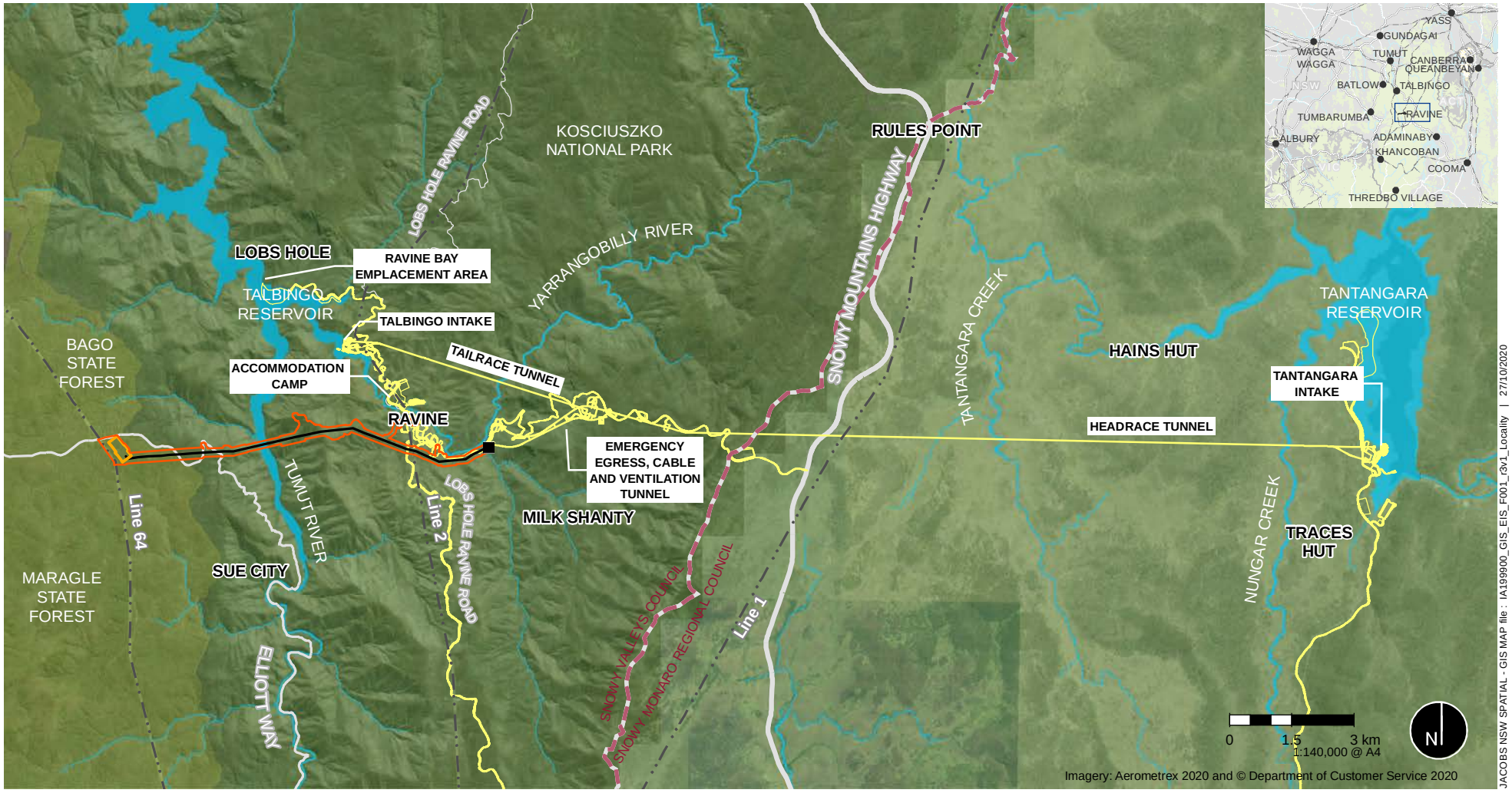
The project would involve the construction and operation of an overhead transmission connection and substation to connect Snowy 2.0 to the National Electricity Market.

The key elements of the project include:

- A new 500/330 kilovolt (kV) substation located within Bago State Forest and adjacent to TransGrid's existing Line 64, which forms a 330 kV connection between Upper Tumut and Lower Tumut switching stations. The substation would occupy a footprint of approximately 300 metres (m) wide 600 m long inclusive of an approximate 25 m to 45 m wide cleared asset protection zone (APZ) surrounding the switchyard
- Upgrade and widening of an existing access road off Elliott Way to the new substation including the construction of new driveways into the 330 kV and 500 kV switchyards
- Two new 330 kV overhead double-circuit transmission lines from the Snowy 2.0 cable yard to the new substation:
  - Total length of each line is approximately nine kilometres (km)
  - Located in a transmission corridor ranging in width from approximately 120 m to 200 m
  - Each line would comprise approximately 21 steel lattice structures up to 75 m in height
- Short overhead 330 kV transmission line connection (approximately 300 m in length) comprising both steel lattice structures and pole structures as required between the substation and Line 64
- Construction of up to 10 km of new access tracks (Option A) or 8 km (Option B) to the transmission structures and upgrade to existing access tracks where required. Option A minimises disturbance within a mapped high risk naturally occurring asbestos (NOA) zone. The access tracks would remain following completion of construction to service ongoing maintenance activities along the transmission lines
- Establishment of a helipad (approximately 30 m wide by 30 m long) to support the transmission line construction activities carried out at higher elevations
- Ancillary activities, including the establishment of tensioning and pulling sites for conductor and earth wire stringing, crane pads, site compounds, and equipment laydown areas.

The project location and key components of the project are shown **Figure 2-1** and **Figure 2-2**, respectively.

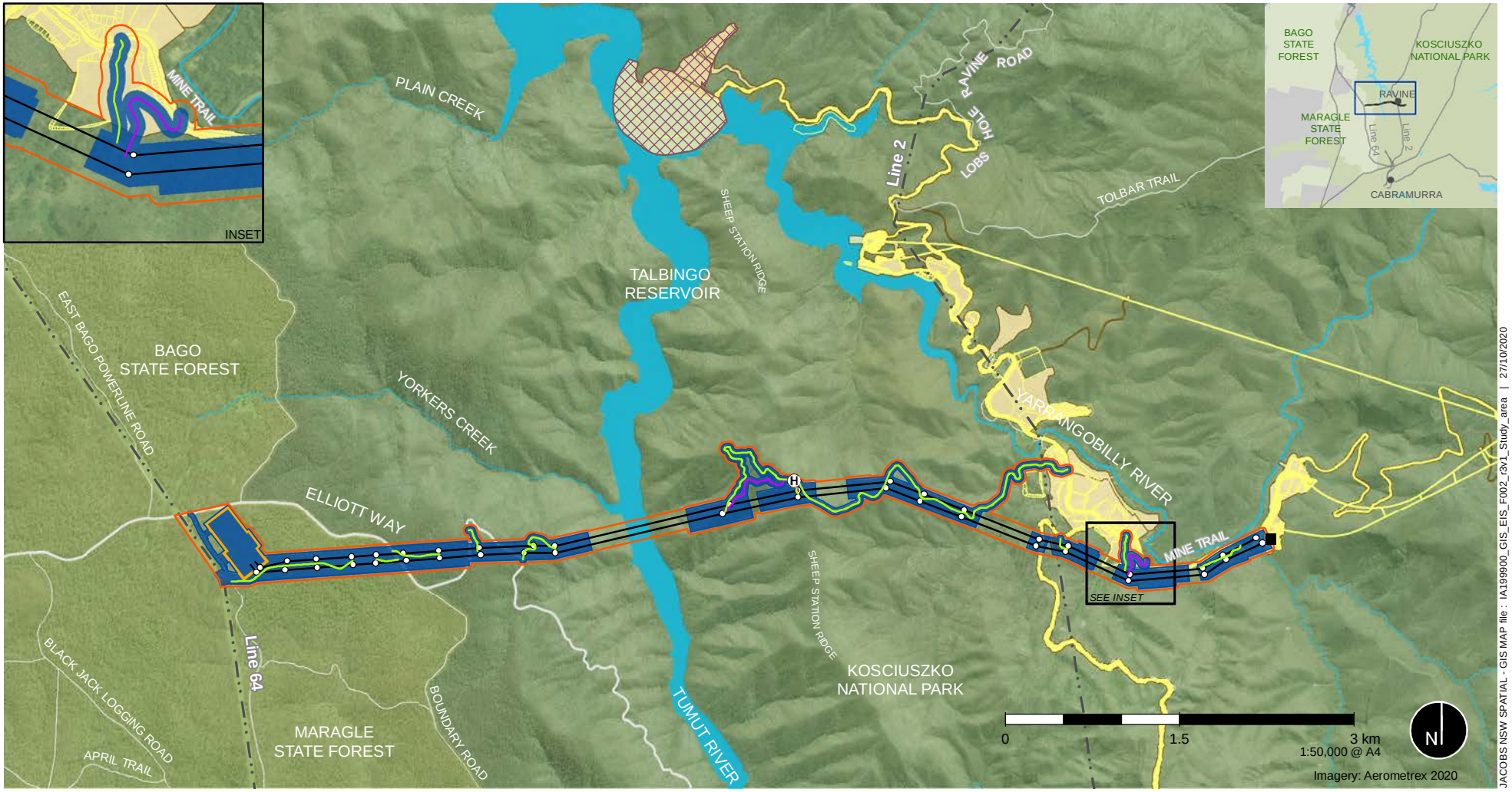
A complete project description which includes a consolidated summary and discussion of the construction and operation of the project is provided in Chapter 5 of the EIS.




Project area
Proposed transmission line
Proposed 500kV substation
Snowy 2.0 cable yard
Snowy 2.0 element
Electricity transmission line
Local Government boundary
Waterway
Water body
State forest
NPWS estate

**Figure 2-1** | Project location

**Data source:**
Jacobs 2020, TransGrid, EMM 2020
© Department Finance, Services and Innovation 2018




- Project area
- Disturbance area
- Proposed 500kV substation
- Potential helipad location
- Proposed structure
- Proposed transmission line
- Proposed access track - Option A
- Proposed access track - Option B
- Snowy 2.0 cable yard
- Snowy 2.0 element
- Ravine Bay Emplacement Area
- Snowy 2.0 Disturbance footprint
- Electricity transmission line
- Waterway
- Water body
- State forest
- NPWS estate

**Figure 2-2** | Project overview

**Data source:**
Jacobs 2020, TransGrid, EMM 2020,

## 2.2 Project location

The eastern extent of the project is defined by the location of the Snowy 2.0 cable yard at Lobs Hole in Kosciuszko National Park (KNP). The cable yard serves as the transition point between the underground cables carrying electricity generated by Snowy 2.0 to the overhead transmission connection. The cable yard forms part of Snowy 2.0.

From the cable yard, the transmission connection extends west through KNP and up Sheep Station Ridge, which is characterised by steep, mountainous terrain before traversing Talbingo Reservoir. The transmission connection then continues west, passing over Elliott Way at three locations before entering Bago State Forest to the proposed substation site. The location of the project is shown in **Figure 2-1**.

## 2.3 Project area

For the purposes of predicting environmental impacts of the project, a disturbance area has been defined. The disturbance area encompasses the extent of physical disturbance likely to be required to accommodate construction activities and infrastructure needed to build the overhead transmission line, the permanent substation and access roads and vegetation clearing along the transmission corridor.

A broader project area has also been defined. The project area represents the limits of where disturbance may occur during construction to allow for flexibility for the final siting of project infrastructure. Final siting of the infrastructure (i.e. the disturbance area) can move within the assessed project area subject to recommended environmental management measures and provided it does not exceed the limits defined by the project area.

The project traverses Talbingo Reservoir, which naturally splits the project area into two. When defining the area of works, the terms 'project area east' and 'project area west' have been used where required for the purpose of the EIS. These are defined as follows:

- **Project area east:** includes the project area and existing surrounding access roads in the area east of Talbingo Reservoir
- **Project area west:** includes the project area and existing surrounding access roads in the area west of Talbingo Reservoir.

The existing landscape character of much of the project area consists of undisturbed and mountainous terrain, forested valleys, and is the only true alpine environment in NSW (NPWS 2003). This landscape contains limited human disturbance, however existing transmission line easements, minor access tracks, and infrastructure associated with the Talbingo Reservoir are located within and surrounding the project area.

The project area disturbance area is shown in **Figure 2-2**.

## 2.4 Construction activities

The construction works would commence with the construction of the access tracks to the substation and transmission structure locations. Construction of the helipad is also expected to commence in the initial stages. Once suitable access has been established, construction of the substation and transmission line would commence and occur concurrently.

A summary of the construction activities is provided in **Table 2-1**.

Table 2-1: Summary of construction activities

| Construction activity | Description |
|---|---|
| **Pre-construction, site establishment and vegetation clearance** | ▪ Site mobilisation once relevant approvals have been granted, property acquisitions have been finalised Forestry Corporation of NSW (FCNSW) and National Parks and Wildlife Service (NPWS) and agreements with construction contractors has been achieved<br>▪ Surveying and marking out the approved disturbance footprint and any environmental avoidance areas<br>▪ Installation of appropriate stormwater and diversion drainage and erosion and sedimentation control works prior to ground disturbance and vegetation clearing<br>▪ Inform recreational users of KNP, Bago State Forest and Talbingo Reservoir of the construction activities, the extent of work areas and the locations of environmental exclusion areas with project notifications, including warning signs of construction activities and notifications of access restrictions<br>▪ Establishment of the construction compound and equipment laydown areas at the substation site and at Lobs Hole[1]. |
| **Access tracks** | ▪ Vegetation clearing within the approved corridor. This is expected to be carried out both manually in the areas of steeper slopes and machine clearing where access can be safely achieved<br>▪ Grubbing and bulk earthworks (cut and fill) using an excavator<br>▪ Installation of suitable drainage structures and sediment retention basins where required<br>▪ Laying and compaction of a suitable rock aggregate/road base<br>▪ Grading and/or reshaping of existing tracks where required, within the existing access track width (no road widening)<br>▪ Minor excavations followed by laying and compaction of crushed rock or gravel, to improve the existing track surface and drainage. |
| **Substation** | ▪ Vegetation clearing across the substation site and surrounding APZ. This would involve the stripping and stockpiling of topsoil for later use. Vegetation clearing is expected to be carried out utilising a bulldozer equipment with a tree pusher, however would be confirmed in consultation with FCNSW<br>▪ Establishment of a site compound and laydown area within the cleared APZ. The site compound would be in place throughout the construction period and is expected to contain a demountable office, meal room, and toilet/shower facilities, equipment laydown areas, vehicle and equipment storage, maintenance sheds, chemical/fuel stores and stockpile areas<br>▪ Minor earthworks to establish the site amenities; which would include cut and fill to establish a level area for the site facilities and temporary storage areas and establishment of the permanent site access road<br>▪ Earthworks:<br>  ▪ Excavation works to remove excess material, provide a level surface, and create the required trenches for drainage, earthing, and electrical conduits. Some spoil from the excavation may be reused on site for filling and compaction (including benching areas of the site where required). Excavation works would be carried out using equipment such as excavators, dozers and crushing plant. Furthermore, depending on the underlying geology, blasting may be required to facilitate the break-up of rock, should it be present<br>  ▪ Bulk earthworks to establish the level surface for the substation bench<br>  ▪ Approximately 11,300 cubic metres of excess spoil would be generated from the levelling of the substation site and construction of the access road. Any soil which cannot be reused onsite as fill material, landscaping or other means would be disposed of off-site at a suitably licenced facility and/or at a location(s) as agreed with FCNSW<br>  ▪ Where excavated spoil is not appropriate for reuse on site, additional spoil would be imported to site.<br>▪ Civil and building works:<br>  ▪ Civil works involving the establishment of concrete footings for the high voltage equipment and buildings, construction of stormwater drainage and oil containment infrastructure and cable trenches and subsurface cables<br>  ▪ Construction of onsite buildings (e.g. control room) and services installed including general lighting, power and ventilation. |

[1] The site compound at Lobs Hole would be located within the approved disturbance footprint of Snowy 2.0.

| Construction activity | Description |
|---|---|
| **Transmission line** | ▪ Vegetation clearing within the approved corridor where the overhead conductors would not meet safe clearance heights above the underlying vegetation<br>▪ Grading and/or reshaping of existing access tracks where required<br>▪ Vegetation clearing and bulk earthworks to establish the level helipad<br>▪ Establishment of the transmission structure work sites involving:<br>  ▪ Clearing of an approximate 40 m by 60 m area around each transmission structure location to allow for the laydown of materials and equipment and facilitate access for vehicles, plant and machinery during structure construction<br>  ▪ Bulk earthworks (cut and fill) to establish level construction benches within the worksite to allow for the safe operation of plant and equipment (namely elevated works platforms and cranes) during structure construction<br>  ▪ Geotechnical investigation works using a mobile drill rig at each structure location to determine the most appropriate footing design<br>  ▪ Bulk earthworks and excavations to establish the structure footings involving the installation of steel framework and backfilling with concrete or pile type footings involving boring four boreholes at each structure leg location and backfilling with concrete<br>  ▪ Steel lattice structures would be transported to each structure location via heavy vehicle in parts and assembled on site using mobile cranes.<br>▪ Stringing of conductor and overhead earth wire which would involve:<br>  ▪ Establishment of level tensioning and pulling sites within the approximate 40 m by 60 m structure worksite or at suitable locations within the transmission line corridor<br>  ▪ Attachment of sheaves (or pulleys) to the top of the structures in readiness for stringing work using an elevated work platform<br>  ▪ Pulling out a light weight draw wire across the section of line being strung using a drone or, vehicle/machine (such as dozer), followed by the placement of the draw wire through the sheaves<br>  ▪ Attachment of the draw wire to the earth wire or conductor drum (depending on which is being strung) and pulling it through the sheaves under tension using specialised tensioning and pulling equipment<br>  ▪ Termination of the conductor/earth wire at each end clipping it into position followed by the removal of the sheaves. |
| **Commissioning** | ▪ Testing of all high voltage equipment at the substation and ensuring all protection, control and metering equipment is operating correctly<br>▪ Completion of all necessary cut-in works to Line 64 and relevant testing undertaken<br>▪ Placement of the new transmission lines and substation into standby in readiness for Snowy 2.0 to be completed<br>▪ Once Snowy 2.0 becomes operational, energisation of the high voltage equipment and the project placed into service. |
| **Rehabilitation and demobilisation** | ▪ Removal of all non-permanent infrastructure and equipment from the work sites and site compounds<br>▪ Decommissioning and dismantling of the site compounds at the substation and Lobs Hole<br>▪ Site stabilisation and landscaping involving:<br>  ▪ Stabilisation of exposed areas and slopes<br>  ▪ Installation and maintenance of erosion and sediment controls at the work sites to manage impacts post-construction<br>  ▪ Seeding soil slopes to assist stabilisation<br>  ▪ Planting vegetation on any higher risk slopes<br>  ▪ Mulching of stabilised and revegetated areas where required. |

### 2.4.1 Construction staging and timing

Construction of the project is anticipated to commence in early 2022 and take approximately 39 months to complete. Estimated timing for the main construction activities is set out in **Figure 2-3**. Further details on the estimated timing and staging of the main project activities is described in Section 5.3 of the EIS.

| Construction works | 2022 | | | | 2023 | | | | 2024 | | | | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarter | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 |
| Access tracks, roads and helipad | | | | | | | | | | | | | |
| 330 kV Switchyard | | | | | | | | | | | | | |
| 500 kV Substation | | | | | | | | | | | | | |
| Transmission connection | | | | | | | | | | | | | |

Figure 2-3: Indicative timing for the construction of key project components

## 2.5 Operation and maintenance

The substation and transmission connection would be inspected by field staff on a regular basis. Key activities undertaken during operation would include:

- Regular inspection and maintenance of electrical equipment at the substation including structural integrity of all footings and support structures
- General inspection and maintenance of other components within the substation including the stormwater management system, fire detection system, onsite buildings and drainage infrastructure
- Regular inspection and maintenance of the transmission structures, footings, fittings, conductors and overhead earth wires
- Vegetation removal and trimming along the transmission corridor and APZ surrounding the substation to maintain appropriate clearances between ground vegetation and the overhead transmission lines and around the substation to manage bushfire risk
- Removal of trees which have the potential to strike the overhead conductors if they were to fall (referred to as hazard trees) as required.

It is expected that only light vehicles and small to medium plant would need to access the substation site and the transmission line corridor for these activities. The substation would not accommodate full-time staff or contractors, and the regular collection of waste would not be required. Any waste generated during operation of the substation would be minimal and disposed of on an 'as need' basis.

# 3. Methodology

The study area of this traffic and transport impact assessment includes the road network that provides access to the new substation (project area west) via Hume Highway, Snowy Mountains Highway, Batlow Road, Tooma Road and Elliott Way, and the connection point for Snowy 2.0 cable yard (project area east) via Snowy Mountains Highway (from Tumut and Cooma), Link Road, Lobs Hole Ravine Road and Mine Trail.

A summary of the methodology used to assess impact of the project on the transport network is provided in **Table 3-1**.

Table 3-1: Summary of the traffic and transport assessment methodology

| Component of traffic and transport assessment | Assessment approach |
|---|---|
| Impacts on road network performance | Analysis of existing traffic conditions and traffic generation during construction and operation phases of the project to determine impacts in terms of volume capacity ratio (V/C) |
| Impacts on road safety, condition and maintenance | ▪ Analysis of historical 5-year crash data to determine existing crash trends<br>▪ Review of road safety audit of the proposed haulage route to assess road safety, condition and suitability for anticipated construction vehicle movements |
| Impacts on access (including regular and emergency management activities within KNP) | Analysis of proposed access provisions within the KNP during construction and operation of the project |
| Impacts on public transport | Analysis of proposed impacts to public transport operation during construction and operation of the project |
| Impacts on pedestrians and cyclists | Analysis of proposed changes to pedestrian and cyclist access, infrastructure and amenity during construction and operation of the project |
| Cumulative impacts of the project with nearby concurrent projects | ▪ Analysis of cumulative traffic generation of the project with nearby concurrent projects and impacts in terms of V/C<br>▪ Analysis of cumulative impacts on road safety, condition, access, public transport, pedestrians and cyclists |

# 4. Existing traffic and transport environment

## 4.1 Road network

The key roads in the study area are described below.

- Hume Highway, shown in **Photos 4-1**, is an 840-kilometre highway that connects Sydney to Melbourne (inclusive of sections named Hume Freeway and Hume Motorway). Near the project, the Hume Highway runs in a northeast to southwest direction and is a dual carriageway road with two lanes in each direction with a posted speed limit of 110 km/hr. The road is an approved B-double route for 25/26-metre long B-double vehicles.
- Snowy Mountains Highway, shown in **Photos 4-2**, is a rural state road that links the Hume Highway, Mount Adrah, Monaro Highway, Cooma and Princes Highway near Angledale. The road runs through the townships of Adelong, Tumut, Adaminaby, Cooma, Nimmitabel and Bemboka and has one lane in each direction with posted speed limits that range from 50 kilometres per hour (km/hr) to 100 km/hr. In the higher altitude regions (above 1,000 m altitude), the highway is subject to snow and ice cover over the winter months, with yellow line marking and tall red reflector posts used for better visibility of the road. Vehicles may be required to use snow chains when travelling on these higher sections of the Snowy Mountains Highway with speed reductions to 80 km/hr. Snowy Mountains Highway is an approved B-double route for 25/26-metre long B-double vehicles between Hume Highway and Miles Franklin Drive as well as between Kosciuszko Road and Old Adaminaby Road, and approved for 19-metre long B-double vehicles elsewhere.
- Batlow Road, shown in **Photos 4-3**, is a regional state road that generally runs north-south between Snowy Mountains Highway, Gilmore and Tumbarumba. Batlow Road is a two-way, single carriageway road with one lane in each direction and a posted speed limit of 80 km/hr (reducing to up to 50 km/hr at Batlow and Tumbarumba). At Tumbarumba, Batlow Road continues south and connects to Tooma Road via The Parade, Bridge Street, Winton Street, Regent Street and William Street. Batlow Road is an approved B-double route for 25/26-metre long B-double vehicles, with the exception of between Kurrajong Avenue and Cottams Road.
- Tooma Road is a regional state road that generally runs north-south between Tumbarumba and Alpine Way, Bringenbrong and provides access to Elliott Way at Paddys River. Tooma Road is a two-way, single carriageway road with one lane in each direction and a posted speed limit of 100 km/hr. Tooma Road is an approved B-double route for 25/26-metre long B-double vehicles north of Maragle Road.
- Elliott Way is a regional state road that links the township of Tumbarumba and the locality of Nurenmerenmong via Paddys River. The road connects Tooma Road with Goat Ridge Road through KNP and has one lane in each direction with a posted speed limit of 80 km/hr. This road was impacted by bushfires in 2019 and is currently closed west of the Bago State Forest/KNP boundary. The road is an approved B-double route for 25/26-metre long B-double vehicles. However, B-double travel conditions exist, and travel is permitted outside of between 8am to 9am and 3:30pm to 4:30pm on school days and in dry weather only.
- Link Road, shown in **Photos 4-4**, is a regional state road two-way road with one lane in each direction that connects Goat Ridge Road to the west and Snowy Mountains Highway to the east. The road provides access to the Selwyn Snow Resort and Cabramurra as well as access roads including Lobs Hole Ravine Road. The posted speed limit is 80 km/h, except in the vicinity of the National Parks and Wildlife Service ticket booth which is typically 60 km/hr and 40km/hr during the ski season. Link Road is not an approved B-double route. As of August 2020, Link Road is currently closed due to damage from the December 2019 and January 2020 bushfires.

- Lobs Hole Ravine Road is a regional two-way local road within the KNP with a single lane but allows two-way traffic. The road runs in a north-south direction, linking Bogong Peaks Wilderness, Pinbeyan and Cabramurra. The road connects the Snowy Mountains Highway with Link Road and has no line marking and no sign posted speed limit but is default to 100 km/hr under the Australian Road Rules. Based on the steep terrain, motorists driving to the conditions generally would not achieve speeds greater than 60 km/hr. Lobs Hole Ravine Road has been recently widened to dual lane in each direction with access restricted to Snowy 2.0 construction traffic only.
- Mine Trail is a regional two-way local road within the KNP that runs east-west to link Cabramurra and Yarrangobilly. The road connects Lobs Hole Ravine Road and Wallaces Creek through KNP. As part of Snowy 2.0, Mine Trail was reconstructed for use by the project construction traffic and widened to one lane in each direction.

Photos 4-1: Hume Highway facing west, east of Snowy Mountains Highway (*Source: Google Maps)*

Photos 4-2 Snowy Mountains Highway within KNP facing north, south of Long Plain Road (*Source: Google Maps)*

Photos 4-3: Batlow Road at Batlow facing north at Nellis Street (*Source: Google Maps)*

Photos 4-4: Link Road facing west at Lobs Hole Ravine Road (*Source: EMM Consulting, 2018)*

## 4.2 Public transport

There are no train services in the study area. The nearest train stations are at Canberra, which has connecting train services to Goulburn, the Southern Highlands townships and Sydney three times a day, and at Wagga Wagga, which has services connecting to Melbourne and Sydney twice daily with interchange stops for coach services in Albury, Wagga Wagga, Griffith, Cootamundra, Canberra, Moss Vale and Bowral.

A Southern NSW road coach service operates between Wagga Wagga train station interchange and Tumut on Monday, Wednesday and Friday, and from Cootamundra train station interchange to Tumut every Tuesday, Thursday and Sunday. Coach services also operate daily between Canberra interchange and Eden, stopping at Cooma, and a Canberra interchange to Bombala service that stops at Cooma every Monday, Wednesday and Friday.

There is only one designated coach stop in the township at Tumut and Cooma with both stops located in the centre of town. Selwyn Snow Resort has a coach service from Cooma to the resort during the snow season. The coaches arrive at the resort between 6:00 and 6:30 am on a Friday, Saturday and Sunday.

Similarly, transport provided by Snowy Valleys Council and private coach/bus services are available to people living in the Snowy Valleys LGA. Community transport provided by Council are for those in the Commonwealth Home Support Program (CHSP) group, people with disabilities and disadvantaged because of isolation and lack of transport. These services require booking in advance of transportation. Other private coach/bus services include school buses that service the local schools in the Snowy Valleys LGA. There is also a bus service operated by Cooma Coaches which travels around Cooma on weekdays providing limited services during the morning and afternoon peaks.

Community transport is also provided by Snowy Monaro Regional Council, servicing people living in Cooma, Berridale and Bombala to and from Canberra and Bega for medical and social appointments, and to other regional towns for shopping on a fortnightly and monthly basis. People eligible for the Council's community transport are those of age 65 (Aboriginal people age 50) and above with disability, and persons disadvantaged because of their isolation and remoteness. Bus services from Cooma also operate more frequently during the winter season to ski resorts.

## 4.3 Active transport

Off-road cycling facilities in the study area are limited to shared paths at Adelong, Tumut, Tumbarumba and Cooma, which facilitate local cycling access within these towns. Similarly, footpaths and formal pedestrian crossing facilities are only provided at town centres and not provided on rural roads near the project area.

Within the project area, there are no formal walking trails in KNP. However, management trails (which only allow vehicular access to KNP management and protection vehicles) are used by pedestrians and cyclists/mountain bikers at the following locations near the project area:

- Mine Trail, which is wholly located within the project area
- Flying Fox Trail, which is intersected by the eastern side of the project area
- Maragle State Forest trails, including Hannams, March and April trails about 1 km west of the project area
- Trails at Lobs Hole including O'Hares Trail south of the project area and Tolbar Trail north of the project area.

The nearest formal walking trails are at Yarrangobilly Caves, approximately 8 km north-east of the project. A number of trails are also in the Maragle State Forest about 1 km west of the project area including Hannams, March and April trails that are used for bushwalking and cycling. The existing transmission line easement (Line 64) to the west of project area is also used by mountain bikers.

## 4.4 Existing road safety

Crash data for roads used for access to project area east and project area west was sourced from Transport for NSW's CrashLink database. The crash records comprise self-reported crashes in the most recent five-year period of available data from 1 July 2014 to 30 June 2019.

Key crash statistics include:

- In the five-year period from July 2014 to June 2019, a total of 226 crashes were recorded
- Six fatal crashes were recorded on Snowy Mountains Highway between Hume Highway and Cooma and one fatal crash occurred on Batlow Road between Snowy Mountains Highway and Tumbarumba
    - Four of these fatal crashes involved vehicles travelling off the carriageway at a bend and colliding with an object
- The most common crash type involved vehicles travelling off the carriageway at a bend (45 per cent of all crashes), particularly on Snowy Mountains Highway, Batlow Road and Elliott Way
- 18 per cent of crashes occurred in wet surface conditions and nine per cent of crashes occurred during snow or ice surface conditions. 27 per cent of crashes occurred in dark lighting conditions
- Crash rates are low on roads forming part of the proposed haulage route. However, fatal and serious injury (FSI) and casualty crash rates are relatively higher on local roads in Tumbarumba than on other roads.

Crashes by injury severity are shown in **Table 4-1**. Crashes by road user movement (RUM) group are shown in **Table 4-2**. Crashes by surface and lighting conditions are shown in **Table 4-3**. Crash rates per kilometre per year are shown in **Table 4-4**.

Table 4-1: Crashes by injury severity (2014 – 2019)

| Road | Number of crashes | | | | | |
|---|---|---|---|---|---|---|
| | Fatal | Serious injury | Moderate injury | Minor injury | Non-casualty | Total |
| Snowy Mountains Highway between Hume Highway and Cooma | 6 | 27 | 46 | 18 | 58 | **155** |
| Batlow Road between Snowy Mountains Highway and Tumbarumba | 1 | 13 | 9 | 10 | 19 | **52** |
| The Parade, Bridge Street, Winton Street, Regent Street and William Street, Tumbarumba | 0 | 3 | 0 | 1 | 1 | **5** |
| Tooma Road north of Elliott Way | 0 | 1 | 4 | 0 | 1 | **6** |
| Elliott Way and Goat Ridge Road between Tooma Road and Link Road | 0 | 3 | 0 | 2 | 2 | **7** |
| Link Road between Goat Ridge Road and Snowy Mountains Highway | 0 | 0 | 0 | 0 | 0 | **0** |
| Lobs Hole Ravine Road and Mine Trail north of Link Road | 0 | 1 | 0 | 0 | 0 | **1** |
| **Total** | **7** | **48** | **59** | **31** | **81** | **226** |

Table 4-2: Crashes by RUM group (2014 – 2019)

| Road | RUM group | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pedestrians (00-09) | Adjacent direction (10-19) | Opposing direction (20-29) | Same direction (30-39) | Manoeuvring (40-49) | Overtaking (50-59) | On path (60-69) | Off path on straight (70-79) | Off path on curve (80-89) | Miscellaneous (90-99) | |
| Snowy Mountains Highway between Hume Highway and Cooma | 3 | 17 | 11 | 18 | 5 | 6 | 9 | 22 | 63 | 1 | **155** |
| Batlow Road between Snowy Mountains Highway and Tumbarumba | 0 | 0 | 6 | 5 | 1 | 2 | 3 | 3 | 32 | 0 | **52** |
| The Parade, Bridge Street, Winton Street, Regent Street and William Street, Tumbarumba | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | **5** |
| Tooma Road north of Elliott Way | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | **6** |
| Elliott Way and Goat Ridge Road between Tooma Road and Link Road | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | **7** |
| Link Road between Goat Ridge Road and Snowy Mountains Highway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Lobs Hole Ravine Road and Mine Trail north of Link Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| **Total** | **3** | **17** | **20** | **25** | **6** | **8** | **13** | **31** | **102** | **1** | **226** |

Table 4-3: Crashes by surface and lighting conditions (2014 – 2019)

| Road | Surface condition | | Dark lighting conditions[2] |
|---|---|---|---|
| | Wet | Snow or Ice | |
| Snowy Mountains Highway between Hume Highway and Cooma | 24 (15%) | 18 (12%) | 41 (26%) |
| Batlow Road between Snowy Mountains Highway and Tumbarumba | 15 (29%) | 2 (4%) | 15 (29%) |
| The Parade, Bridge Street, Winton Street, Regent Street and William Street, Tumbarumba | 0 (0%) | 0 (0%) | 3 (60%) |
| Tooma Road north of Elliott Way | 2 (33%) | 0 (0%) | 0 (0%) |
| Elliott Way and Goat Ridge Road between Tooma Road and Link Road | 0 (0%) | 1 (14%) | 1 (14%) |
| Link Road between Goat Ridge Road and Snowy Mountains Highway | 0 (0%) | 0 (0%) | 0 (0%) |
| Lobs Hole Ravine Road and Mine Trail north of Link Road | 0 (0%) | 0 (0%) | 0 (0%) |
| **Total** | **41 (18%)** | **21 (9%)** | **60 (27%)** |

[2] Crashes occurring in dark lighting conditions includes crashes occurring in darkness or at dawn or dusk.

Table 4-4: Crash rates per kilometre per year (2014 – 2019)

| Road | Length (km) | FSI crash rate | Casualty crash rate | Crash rate |
|---|---|---|---|---|
| Snowy Mountains Highway between Hume Highway and Cooma | 226 | 0.03 | 0.09 | 0.14 |
| Batlow Road between Snowy Mountains Highway and Tumbarumba | 60 | 0.05 | 0.11 | 0.17 |
| The Parade, Bridge Street, Winton Street, Regent Street and William Street, Tumbarumba | 3 | 0.20 | 0.27 | 0.33 |
| Tooma Road north of Elliott Way | 16 | 0.01 | 0.06 | 0.08 |
| Elliott Way and Goat Ridge Road between Tooma Road and Link Road | 45 | 0.01 | 0.02 | 0.03 |
| Link Road between Goat Ridge Road and Snowy Mountains Highway | 15 | 0 | 0 | 0 |
| Lobs Hole Ravine Road and Mine Trail north of Link Road | 16 | 0.01 | 0.01 | 0.01 |

## 4.5 Existing traffic volumes

Existing traffic volumes (prior to Snowy 2.0 works) on roads forming part of the proposed haulage route were sourced from traffic counts undertaken for previous studies within and near the study area and include the following:

- Weekday AM and PM peak hour classified vehicle tube counts undertaken between January 2018 and April 2018 as part of the *Snowy Hydro 2.0 Exploratory Work EIS – Traffic and Transport Impact Assessment* (2018)
- Weekday PM peak hour intersection counts collected in 2019 during the non-winter period and the winter holiday period (June to August) as part of the *Snowy 2.0 Main Works Traffic and Transport Assessment* (2019)
- Daily traffic counts collected in 2019 by Snowy Valleys Council.

Road capacity was determined in accordance with Section 4.1.1 and 5.2.1 of *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* (2017). As per the *Snowy 2.0 Main Works Traffic and Transport Assessment*, one-way PM peak hour project traffic volumes were assumed to be 10 per cent of the above daily traffic volumes and an annual (linear) 1% traffic growth rate has been applied to scale traffic volumes from 2018 to 2019.

Existing 2019 non-winter period peak bidirectional traffic volumes, two-way capacities and V/C ratios on roads forming part of the proposed haulage route are shown in **Table 4-5**. Snowy Mountains Highway, Link Road, Elliott Way, Lobs Hole Ravine Road, Batlow Road and Tooma Road carry low amounts of traffic and have ample spare capacity to accommodate additional traffic. As Mine Trail is only accessible via Lobs Hole Ravine Road, Mine Trail is also expected to have ample spare capacity.

Table 4-5: Existing 2019 non-winter period weekday AM and PM peak hour bidirectional traffic volumes, capacities and V/C ratios[3]

| Road | Two-way capacity (PCU/hr) | Weekday AM peak hour | | | | Weekday PM peak hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C |
| Snowy Mountains Highway south of Link Road | 2,600 | 85 | 13 | 116 | 0.05 | 106 | 15 | 142 | 0.06 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | | 66 | 15 | 102 | 0.04 | 77 | 16 | 115 | 0.05 |
| Snowy Mountains Highway east of Kosciuszko Road | | Not available[4] | | | | 730 | 17 | 771 | 0.30 |
| Snowy Mountains Highway west of Vale Street | 1,800 | | | | | 297 | 3 | 304 | 0.17 |
| Link Road west of Snowy Mountains Highway | 2,200 | 36 | 6 | 50 | 0.03 | 48 | 7 | 65 | 0.03 |
| Elliott Way north-west of Link Road | 1,600 | 21 | 5 | 33 | 0.03 | 30 | 6 | 44 | 0.03 |
| Lobs Hole Ravine Road north of Link Road | 1,600 | 7 | 1 | 9 | 0.01 | 8 | 2 | 13 | 0.01 |
| Batlow Road north of Tumbarumba | 2,600 | Not available[5] | | | | 89 | 16 | 127 | 0.05 |
| Tooma Road south of Tumbarumba | 2,600 | | | | | 46 | 8 | 65 | 0.03 |

*Source: January 2018 – April 2018 classified vehicle tube counts (Snowy Hydro 2.0 Exploratory Work EIS – Traffic and Transport Impact Assessment), 2019 intersection counts (Snowy 2.0 Main Works Traffic and Transport Assessment), 2019 ADT traffic counts (Snowy Valleys Council)*

[3] One light vehicle has been assumed to be equivalent to one passenger car unit (PCU) and one heavy vehicle equivalent to 2.4 PCU.
[4] Traffic volumes on Snowy Mountains Highway at Kosciuszko Road and Vale Street, Cooma have been derived from intersection traffic counts conducted during the PM peak hour only as part of the *Snowy 2.0 Main Works Traffic and Transport Assessment*.
[5] Traffic volumes on Batlow Road and Tooma Road near Tumbarumba have been derived from AADT counts commissioned by Snowy Valleys Council.

### 4.5.1 Seasonal traffic variation

Due to the proximity of the project to nearby ski fields and resorts in the Snowy Mountains, traffic on the surrounding road network is subject to seasonal variations. Roads in the surrounding road network, particularly Snowy Mountains Highway and Link Road, experience significantly increased daily and peak hour traffic volumes during the winter peak snow season periods due to increased travel to the Adaminaby and Kiandra areas and Selwyn Snow Resort.

To quantify the impacts of seasonal traffic variations, a comparison of intersection counts during the non-winter period and the winter holiday period was undertaken for key roads used to access recreational skiing areas:

- Snowy Mountains Highway at Link Road and Vale Street
- Link Road.

A comparison between the peak hour during the non-winter periods (weekday PM peak) and winter peak periods (Friday PM peak) is shown in **Table 4-6**. During the winter period, traffic volumes are significantly higher on Snowy Mountains Highway and Link Road, particularly near Cooma due to vehicles travelling to Jindabyne and Thredbo via Kosciuszko Road and vehicles accessing the Selwyn Snow Resort.

Table 4-6: Non-winter and winter period traffic volume comparison

| Road | Non-winter weekday PM peak | | | Winter weekday PM peak | | | Difference (veh/hr) | Difference (%) |
|---|---|---|---|---|---|---|---|---|
| | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Total (veh/hr) | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Total (veh/hr) | | |
| Snowy Mountains Highway north of Link Road | 77 | 16 | **77** | 98 | 0 | **98** | 21 | 27% |
| Snowy Mountains Highway south of Link Road | 106 | 15 | **121** | 220 | 0 | **220** | 99 | 82% |
| Snowy Mountains Highway east of Kosciuszko Road | 730 | 17 | **747** | 986 | 3 | **989** | 242 | 32% |
| Snowy Mountains Highway west of Vale Street | 297 | 3 | **300** | 925 | 35 | **960** | 660 | 220% |
| Link Road west of Kosciuszko Road | 48 | 7 | **55** | 222 | 0 | **222** | 167 | 304% |

*Source: 2019 intersection counts (Snowy 2.0 Main Works Traffic and Transport Assessment)*

As the peak period of traffic occurs during the winter periods, traffic volumes during this period were used as the basis of this assessment. The winter AM and PM peak hour traffic volumes were estimated using the following:

- Scaling up existing 2019 peak hour traffic volumes in **Table 4-5** based on the non-winter and winter differences in **Table 4-6**
- Estimating AM peak hour traffic volumes for Snowy Mountains Highway east of Kosciuszko Road and Snowy Mountains Highway west of Vale Street based on AM and PM factors on other sections of Snowy Mountains Highway.

The estimated 2019 winter period peak bidirectional traffic volumes, two-way capacities and V/C ratios on roads forming part of the proposed haulage route are shown in **Table 4-7**. As with the non-winter period, these roads have ample spare capacity to accommodate additional traffic. V/C is relatively higher on Snowy Mountains Highway west of Vale Street, which carries higher amounts of traffic during the winter period due to an increase in traffic demand to and from Cooma.

Table 4-7: Existing 2019 winter peak weekday AM and PM peak hour bidirectional traffic volumes, capacity and V/C

| Road | Two-way capacity (PCU/hr) | Weekday AM peak hour | | | | Weekday PM peak hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C |
| Snowy Mountains Highway south of Link Road | 2,600 | 155 | 24 | 213 | 0.09 | 220 | 0 | 220 | 0.09 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | | 86 | 20 | 134 | 0.06 | 100 | 21 | 150 | 0.06 |
| Snowy Mountains Highway east of Kosciuszko Road | | 789 | 2 | 794 | 0.31 | 986 | 3 | 993 | 0.39 |
| Snowy Mountains Highway west of Vale Street | 1,800 | 740 | 28 | 807 | 0.45 | 925 | 35 | 1009 | 0.57 |
| Link Road west of Snowy Mountains Highway | 2,200 | 145 | 24 | 203 | 0.10 | 222 | 0 | 222 | 0.11 |
| Elliott Way north-west of Link Road | 1,600 | 84 | 20 | 132 | 0.09 | 120 | 24 | 178 | 0.12 |
| Lobs Hole Ravine Road north of Link Road | 1,600 | 28 | 4 | 38 | 0.03 | 32 | 8 | 51 | 0.04 |
| Batlow Road north of Tumbarumba | 2,600 | 71 | 13 | 102 | 0.04 | 89 | 16 | 127 | 0.05 |
| Tooma Road south of Tumbarumba | 2,600 | 37 | 6 | 51 | 0.02 | 46 | 8 | 65 | 0.03 |

# 5. Traffic impact assessment

This section assesses the traffic and transport impacts associated with the construction and operation of the project.

## 5.1 Construction impacts

### 5.1.1 Construction assessment year and work hours

As discussed in **Section 2.4.1**, construction of the project is anticipated to commence in early 2022 and take approximately 30 months to complete. As such, the peak construction year that has been assessed is 2024.

Given the isolated location and the construction of Snowy 2.0 occurring in parallel, construction works are expected to be carried out 12 hours per day, seven days per week between the hours of 6 am and 6 pm.

### 5.1.2 Parking

Construction vehicles in the project area east, when not in use, would be parked within the designated site compound area at Lobs Hole or at other designated areas as agreed with Snowy Hydro and NPWS.

Construction personnel working in project area west are expected to park within a designated construction workforce parking area, which would be established within the site compound area at the substation site. The compound would also have sufficient capacity to support the parking of utility and heavy vehicles required to facilitate construction in the western portion of the project area.

Based on the assessment and the isolated location of the project, the project has sufficient capacity to accommodate the parking of construction vehicles for the duration of construction works.

### 5.1.3 Construction traffic vehicles

Light vehicles would be used by construction personnel to access the project area for work as described below:

- Construction personnel working in project area west are expected to be accommodated in Tumbarumba, which is located approximately 40 km (approximately 30 minutes' drive) from the proposed substation site. During peak construction activities, approximately 90 workers would work within project area west, which would generate 90 one-way light vehicle movements within one hour on either side of construction work hours.
- Construction personnel working in project area east are expected to be housed in Tumbarumba as well as Snowy Hydro's accommodation camp at Lobs Hole (Snowy 2.0 workers accommodation). During peak construction activities, approximately 50 workers would work within project area east. Up to 20 workers would be housed at the accommodation camp and are expected to be transported between project area east and the accommodation camp by bus. This would generate one two-way bus movement between one hour on either side of construction work hours. The remaining 30 workers would generate 30 one-way light vehicle movements within one hour on either side of construction work hours.

In addition to the above, light construction vehicle movements would also be attributed to construction activities including construction workforce accessing the work locations along the transmission connection corridor and to facilitate construction works. Heavy construction vehicle movements would also be used to transport equipment, waste, materials and spoil to project area east and project area west. It is assumed that vehicle movements would be distributed through construction work hours.

Total estimated light and heavy vehicle movements on a typical day and during the peak construction period are outlined in **Table 5-1**.

Table 5-1: Estimated vehicle movements for construction activities

| Vehicles | Movement type | Estimated two-way movements[6] |
|---|---|---|
| **Substation** | | |
| Light vehicles | Indicative daily movements (typical day) | 50 |
| | Maximum daily movements (peak construction period) | 80 |
| Heavy vehicles | Indicative daily movements (typical day) | 30 |
| | Maximum daily movements (peak construction period) | 75 |
| **Transmission lines and access tracks** | | |
| Light vehicles | Indicative daily movements (typical day) | 40 |
| | Maximum daily movements (peak construction period) | 70 |
| Heavy vehicles | Indicative daily movements (typical day) | 50 |
| | Maximum daily movements (peak construction period) | 75 |

It is anticipated that the maximum predicted daily heavy vehicle movements would occur during:

- Bulk earthworks and civil works during the substation construction
- Bulk earthworks and civil works during access track construction and establishment of the transmission structure footings
- Transmission corridor vegetation clearing works.

### 5.1.4 Construction site access

The anticipated primary transport routes for light and heavy vehicles travelling to and from the project area are shown in Error! Reference source not found. and described below:

- **Project area west:** Light vehicles are expected to travel on local roads from Tumbarumba including, The Parade, Bridge Street, Winton Street, Regent Street and William Street to Tooma Road and Elliott Way. Heavy vehicles are expected to travel along Hume Highway, Snowy Mountains Highway, Batlow Road, Tooma Road and Elliott Way.
- **Project area east:** Vehicles are expected to travel along Snowy Mountains Highway (from Cooma and Tumut), Link Road, Lobs Hole Ravine Road and Mine Trail.

Once repairs to Link Road and Goat Ridge Road are complete following the damage from the 2019 bushfires, some traffic movement would occur along these roads for access to project area east and project area west (via Elliott Way, Goats Ridge Road, Link Road, Lobs Hole Ravine Road and Mine Trail).

A new access road would be established from Elliott Way to the substation to facilitate construction and would remain in place throughout its operation. New access roads and tracks would also be required to allow for vehicles, plant, machinery and equipment to be transported to the work locations, including all transmission structures and the helipad during the construction phase. The access tracks would be approximately 5 m wide and would be retained to facilitate ongoing maintenance activities of the transmission lines and provide access during emergency events such as bushfire. The new access tracks and roads would be of suitable grade to allow deliveries of large equipment and plant (such as transmission structures, concrete trucks, cranes, elevated work platforms etc) and allow for the turning radius of the vehicles.

[6] Indicative daily movements are based on current program of work and may change as a result of detailed construction planning. One vehicle movement refers to one inbound and outbound trip.

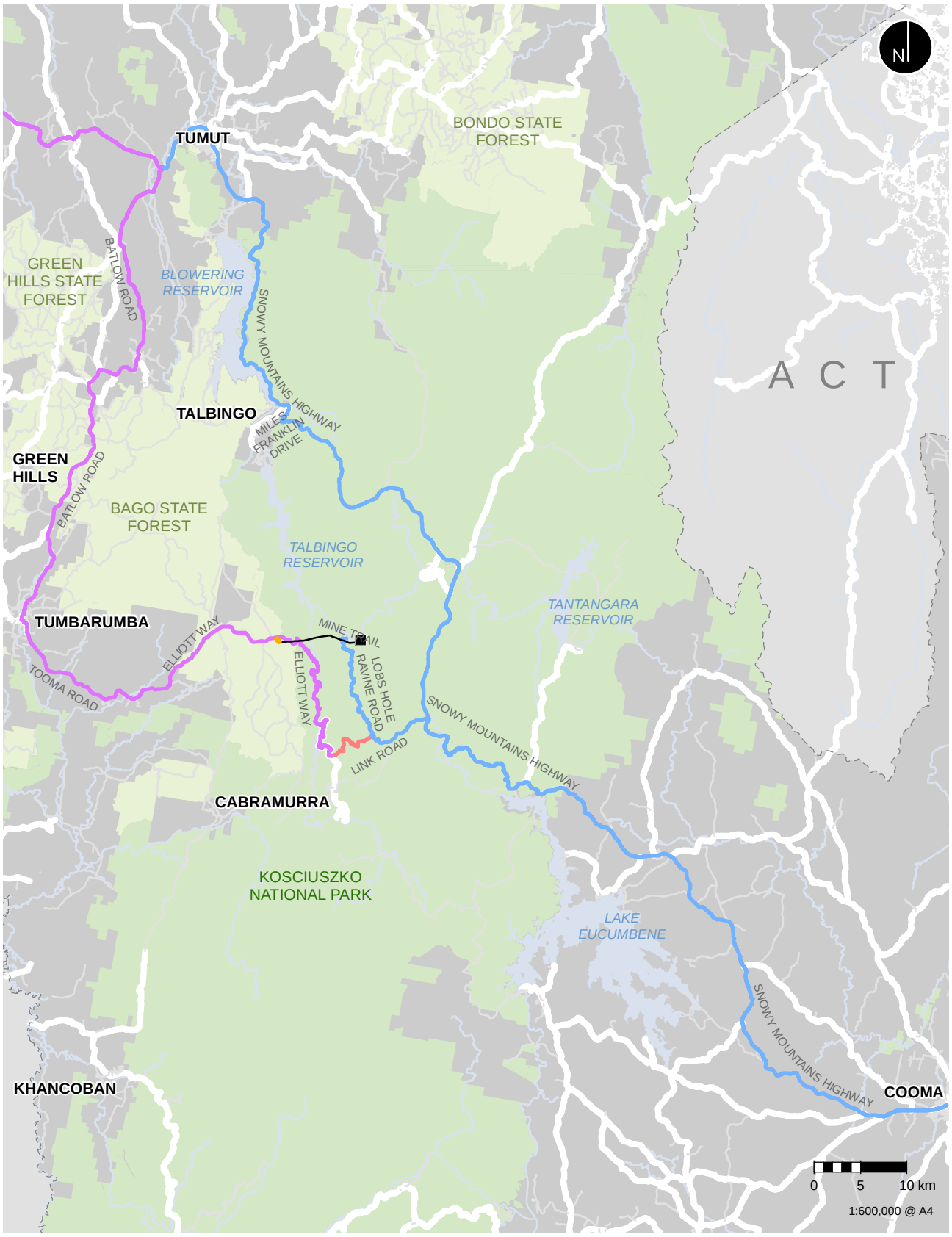



**Figure 5-1** | Primary transport routes

**Data source:**
Jacobs 2020, TransGrid, © Department of Finance, Services and Innovation 2018

### 5.1.5 Construction traffic generation

The peak period of construction traffic generation is expected to occur in 2024 during the 5-6am and 6-7pm hour periods due to vehicles transporting the construction workforce to the project area. The one-way traffic generation during these peak hour periods is summarised in **Table 5-2** and based on the traffic vehicles described in Section 5.1.3 as well as the following assumptions:

- All traffic movements related to the construction of the new substation would travel to and from project area west
- 60 per cent of traffic movements related to the construction of the transmission lines are assumed to travel to and from project area east, with the remaining 40 per cent of traffic movements assumed to travel to and from project area west. This distribution is based on the length of the proposed transmission line to be constructed at project area east and project area west, which is approximately 60 per cent and 40 per cent respectively
- Light and heavy vehicles facilitating construction works are assumed to be spread evenly throughout the day during the standard construction work hours between 6am and 6pm and are expected to travel to and from site within the hour (i.e. two-way movement within the hour)
- Light vehicles transporting construction personnel to project area east and west are assumed to travel within one hour before shift commencement and one hour after shift end (i.e. one-way movement within the hour).

Table 5-2: Forecast hourly bidirectional traffic generation in 2024 during peak construction periods[7]

| Project area | Road | Forecast hourly traffic generation during peak construction period | | | | | |
|---|---|---|---|---|---|---|---|
| | | 5-6am | | | 6-7pm | | |
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) |
| West | Elliott Way | 95 | 18 | 138 | 95 | 18 | 138 |
| | Batlow Road | 0 | 18 | 43 | 0 | 18 | 43 |
| | Tooma Road | 90 | 18 | 133 | 90 | 18 | 133 |
| East | Lobs Hole Ravine Road | 35 | 8 | 54 | 35 | 8 | 54 |
| | Link Road | | | | | | |
| | Snowy Mountains Highway north of Link Road | 0 | 4 | 10 | 0 | 4 | 10 |
| | Snowy Mountains Highway south of Link Road | 30 | 4 | 40 | 30 | 4 | 40 |

[7] The assessed traffic generation represents a worst-case scenario where light construction vehicles transporting construction workforce is generated in the same peak hour as light vehicles used for construction activities as well as heavy vehicles used for transportation. This is a conservative assessment as vehicles used for construction activities are expected to be spread throughout the construction work hours.

### 5.1.6 Impact on road network performance

Anticipated bidirectional traffic volumes and V/C ratios in 2024 (without construction vehicles) during the winter period are shown in **Table 5-3**. As per the *Snowy 2.0 Main Works Traffic and Transport Assessment*, an annual (linear) 1% traffic growth rate has been applied to scale 2019 traffic volumes to 2024.

As per existing traffic volumes, roads forming part of the proposed haulage route have ample spare capacity to accommodate additional traffic.

Table 5-3: 2024 winter peak weekday AM and PM peak hour bidirectional traffic volumes, capacity and V/C

| Road | Two-way capacity (PCU/hr) | Weekday AM peak hour | | | | Weekday PM peak hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C |
| Snowy Mountains Highway south of Link Road | 2,600 | 163 | 25 | 223 | 0.09 | 231 | 0 | 231 | 0.09 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | | 90 | 21 | 140 | 0.06 | 105 | 22 | 158 | 0.07 |
| Snowy Mountains Highway east of Kosciuszko Road | | 828 | 2 | 833 | 0.33 | 1035 | 3 | 1042 | 0.41 |
| Snowy Mountains Highway west of Vale Street | 1,800 | 777 | 29 | 847 | 0.48 | 971 | 37 | 1060 | 0.59 |
| Link Road west of Snowy Mountains Highway | 2,200 | 152 | 25 | 212 | 0.10 | 233 | 0 | 233 | 0.11 |
| Elliott Way north-west of Link Road | 1,600 | 88 | 21 | 138 | 0.09 | 126 | 25 | 186 | 0.12 |
| Lobs Hole Ravine Road north of Link Road | 1,600 | 29 | 4 | 39 | 0.03 | 34 | 8 | 53 | 0.04 |
| Batlow Road north of Tumbarumba | 2,600 | 75 | 14 | 109 | 0.05 | 93 | 17 | 134 | 0.06 |
| Tooma Road south of Tumbarumba | 2,600 | 39 | 6 | 53 | 0.03 | 48 | 8 | 67 | 0.03 |

Anticipated bidirectional traffic volumes and V/C ratios in 2024 with construction traffic during the winter period are shown in **Table 5-4**. As such, peak construction traffic was assessed against AM and PM peak hour volumes, which is considered to be a conservative assessment of road network performance with construction traffic.

Construction traffic would generally result in a very slight increase in V/C ratio on roads forming part of the proposed haulage route. However, the overall impact is minimal and these roads would continue to operate with spare capacity during the winter period.

Table 5-4: 2024 winter peak weekday AM and PM peak hour bidirectional traffic volumes, capacity and V/C with construction traffic

| Road | Two-way capacity (PCU/hr) | Weekday AM peak hour | | | | Weekday PM peak hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C |
| Snowy Mountains Highway south of Link Road | 2,600 | 193 | 29 | 263 | 0.11 | 261 | 4 | 271 | 0.11 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | | 90 | 25 | 150 | 0.06 | 105 | 26 | 167 | 0.07 |
| Snowy Mountains Highway east of Kosciuszko Road | | 828 | 6 | 842 | 0.33 | 1035 | 7 | 1052 | 0.41 |
| Snowy Mountains Highway west of Vale Street | 1,800 | 777 | 33 | 856 | 0.48 | 971 | 41 | 1069 | 0.60 |
| Link Road west of Snowy Mountains Highway | 2,200 | 187 | 33 | 266 | 0.13 | 268 | 8 | 287 | 0.14 |
| Elliott Way north-west of Link Road | 1,600 | 183 | 39 | 277 | 0.18 | 221 | 43 | 324 | 0.21 |
| Lobs Hole Ravine Road north of Link Road | 1,600 | 64 | 12 | 93 | 0.06 | 69 | 16 | 107 | 0.07 |
| Batlow Road north of Tumbarumba | 2,600 | 75 | 32 | 152 | 0.06 | 93 | 35 | 177 | 0.07 |
| Tooma Road south of Tumbarumba | 2600 | 129 | 24 | 187 | 0.08 | 138 | 26 | 200 | 0.08 |

### 5.1.7 Impacts of oversized vehicles

The substation would comprise up to three 500/330 kV 3-phase or up to nine single-phase transformers to convert the voltage from 330 kV to 550 kV. Under the single-phase transformer option, each of the nine single-phase transformers would be transported separately to the substation site on an oversize overmass (OSOM) vehicle. Other OSOM vehicles may also be required for the delivery of equipment but the total number of OSOM movements is expected to be low. These OSOM vehicles are anticipated to travel from Port Kembla to the substation in project area west.

Due to the low number of transformer deliveries, combined with the fact that these OSOM vehicles would travel outside of peak periods, the traffic impact of OSOM vehicles on the existing network would be minimal.

To manage these oversized vehicles, an over dimensional permit will be sought from the National Heavy Vehicle Regulator (NVHR). This permit will undergo a separate approval process and a suitable contractor will be engaged for transportation. As part of the permit, the subcontractor would develop a traffic management plan and determine a suitable route and required road upgrades via a detailed route survey in consultation with TransGrid and the NVHR. These traffic movements would be undertaken at night under police escort and in accordance with any OSOM permit conditions.

#### 5.1.8 Impacts on public transport

Impacts to buses would be limited to a potential minor increase in travel time due to the addition of construction vehicles on the road network. However, due to the availability of spare capacity on the surrounding road network, this impact is expected to be minimal. No impacts are anticipated on the operation of bus stops.

#### 5.1.9 Impacts on active transport

Impacts to active transport would be limited to minor amenity impacts at town centres due to the addition of construction vehicles on the road network. However, footpaths, pedestrian crossings and cycling facilities near construction vehicle routes would remain open during construction. Furthermore, as the project is not located near any formal walking or cycling tracks, no impacts on active transport in KNP are expected.

#### 5.1.10 Impacts on road safety and road condition

During construction, additional construction traffic has the potential to impact road safety on roads forming part of the proposed haulage route. This includes construction workers using Tooma Road and Elliott Way to commute between accommodation at Tumbarumba and construction worksites and heavy vehicles transporting materials, equipment and spoil. However, as discussed in **Section 4.4**, existing crash rates on roads forming part of the proposed haulage route are low, particularly on Elliott Way, Link Road and Lobs Hole Ravine Road near the project area. To minimise the impacts of additional construction vehicles on road safety, appropriate driver induction, training, safety measures and protocols would be outlined in the Construction Traffic Management Plan (CTMP) and adhered to by the construction workforce.

Additional construction traffic has the potential to impact road condition on access roads and tracks. To minimise the risks associated with these impacts, routine defect identification and rectification of the access roads and tracks will be managed in accordance with existing road maintenance agreements (i.e. the Memorandum of Understanding between TransGrid and NPWS for the *Procedure for the Undertaking of Inspection, Maintenance and Emergency Works of TransGrid Network Assets and Associated Infrastructure,* which is the original road maintenance agreement for works in KNP including access tracks). Furthermore, internal access roads and tracks will be designed in accordance with the relevant vehicle loading requirements. It is noted that Lobs Hole Ravine Road and Mine Trail were recently upgraded as part of Snowy 2.0 to increase road width and improve operating conditions for heavy vehicles.

A road safety audit of public roads on the proposed haulage routes that would be used for carrying materials and equipment was as carried out in September 2020 for the following routes:

- Western route along Batlow Road from the intersection of Snowy Mountains Highway (Chainage Western 0 km) to Tumbarumba through Batlow, along Tooma Road from Tumbarumba to the intersection of Elliott Way, and along Elliott Way to the National Parks gates (Chainage Western 100 km)
- Eastern route along Snowy Mountains Highway (Chainage Eastern 0 km) from the intersection of Miles Franklin Drive to the intersection Link Road, and along Link Road to the existing Snowy 2.0 site gates (Chainage Eastern 60 km).

The key findings of the road safety audit (safety items identified with medium or higher level of risks only) are summarised in **Table 5-5**. The full road safety audit and definitions of the incident frequency, severity and level of risk are included in **Appendix A**. Furthermore, relevant key findings of the road safety audit from the *Snowy 2.0 Main Works Traffic and Transport Assessment* have also been detailed in **Table 5-5**, which assessed Sharp Street, Snowy Mountains Highway and Link Road between Polo Flat and the Snowy 2.0 construction site.

The road safety audit identified that sections of the haulage route were of poor road condition including loose material, water ponding, vertical drops and unprotected non-frangible hazards in the clear zone of the carriageway and pavement damage including potholes, shoves, edge break and polishing. Road improvements should be considered at these locations to improve safety outcomes for construction vehicles and local traffic.

Furthermore, additional construction traffic has the potential to impact the road condition on roads forming part of the proposed haulage route. To minimise these impacts, a Road Dilapidation Report will be prepared and approved prior to and following construction of the project. Any impacts identified as caused by the project will be rectified as specified in existing road maintenance agreements.

**Table 5-5 Summary of road safety audit**

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 1) Vertical Drop<br>Extent of haulage route | There are unprotected vertical drops located in the clear zone of the carriageway.<br>There is a risk that an errant vehicle may travel over a vertical drop resulting in vehicle roll-over.<br>This risk is increased where vertical drops are located above water bodies or on the back of curves. |  | Improbable | Serious | Medium |
| 2) Hazard in Clear zone<br>Extent of haulage route | There are unprotected non-frangible hazards located in the clear zone of the carriageway, including large trees, fallen trees and large rocks.<br>There is a risk that an errant vehicle may impact a non-frangible hazard resulting in injury to vehicle occupants. |  | Improbable | Serious | Medium |
| 3) Barrier Point of Need<br>Extent of haulage route | There are instances of barrier installed to protect hazards in the clear zone that have not sufficiently protected the hazard.<br>There is a risk that an errant vehicle may not be contained by a barrier system before reaching a hazard or may travel behind the barrier system and impact a hazard resulting in injury to vehicle occupants or vehicle roll-over. |  | Improbable | Serious | Medium |

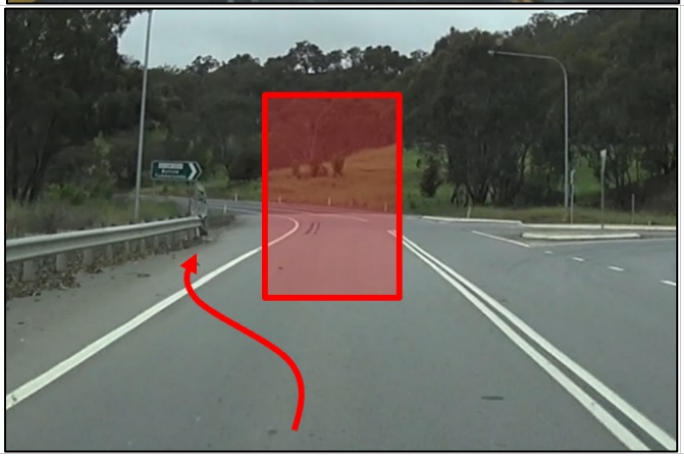
| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 4) Barrier Height<br>Extent of haulage route | There are existing barrier systems that appear to be installed at a low height.<br>There is a risk that an errant vehicle may not be contained by a low height barrier system resulting in vehicle roll-over. |  | Improbable | Serious | Medium |
| 5) Barrier Terminal<br>Extent of haulage route | There are barrier systems without terminals installed.<br>There are new barrier terminal installations that are not approved systems (Modified Eccentric Loader Terminal (MELT) and wooden posts).<br>There is a risk that an errant vehicle may impact an exposed barrier rail resulting in spearing incidents. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 6) Damaged Barrier<br>Extent of haulage route | There are existing barriers and terminals that have been impacted by vehicles.<br>There is a risk that a damaged barrier may not contain an errant vehicle resulting in injury to vehicle occupants. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 7) Vertical Crests<br>Extent of haulage route | There are locations of substandard vertical crests that restricts visibility to upcoming horizontal curves or intersections.<br>There is a risk that a motorist may not sight a horizontal curve or intersection past a crest resulting in run-off-road, rear-end, side-impact or head-on collisions. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 8) Overtaking<br>Extent of haulage route | There are locations where overtaking is permitted with limited sight distance to oncoming vehicles or the upcoming road alignment.<br>There is a risk that a motorists may attempt to overtake a slow vehicle with insufficient sight distance to oncoming vehicles resulting in head-on collisions. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 9) Overtaking Lane<br>Snowy Mountains Highway/ Yarrangobilly Caves Entry Road intersection | There is an existing overtaking lane southbound on Snowy Mountains Highway, 31 km south of Miles Franklin Drive. The overtaking lane begins at the same location as the intersection to the Yarrangobilly Caves Visitor Centre.<br>There is a risk that a motorist may enter the overtaking lane and decelerate to turn into the visitor centre and the same time a following vehicle may enter the overtaking lane and accelerate resulting in rear-end collisions. |  <br>  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 10) Sight to Link Road<br>Snowy Mountains Highway, approximately 1.5 km north of Link Road | There is a vertical crest southbound on Snowy Mountains Highway, on approach to Link Road.<br>There is a risk that a motorist may not sight a decelerating/turning vehicle into/out of Link Road resulting in rear end or side impact collisions. |  | Occasional | Serious | High |
| 11) Snowy Mountains Highway/Batlow Road intersection | There is no separation between an eastbound through vehicle on Snowy Mountains Highway and a right turning vehicle into Batlow Road.<br>There is a narrow shoulder and safety barrier adjacent to the travel lane.<br>There is a risk that a through motorist may not have sufficient time to sight and decelerate to avoid a collision with a queued/turning vehicle. |  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 12) Batlow Road/E Gilmore Road intersection | There is insufficient signage and linemarking to delineate the intersection of E Gilmore Road, which is on the back of a small radius curve on Batlow Road.<br>There is a risk that a motorist may not sight the curved through alignment and approach at a speed higher than required to negotiate the curve resulting in run-off-road incidents. |  | Improbable | Serious | Medium |
| 13) Pedestrian and Parking<br>Batlow Town Centre | There is pedestrian activity and parallel parking through the Batlow Town Centre.<br>On site it was observed motorists would park on either side of the road and cross the travel lanes to access shops.<br>There are long pedestrian crossing routes across the travel lanes.<br>There is a risk that a pedestrian may attempt to cross in front of or between vehicles resulting in pedestrian-vehicle collisions. |  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 14) Line Marking<br>Batlow Town Centre | There is insufficient delineation through the Batlow town centre including lane edge, parking, centreline and delineation for right of way through intersections, particularly where the through lane goes against conventional T-intersection arrangements.<br>There is a risk that a motorist may not appreciate lane discipline or intersection priority resulting in sideswipe or side-impact collisions. |  | Occasional | Minor | Medium |
| 15) Ponding Water<br>Batlow Road at bridge over Tumbarumba Creek, approximately 500m north of Bago Forest Road | There is water ponding on the bridge deck adjacent to the barrier.<br>There is a risk that a vehicle may aquaplane on ponding water resulting in run-off-road incidents or head-on collisions. |  | Occasional | Minor | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 16) Pedestrian and Parking<br>Tumbarumba Town Centre | There is pedestrian activity and 45-degree parking through the Tumbarumba Town Centre.<br>On site it was observed that parked vehicles were overhanging into the travel lane and pedestrians were walking along the travel lane with prams and trolleys from a designated crossing point to their parked vehicle.<br>There is a risk that a pedestrian or parked vehicle may be impacted by a through vehicle.<br>  <br>  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 17) Line Marking<br>Tumbarumba Town Centre | There is faded or missing delineation through the Tumbarumba Town Centre including lane edge, centreline and delineation for right of way through intersections, particularly where the through lane goes against conventional T-intersection arrangements.<br>There is a risk that a motorist may not appreciate lane discipline or intersection priority resulting in sideswipe or side-impact collisions. |  | Occasional | Minor | Medium |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 18) Bridge Protection<br>Approximately 20m east of the Batlow Road/Kent Street intersection | There is no barrier-terminal arrangement on approach to the bridge on Kent Street.<br>There is a risk that a vehicle may impact a blunt face of the bridge barrier or travel over the vertical drop into water resulting in injury to vehicle occupants. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 19) Vertical Crests<br>Gilbert Street | There are 2 vertical crests along Gilbert Street, at a location with an intersection and sign posted as a location of crossing pedestrians.<br>There is a risk that a vehicle travelling along Gilbert Street may have insufficient sight distance to queued or turning vehicles resulting in rear-end or side-impact collisions.<br>There is a risk that a vehicle travelling along Gilbert Street may have insufficient sight distance to pedestrians resulting in pedestrian-vehicle collisions.<br>  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 20) School Route William Street/Gilbert Street intersection | There is a school pedestrian route between the town centre and Tumbarumba High School, across Gilbert Street at the intersection of Gilbert Street and William Street.<br>The carriageway at this point requires a considerable crossing width.<br>There is a risk that a pedestrian may not have sufficient sight or time to find a suitable gap between approaching or turning vehicles and may attempt to cross in front of or between vehicles resulting in pedestrian-vehicle collisions. |  <br>  | Occasional | Serious | High |

| Item and location | Safety hazard finding | | Frequency | Severity | Level of risk |
|---|---|---|---|---|---|
| 21) Barrier Arrangement<br>William Street, approximately 50m east of Gilbert Road | There is a barrier installed on the back of a curve, with no terminals, as well as a utility pole within the deflection zone.<br>There is a risk that an errant vehicle may impact the barrier rail resulting in spearing incidents.<br>There is a risk that an errant vehicle may not be contained by the barrier and impact the utility pole. |  | Improbable | Serious | Medium |
| 22) Kerb Ramp<br>William Street/Fleet Street intersection | There is a pedestrian path and kerb ramp from the school on the eastern side of William Street with no connectivity to kerb ramps or paths to the west.<br>There is a risk that a pedestrian may cross at this location and continue along the travel lane resulting in pedestrian-vehicle collisions. |  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 23) Sharp Street (Cooma Town Centre) - Pedestrians | The strip shopping centre environment increases the likelihood of pedestrian jay-walking. A crash involving a pedestrian and fully-laden heavy vehicle has the potential to result in serious/fatal outcomes – even in a low speed environment.   | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 24) Sharp Street (Cooma Town Centre) – Cooma Creek Bridge | The Cooma Creek Bridge has non-standard features including:<br>a. The vertical face of the concrete barrier. This is a rigid, fixed object. Should an errant vehicle collide with this vertical edge, there would be rapid deceleration increasing the impact force on the occupants.<br>b. The concrete barrier tapers from kerb height (approx. 100mm) to approx. 500mm. Should a vehicle leaving Cooma mount the barrier on the bridge then travel along the concrete barrier system (one side of the vehicle on the barrier and the other on the road pavement), this could potentially lead to a roll-over crash.<br>c. The existing bridge containment appears to be a pedestrian parapet and would be unlikely to contain an errant heavy vehicle. A heavy vehicle that loses control at this site could drive through the containment system and fall into the creek below.  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 25) Snowy Mountains Highway/ Kosciuszko Road intersection | The Snowy Mountains Highway continues straight onto Kosciusko Road. To continue on the Snowy Mountains Highway, a vehicle needs to turn right using the channelised right-turn facility. This right turn has restricted sight lines due to the crest of the road. This restricted sight line increases the likelihood of heavy vehicles not seeing an oncoming vehicle and therefore the likelihood of cross-traffic type crashes. In addition, the channelised right-turn facility appears to have a short deceleration lane with inadequate space for additional storage. As heavy vehicles will be turning right here as part of the haul route, inadequate deceleration lanes and lack of storage could lead to rear-end type crashes.  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 26) Snowy Mountains Highway/ Tantangara Road intersection | At the Tantangara Road intersection, the sight lines are restricted due to the horizontal and vertical geometry along Snowy Mountains Highway. This may mean a heavy vehicle exiting the minor road may not be able to see a vehicle travelling on Snowy Mountains Highway and the vehicle would need to brake to let the heavy vehicle in or manoeuvre around the heavy vehicle. This could lead to a collision with the heavy vehicle or with oncoming traffic. Also, a heavy vehicle turning right into Tantangara Road would block the through-traffic lane. This increases the risk of a rear-end crash.  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 27) Link Road | There is an absence of linemarking on Link Road due to the reduced carriageway width. Linemarking plays a key role in delineating a road environment, particularly highlighting where the edge of the road ends and where opposing traffic lanes are separated. Lack of delineation increases the risk of run-off road crashes and head-on crashes.  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 28) General – steep drop offs | Along the haul route there are a several examples where steep drop-offs are unshielded. An errant vehicle travelling at these locations may leave the carriageway and descend down steep batters and potentially rolling-over or colliding with fixed hazards (trees).   | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 29) General – road geometry | Along the haul route, substandard horizontal and vertical geometry are present. While there are several examples of "Curve Warning" with advisory speed signs along the route, there is further improvement potential along the route where these warning signs could be implemented. The winding nature of this route means there is horizontal and vertical geometry that restricts sights lines. Warning signs inform drivers of the upcoming restricted sight line environment and enables them to adjust their driving to suit conditions. Without these signs, there is an increased potential for run-off road crashes to occur.   | Improbable | Serious | Medium |
| 30) General – road pavement | With the introduction of more heavy vehicles, the condition of the road pavement would be expected to deteriorate more rapidly. Roads in poor condition can lead to potholes, reduced grip and traction and an increased risk for vehicle loss of stability. The pavement condition impacts on the likelihood of a crash occurring. | Improbable | Serious | Medium |

| | | | | |
|---|---|---|---|---|
| 31) General – barrier systems | There are a variety of containment systems implemented along the haul route. It is unclear from the site inspection whether the containment systems are graded to be able contain heavy vehicle in the highspeed environment. If the containment system fails, an errant heavy vehicle could break through the barrier and be exposed to significant roadside hazards (large drop offs, bodies of water, fixed objects etc.).<br>  | Improbable | Serious | Medium |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| |  <br>  | | | |

| Item and location | Safety hazard finding | Frequency | Severity | Level of risk |
|---|---|---|---|---|
| 32) General – overtaking opportunities | There is an approximately 75km length along Snowy Mountains Highway where there are no dedicated overtaking lanes. This significant length increases the likelihood of vehicles overtaking by using the oncoming traffic lane. Overtaking in this manner increases the likelihood of head-on collisions. | Improbable | Serious | Medium |
| 33) General – wildlife | During the site inspection, high occurrences of dead wildlife were observed lying on the shoulders / adjacent the live carriageway. Colliding with animals in high-speed environments can lead to collisions with run-off road crash types typically occurring. If an animal is left on the live carriageway, heavy vehicles may run over the animal causing instability or choose to swerve to avoid the animal, potentially leading to head-on crashes. | Improbable | Serious | Medium |

*Source: AMWC RSA (2020), Snowy 2.0 Main Works Traffic and Transport Assessment*

#### 5.1.11 Impact on management and emergency management vehicle access

Access for management and emergency management activities would be unaffected as there are no plans to close any of the roads to management or emergency vehicles. During construction of the project, unhindered access will be available and maintained for management and emergency vehicles at all times. However, measures and strategies to maintain access at all times for management and emergency management activities may include consideration of the following and would be further developed as part of the CTMP:

- Provision of sufficient shoulder width or regular stopping bays to allow regular and emergency vehicles to pass or stop
- Staging of construction works to avoid the need for roads to be fully closed for any extended period of time
- Development of alternative access routes in consultation with NPWS and emergency services if any closures are required.

In addition, consultation with NPWS and emergency service providers would be required as part of the finalisation of the CTMP for the project. The CTMP would ensure that procedures are in place to maintain safe access for management vehicles through construction zones. Additionally, the CTMP would be prepared in close consultation with emergency services and FCNSW with a view to planning and executing the works to minimise any impact of the works on their ability to respond to an incident, when possible.

## 5.2 Cumulative construction impacts

Projects which have been considered for the cumulative construction assessment are these in close proximity to the project as well as these with construction vehicle routes that use the haulage routes proposed to be used by the project. As discussed in **Section 2.4.1**, construction of the project is anticipated to commence in early 2022 and take approximately 30 months to complete. As such, nearby projects which were considered for the cumulative construction assessment are:

- Snowy 2.0– commenced construction in 2019 and expected to take five to six years to complete
- Snowy 2.0 Segment Factory – expected to commence in 2022 and take five months to complete
- Bellettes Landfill Expansion – expected to commence construction in 2020 with ongoing works until 2032
- Snowy Mountains Highway upgrades – expected to complete by October 2020
- HumeLink – EIS to be exhibited in late 2021. As of October 2020, information was not publicly available and the project was not assessed.

#### 5.2.1 Snowy 2.0 and Snowy 2.0 Segment Factory

The construction schedule of Snowy 2.0 and Snowy 2.0 Segment Factory is expected to overlap with the construction schedule of the project. As discussed in the *Snowy 2.0 Main Works Traffic and Transport Assessment* (2019), construction of Snowy 2.0 commenced in 2019 and is expected to take approximately five to six years to complete. Construction of Snowy 2.0 Segment Factory is expected to commence in 2022 and take approximately five months to complete.

Roads which are common to these used by the project are Snowy Mountains Highway (north of Link Road and between Link Road and Cooma) and Link Road, west of Snowy Mountains Highway. Peak cumulative traffic generation of the Snowy 2.0 Main Works and Snowy 2.0 Segment Factory projects is expected to occur in 2022 and is shown in **Table 5-6**.

**Table 5-6: 2022 peak daily construction traffic generation of Snowy 2.0 Main Works and Snowy 2.0 Segment Factory**

| Road | Light vehicles (veh/day) | Heavy vehicles (veh/day) |
|---|---|---|
| Snowy Mountains Highway south of Link Road | 194 | 410 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | 24 | 64 |
| Snowy Mountains Highway east of Kosciuszko Road | 194 | 410 |
| Snowy Mountains Highway west of Vale Street | 194 | 410 |
| Link Road west of Snowy Mountains Highway | 150 | 402 |

Anticipated bidirectional traffic volumes and V/C ratios in 2022 with cumulative construction traffic during the winter period are shown in **Table 5-7**. As per the *Snowy 2.0 Main Works Traffic and Transport Assessment*, one-way peak hour project traffic volumes were assumed to be 10 per cent of the above daily traffic volumes and an annual (linear) 1% traffic growth rate has been applied to scale 2019 traffic volumes to 2022.

Cumulative construction traffic would generally result in a slight increase in V/C ratio on roads forming part of the proposed haulage route. However, the overall impact is minimal and roads would continue to operate with spare capacity during the winter period.

Table 5-7: 2022 winter peak weekday AM and PM peak hour bidirectional traffic volumes, capacity and V/C with cumulative construction traffic

| Road | Two-way capacity (PCU/hr) | Weekday AM peak hour | | | | Weekday PM peak hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C | Light vehicles (veh/hr) | Heavy vehicles (veh/hr) | Peak hourly volume (PCU/hr) | V/C |
| Snowy Mountains Highway south of Link Road | 2,600 | 209 | 70 | 377 | 0.15 | 276 | 45 | 384 | 0.15 |
| Snowy Mountains Highway north of Yarrangobilly Caves intersection | | 91 | 31 | 165 | 0.07 | 105 | 32 | 182 | 0.07 |
| Snowy Mountains Highway east of Kosciuszko Road | | 832 | 47 | 945 | 0.37 | 1035 | 48 | 1150 | 0.45 |
| Snowy Mountains Highway west of Vale Street | 1,800 | 781 | 74 | 959 | 0.54 | 972 | 81 | 1166 | 0.65 |
| Link Road west of Snowy Mountains Highway | 2,200 | 199 | 73 | 374 | 0.17 | 279 | 48 | 394 | 0.18 |
| Elliott Way north-west of Link Road | 1,600 | 182 | 39 | 276 | 0.18 | 219 | 43 | 322 | 0.21 |
| Lobs Hole Ravine Road north of Link Road | 1,600 | 64 | 12 | 93 | 0.06 | 68 | 16 | 106 | 0.07 |
| Batlow Road north of Tumbarumba | 2,600 | 73 | 31 | 147 | 0.06 | 92 | 34 | 174 | 0.07 |
| Tooma Road south of Tumbarumba | 2,600 | 128 | 24 | 186 | 0.08 | 137 | 26 | 199 | 0.08 |

Cumulative impacts to buses would be limited to a potential minor increase in travel time due to the addition of construction vehicles on the road network. However, due to the availability of spare capacity on the surrounding road network, this impact is expected to be minimal. No impacts are anticipated on the operation of bus stops.

As discussed in the *Snowy 2.0 Main Works Traffic and Transport Assessment*, impacts to pedestrians and cyclists are not expected as Lobs Hole Ravine Road and Lobs Hole are closed to the public. Although there is no alternative access proposed, these impacts are expected to be minimal as there are numerous walking and cycle tracks within the KNP that visitors to the region may continue to access.

No impacts to management and emergency vehicle access are expected as roads would remain open for these vehicles.

### 5.2.2 Bellettes Landfill Expansion

The Bellettes Landfill Expansion includes the expansion of an existing landfill facility at 10 Killarney Road Gilmore, which is located approximately 55 km north-west of the project area. The construction and operation of the Bellettes Landfill Expansion is expected to overlap with the construction schedule of the project. Construction is expected to commence in 2020 with ongoing operation and construction activities until 2032. Roads which are common to these used by the project include Snowy Mountains Highway, west of Killarney Road at Gilmore.

As discussed in the *Bellettes Landfill Expansion Environmental Impact Statement* (2019), construction equipment would be located on-site and only a small number of delivery and contractor vehicles would access the site during construction. During operation, an increase in one additional truck movement per hour is expected on the road network. As such, cumulative impacts on the surrounding road network are expected to be minimal during construction and operation of the Bellettes Landfill Expansion.

### 5.2.3 Snowy Mountains Highway upgrades

Transport for NSW is currently working with Snowy Hydro to deliver road upgrades in the Snowy Mountains area to improve road safety as part of Snowy 2.0. These upgrades include the addition of slow vehicle turn out lanes on the Snowy Mountains Highway and intersection upgrades between Cooma and the Snowy 2.0 site.

Slow vehicle turn-out lanes have been completed at the following locations on Snowy Mountains Highway:

- Connors Hill
- Delaneys Creek
- Eucumbene River
- National Park Boundary
- Sawyers Hill
- Wambrook Hill.

Intersection upgrades have been completed or are currently being undertaken at the following locations:

- Snowy Mountains Highway and Kosciuszko Road intersection – construction completed to widen shoulders and improve pavement
- Monaro Highway and Sales Yard Road intersection – construction of wider shoulders and Vehicle Activated Sign, which is expected to be complete by August 2020
- Snowy Mountains Highway and Tantangara Road intersection – construction of wider shoulders, improved alignment, dedicated right turn lane and Vehicle Activated Signage, which is expected to be complete by August 2020

- Snowy Mountains Highway and Link Road intersection – improved line marking and construction of Vehicle Activated signs, which is expected to be complete by August 2020
- Monaro Highway and Polo Flat road intersection – construction of new roundabout, which is expected to be complete by September 2020
- Snowy Mountains Highway and Russell Lot intersection – construction of wider shoulders, improved curves and additional left turning lane, which is expected to be complete by October 2020
- Snowy Mountains Highway and Marica Trail intersection – construction of wider shoulders and improved road pavement, which is expected to be complete by October 2020.

As these projects are expected to be completed by October 2020, the construction schedule of the Snowy Mountains Highway upgrades is not expected to overlap with the construction schedule of the project. However, road safety is expected to improve along Snowy Mountains Highway at the abovementioned intersections and sections of road.

## 5.3 Operational impacts

During operation, routine inspection and maintenance would occur periodically and would generally involve light vehicles and small to medium plant accessing the project area. On occasion some heavy vehicles may be required. Routine inspection and maintenance is expected to only comprise low numbers of light and heavy vehicle movements accessing the project area during inspection and maintenance periods (approximately 10 two-way movements per day).

TransGrid would also carry out routine vegetation maintenance along the transmission connection corridor as well as periodic maintenance of access tracks to transmission structures in consultation with NPWS in accordance with the Memorandum of Understanding between TransGrid and NPWS for the *Procedure for the Undertaking of Inspection, Maintenance and Emergency Works of TransGrid Network Assets and Associated Infrastructure*. It is expected that up to 10 light vehicles would access the project area during these works.

Due to the infrequent nature and low traffic volumes accessing the project during operation, impacts on the surrounding road network performance and road safety are assessed as minor. No impacts to road access are expected.

# 6. Environmental management measures

This section provides an overview of the measures to manage the potential traffic and transport impacts of construction and operation of the project.

There is likely to be minimal impact on the capacity and efficiency performance of the road network during construction works. However, an appropriate site-specific CTMP, would be prepared as part of the Construction Environmental Management Plan (CEMP) for the project to manage potential temporary impacts. The requirements of the CTMP are detailed within **Table 6-1**.

## 6.1 Management of construction and operational impacts

Recommended safeguards and mitigation measures to manage traffic and transport impacts of the project's construction and operation are summarised in **Table 6-1**.

Table 6-1: Summary of environmental management measures

| Ref | Impact | Mitigation measures |
|---|---|---|
| **Detail design and pre – Construction** | | |
| TT1 | Traffic, access and transport | A CTMP will be prepared and implemented as part of the CEMP. The CTMP will include:<br>▪ Confirmation of haulage routes<br>▪ Measures to maintain access to local roads, and maintain the capacity of existing roads where possible<br>▪ Site specific traffic control measures (including signage) to manage and regulate traffic movement<br>▪ Requirements and methods to consult and inform the local community of impacts on the local road network due to the development-related activities<br>▪ Consultation with TfNSW, and Snowy Valleys Council, NPWS, FCNSW and Snowy Hydro's contactors<br>▪ Consultation with the emergency services to ensure that procedures are in place to maintain safe, priority access for emergency vehicles and emergency management activities<br>▪ Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on Elliott Way<br>▪ A response plan for any construction related traffic incident<br>▪ Monitoring, review and amendment mechanisms<br>▪ Individual traffic management requirements at each phase of construction<br>▪ Measures to minimise the number of workers using private vehicles travelling to and from project area west<br>▪ Employment of standard traffic management measures to minimise short-term traffic impacts expected during construction<br>▪ Management of oversized vehicles<br>▪ Relevant traffic safety measures, including appropriate signage, driver conduct and safety protocols<br>▪ Identify requirements for, and placement of, traffic barriers.<br>The CTMP would also consider the following strategies to maintain access for regular and emergency management activities:<br>▪ Staging of construction works to avoid the need for roads to be fully closed for any extended period of time<br>▪ Development of alternative access routes in consultation with NPWS and emergency services if any closures are required<br>▪ Provision of sufficient shoulder width or regular stopping bays to allow regular and emergency vehicles to pass or stop |
| TT2 | Traffic control | If works will affect the free flow of traffic a Traffic Control Plan will be prepared, and a Road Occupancy Licence will be obtained from TfNSW where required. |

| Ref | Impact | Mitigation measures |
|---|---|---|
| **Construction** | | |
| TT3 | Impact to the local road network | Road maintenance will be managed through the following measures:<br>▪ A Road Dilapidation Report will be prepared and approved prior to and following construction of the project. Any impacts identified as caused by the project will be rectified as specified with any road maintenance agreements<br>▪ Routine defect identification and rectification of the access roads and tracks will be managed as part of the project maintenance procedure<br>▪ Access roads and tracks will be designed in accordance with the relevant vehicle loading requirements<br>▪ Access tracks within KNP will be maintained in accordance with the Memorandum of Understanding between TransGrid and NPWS for the *Procedure for the Undertaking of Inspection, Maintenance and Emergency Works of TransGrid Network Assets and Associated Infrastructure*. |
| TT4 | Access | Affected communities, visitors and emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by project activities. |

# 7. Conclusion

The project would involve the construction and operation of an overhead transmission connection and substation to connect the Snowy 2.0 to the National Electricity Market. This report addresses the SEARs and has been prepared to inform the EIS which will accompany the application for approval of the project. It provides an assessment of potential traffic and transport impacts of the project and identifies the required mitigation measures.

Based on the existing traffic volumes and forecast construction traffic volumes, the additional construction traffic movements are unlikely to cause any operational or efficiency issues to the existing road network within the project study area. Roads forming part of the proposed haulage route have ample spare capacity to accommodate additional traffic.

Minimal impact would be expected on the existing public transport network, active transport network and road safety during construction. No impacts to access for management and emergency management activities are expected and access will be maintained throughout construction. The road network impacts associated with OSOM vehicles would be minimal due to the low number of movements and the final haulage route would be determined and carried out by a suitable contractor.

The road safety audit identified that sections of the haulage route were of poor road condition including loose material, water ponding, vertical drops and unprotected non-frangible hazards in the clear zone of the carriageway and pavement damage including potholes, shoves, edge break and polishing. Road improvements should be considered at these locations to improve safety outcomes for construction vehicles and local traffic. Impacts of additional construction traffic would be managed by rectification per a Road Dilapidation Report as specified in existing road maintenance agreements.

Traffic and transport impacts of cumulative construction alongside Snowy 2.0 Main Works, Snowy 2.0 Segment Factory and the Bellettes Landfill Expansion are also expected to have a minimal impact on surrounding road network performance, public transport network, active transport network and road safety.

Traffic generation during operation is anticipated to be significantly less than traffic generation during construction and cumulative construction, with minimal impacts on the surrounding road network performance, public transport network, active transport network and road safety. No impacts to road access are expected.

Although the overall construction and operational impact of the project would be minimal, appropriate site-specific CTMPs, prepared as part of the CEMP for the project, would be required to address the impacts of construction on transport and traffic.

# 8. References

Department of Environment and Conservation NSW, 2006. *Plan of Management of Kosciuszko National Park, 2006 (as amended in 2010 and 2014)*.

EMM, 2018. *Snowy Hydro 2.0 Exploratory Work EIS – Traffic and Transport Impact Assessment*

NSW National Parks and Wildlife Service, 2019, https://www.nationalparks.nsw.gov.au/things-to-do/4wd-touring-routes/lobs-hole-ravine-4wd-trail.

NSW National Parks and Wildlife Service, 2019. https://www.nationalparks.nsw.gov.au/visit-a-park/parks/selwyn-area/local-alerts.

Roads and Maritime Services, 2013. *Traffic Modelling Guidelines, Version* 1.0, Feb 2013, page 156.

Roads and Maritime Services, 2018. *Traffic control at work sites, Technical Manual.* 27 July 2018.

ParkTransit, 2019. *Traffic Impact Assessment Report for Bellettes Waste Depot*

SCT Consulting, 2018. *Snowy 2.0 Exploratory Works Traffic and Transport Assessment*

SCT Consulting, 2019. *Snowy 2.0 Main Works Traffic and Transport Assessment*

SCT Consulting, 2019. *Proposed Segment Factory Traffic and Transport Assessment*

# Appendix A. Road safety audit

# Snowy 2.0 Transmission Connection Project

## Road Safety Audit

Existing Stage

3rd November 2020

JN21021_Report01 Rev02 - Jacobs Snowy

On Behalf of

## Jacobs Group (Australia) Pty Ltd

1503C/41-45 Belmore Street
Ryde, NSW, 2112

0405 345 124
admin@amwc-rsa.com
www.amwc-rsa.com
ABN 13 619 698 985

# NSW RSA Register Details

| | |
|---|---|
| **Final Signoff Date** | 03/11/2020 |
| **Title of Audit** | Snowy 2.0 Transmission Connection Project |
| **Location of Audit** | Snowy Mountains |
| **Project Description** *(max 300 char)* | The aim of this project is to construct approximately 10km of transmission line to support the Snowy 2.0 pumped hydro scheme (Snowy 2.0) |
| **Purpose of Audit** *(max 300 char)* | The aim of this Road Safety Audit (RSA) is to assess the existing conditions in the context of increasing heavy vehicle movements along proposed haulage routes |
| **State of Audit** | NSW |
| **Stage of Audit** | Existing Stage |
| **Client Company** | Jacobs Group (Australia) Pty Ltd |
| **Client Contact** | Tina Donovan |
| **Client Phone** | 02 4979 2640 |
| **Client Email** | tina-maria.donovan@jacobs.com |
| **Audit Team Lead** | Aaron Walton |
| **Audit Team Member** | Tracey Norberg |

# Table of Contents

# 1 Project Description

The project would involve the construction and operation of an overhead transmission connection and substation to connect the proposed Snowy 2.0 pumped hydro and generation project (Snowy 2.0) to the National Electricity Market. The construction of transmission infrastructure would require the use of heavy vehicles (including OSOM vehicles) as part of the delivery of plant materials and equipment to the works locations. This would see an increase of heavy vehicles and construction traffic on the road network. TransGrid have identified key haulage routes to enable construction.

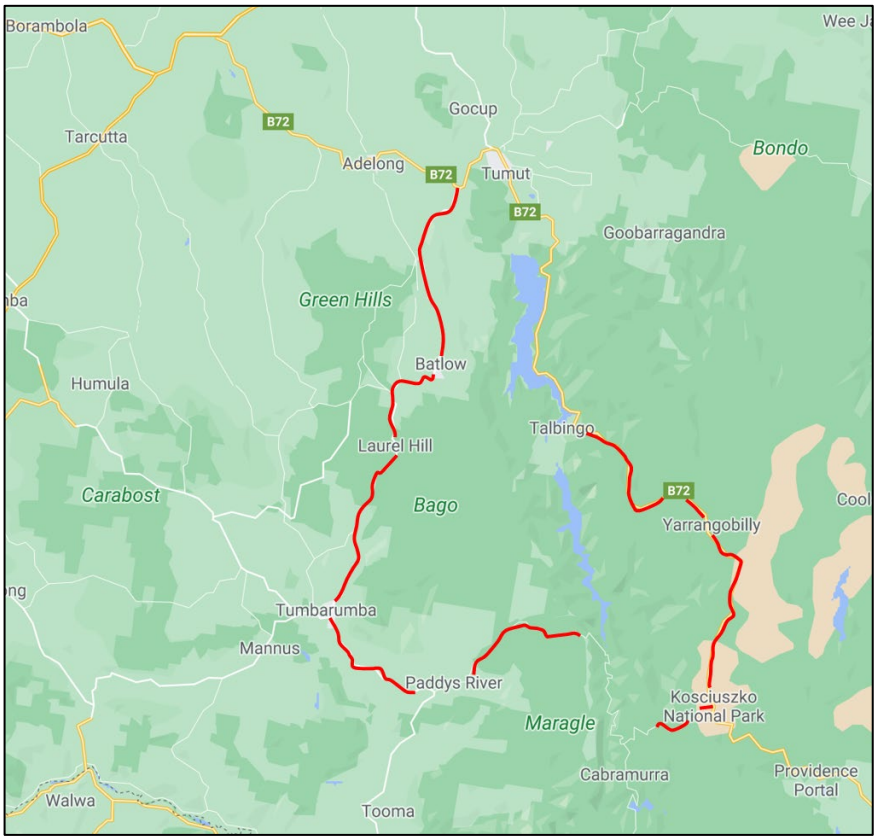
The aim of this Road Safety Audit (RSA) is to assess the existing conditions in the context of increasing heavy vehicle movements along proposed haulage routes.

# 2 Study Area

The study area assessed under the scope of works included:

- a proposed Western route along Batlow Road from the intersection of Snowy Mountains Highway (Audit Chainage 'Western 0 km') to Tumbarumba through Batlow, along Tooma Road from Tumbarumba to the intersection of Elliott Way, and along Elliott way to the Kosciuszko National Park gates (Audit Chainage 'Western 100 km').
- a proposed Eastern route along Snowy Mountains Highway (Audit Chainage 'Eastern 0 km') from the intersection of Miles Franklin Drive to the intersection Link Road, and along Link Road to the existing Snowy 2.0 site gates (Audit Chainage 'Eastern 60 km').

The general audit study area is shown below in red.




*Source – Google Maps*

# 3 Auditable Data

The following data was referenced during the audit:

> IA199900_GIS_LCVIA_F007_r1v1_Location_LR.pdf – Figure 2-1 project location (received – 16/08/2020)

> Snowy Mountains Highway Haul Route – Road Safety Audit (Issue 2, Dated 10/09/2019)

# 4 Audit Stage

An Existing Stage Audit was carried out on the 8th and 9th of October 2020 during a site visit of the existing conditions during day and night conditions. At the time of the site visit the traffic was light and the weather was overcast with intermittent showers.

The audit was generally undertaken in accordance with 'TfNSW Guidelines for Road Safety Audit Practices (2011)' and 'Austroads: Guide to Road Safety Part 6 and Part 6a (2019)'.

# 5 Audit Team

The audit team and client details are shown below.

**Table 5-1 Audit Team & Client Details**

| Role | Name | |
|---|---|---|
| **Client (Sponsor)** | Jacobs Group (Australia) Pty Ltd | |
| **Client Contact** | Tina Donovan | Senior Environmental Scientist |
| **Client Email** | tina-maria.donovan@jacobs.com | |
| **Lead Auditor** | Aaron Walton | RSA-02-0501 - Level 3 Auditor |
| **Lead Auditor Email** | admin@amwc-rsa.com | |
| **Team member** | Tracey Norberg | RSA-02-0964 - Level 2 Auditor |

# 6 Audit Program

The audit program details are shown below.

**Table 6-1 Audit Program**

| Activity | Date | Attendees |
|---|---|---|
| **Opening Meeting** | 16/09/2020 | Aaron Walton, Tina Donovan |
| **Site Inspection** | 08-09/10/2020 | Aaron Walton, Tracey Norberg |
| **Draft Report** | 23/10/2020 | RSA Report (DRAFT for responses) |
| **Completion Meeting** | 29/10/2020 | Aaron Walton, Tina Donovan |
| **Final Report** | 03/11/2020 | RSA Report (Final for issue) |

# 7 Exclusions

At the time of the audit the following exclusions were presented to the audit team.

- The portion of Snowy Mountains Highway from the intersection of Hume Highway to the intersection of Miles Franklin Drive was excluded from the scope of the audit as this is an approved b-double route.
- The portion of Elliott Way from the National Park gates to the site of works, Link Road from the existing construction access (approx. 7km from the west of the intersection of Snowy Mountains Highway), and Goats Ridge Rd between Link Road and Elliott Road were excluded from the scope of the audit as these roads were currently closed due to bushfire and flood damage.
- A previous Road Safety Audit was undertaken by Safe System Solutions on the proposed haulage route for the transportation of precast segments, covering the vehicular ingress/egress at Polo Flat Road into the precast segment factory and ending at the Link Road intersection with Lobs Hole Ravine Road at the perimeter of the Snowy 2.0 Main works construction site within Kosciuszko National Park, as well as Tatangara Road which intersects the Snowy Mountains Highway. This route has not been reassessed as part of this audit.

# 8 Audit Risk Assessment Technique

For each of the safety issues identified, the level of risk with each has been determined. The tables below are extracted from Austroads: Guide to Road Safety Part 6 and Part 6a (2019) and have been used in the assessment of risk for this audit.

**Table 8-1 Incident Frequency**

| Frequency | Description |
|---|---|
| **Frequent** | Once or more per week |
| **Probable** | Once or more per year |
| **Occasional** | Once every five or ten years |
| **Improbable** | Less often than once every ten years |

**Table 8-2 Incident Severity**

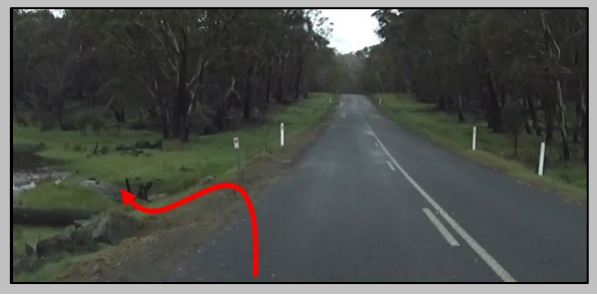
| Severity | Description | Examples |
|---|---|---|
| **Catastrophic** | Likely multiple deaths | > High-speed, multi-vehicle crash on freeway.<br>> Car runs into crowded bus stop.<br>> Bus and petrol tanker collide.<br>> Collapse of bridge or tunnel. |
| **Serious** | Likely death or serious injury | > High or medium-speed vehicle/vehicle collision.<br>> High or medium-speed collision with a fixed roadside object.<br>> Pedestrian or cyclist struck by a car. |
| **Minor** | Likely minor injury | > Some low-speed vehicle collisions.<br>> Cyclist falls from bicycle at low speed.<br>> Left-turn rear-end crash in a slip lane. |
| **Limited** | Likely trivial injury or property damage only | > Some low-speed vehicle collisions.<br>> Pedestrian walks into object (no head injury).<br>> Car reverses into post. |

**Table 8-3 Resulting Level of Risk Matrix**

| | Frequent | Probable | Occasional | Improbable |
|---|---|---|---|---|
| **Catastrophic** | Intolerable | Intolerable | Intolerable | High |
| **Serious** | Intolerable | Intolerable | High | Medium |
| **Minor** | Intolerable | High | Medium | Low |
| **Limited** | High | Medium | Low | Low |

# 9 Audit Findings

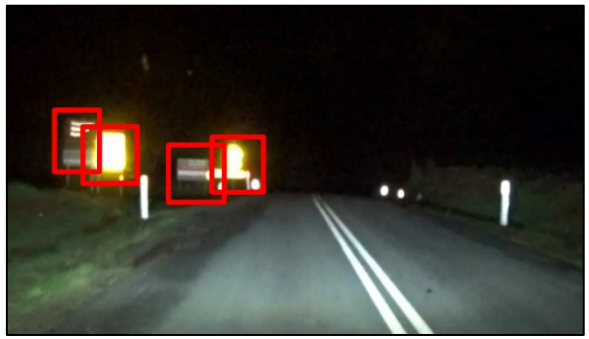
**Table 9-1 Audit Findings**

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **1.**<br>Vertical Drop<br>Extent of Works | There are unprotected vertical drops located in the clearzone of the carriageway.<br>There is a risk that an errant vehicle may travel over a vertical drop resulting in vehicle roll-over.<br>This risk is increased where vertical drops are located above water bodies or on the back of curves.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to provide temporary guideposts and line marking at locations with unprotected vertical drops<br>• Highlight locations with unprotected vertical drops as part of the CTMP and Driver Induction process |
| **2.**<br>Hazard in Clearzone<br>Extent of Works | There are unprotected non-frangible hazards located in the clearzone of the carriageway, including large trees, fallen trees and large rocks.<br>There is a risk that an errant vehicle may impact a non-frangible hazard resulting in injury to vehicle occupants.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to remove unprotected non-frangible hazards in clearzone<br>• Highlight locations with unprotected non-frangible hazards in the clearzone as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **3.**<br>Barrier Point of Need<br>Extent of Works | There are instances of barrier installed to protect hazards in the clearzone that have not sufficiently protected the hazard.<br>There is a risk that an errant vehicle may not be contained by a barrier system before reaching a hazard or may travel behind the barrier system and impact a hazard resulting in injury to vehicle occupants or vehicle roll-over.<br>  | Improbable | Serious | Medium | • Highlight locations of hazards in the clearzone as part of the CTMP and Driver Induction process |
| **4.**<br>Barrier Height<br>Extent of Works | There are existing barrier systems that appear to be installed at a low height.<br>There is a risk that an errant vehicle may not be contained by a low height barrier system resulting in vehicle roll-over.<br>  | Improbable | Serious | Medium | • Highlight locations of substandard barrier systems as part of the CTMP and Driver Induction process |

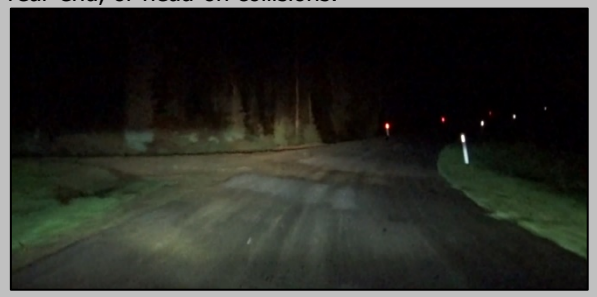
| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **5.**<br>Barrier Terminal<br>Extent of Works | There are barrier systems without terminals installed.<br>There are new barrier terminal installations that are not approved systems (MELT and wooden posts).<br>There is a risk that an errant vehicle may impact an exposed barrier rail resulting in spearing incidents.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to install terminals at barrier systems<br>• Highlight locations of substandard barrier systems as part of the CTMP and Driver Induction process |
| **6.**<br>Damaged Barrier<br>Extent of Works | There are existing barriers and terminals that have been impacted by vehicles.<br>There is a risk that a damaged barrier may not contain an errant vehicle resulting in injury to vehicle occupants.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to repair damaged barriers<br>• Highlight locations of damaged barrier systems as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **7.**<br>Delineation<br>Extent of Works | There is insufficient delineation provided for centreline marking, edge line marking, and on the back of curves.<br>There is a risk that a motorist may not sight the approaching road alignment resulting in run-off-road incidents.<br>There is a risk that motorists from opposing travel directions may not appreciate the centreline of the carriageway resulting in head on collisions, or the edge of the sealed pavement resulting in run-off-road incidents.<br>These risks are increased during adverse weather conditions such as rain/fog/snow or at night-time.<br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide sufficient delineation<br>• Highlight locations of insufficient delineation as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **8.**<br>Sign Visibility<br>Extent of Works | There are signs hidden by vegetation, or signs that are damaged (by vehicle impact, reduced reflectivity, bushfire damage).<br>There is a risk that a damaged or hidden sign may reduce driver awareness to upcoming hazards resulting in injury to vehicle occupants.<br>  <br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to improve visibility of signage |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **9.**<br>Pavement Damage<br>Extent of Works | There is damage to the pavement within travel lanes including potholes, shoves, edge break and polishing.<br>There is a risk that a motorist may attempt to avoid areas of pavement damage and encroach oncoming travel lanes resulting in head-on collisions.<br>There is a risk that a motorist may have reduced traction or vehicle instability on damaged or polished pavement resulting in run-off-road incidents.<br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to repair damage to roads<br>• Highlight locations of poor road condition as part of the CTMP and Driver Induction process |
| **10.**<br>Shoulder-Verge<br>Extent of Works | There are locations of narrow shoulders/verges, and unsealed shoulders.<br>There is a risk that an errant vehicle may not have sufficient recovery width resulting in run-off-road incidents. | Improbable | Minor | Low | • Highlight locations of narrow shoulders/verges and unsealed shoulders as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| | There is a risk that a broken-down vehicle may restrict the through lane resulting in sideswipe or rear-end collisions from following vehicles.<br>  <br>  <br>  | | | | |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **11.**<br>Loose Material<br>Extent of Works | There is loose material in the travel lane.<br>There are intersections/accesses that are unsealed up to the carriageway of the through road that contributes to material being transferred onto the carriageway.<br>There are rock cuttings comprised of unstable material that falls into the travel lane.<br>There is a risk that a motorist may have reduced traction on loose material resulting in run-off-road, rear-end, or head-on collisions.<br>  <br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to improve existing road condition<br>• Highlight locations of poor road condition as part of the CTMP and Driver Induction process |

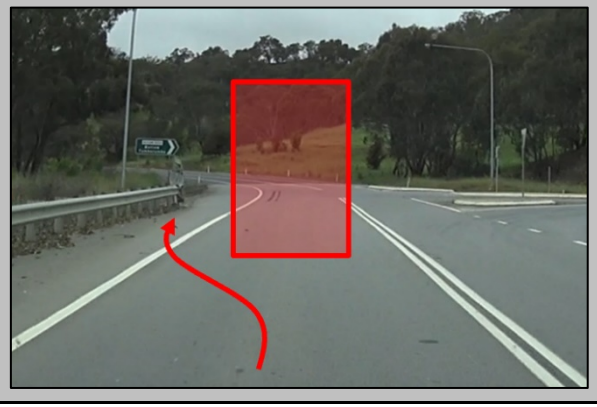
| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **12.**<br>Vertical Crests<br>Extent of Works | There are locations of substandard vertical crests that restricts visibility to upcoming horizontal curves or intersections.<br>There is a risk that a motorist may not sight a horizontal curve or intersection past a crest resulting in run-off-road, rear-end, side-impact or head-on collisions.<br>  <br>  <br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to provide temporary signage (to be outlined in the CTMP)<br>• Highlight locations of restricted visibility at vertical crests as part of the Driver Induction process |

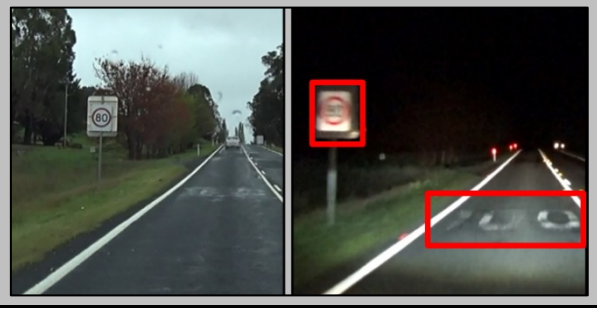
| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **13.**<br>Signage Continuity<br>Extent of Works | There is an inconsistency and discontinuity to warning/advisory signs including curve type, slippery when wet, and particularly for areas of high animal activity warning between northbound and southbound direction of travel.<br>There is a risk that a motorist may not sight the approaching road alignment resulting in run-off-road incidents.<br>There is a risk that motorists may not be aware of areas of high animal activity resulting in collisions with animals.<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to address inconsistency of warning/advisory signage<br>• Highlight locations with insufficient signage to notify curve type, slippery when wet and high animal activity as part of the CTMP and Driver Induction process |
| **14.**<br>Overtaking<br>Extent of Works | There are locations where overtaking is permitted with limited sight distance to oncoming vehicles or the upcoming road alignment.<br>There is a risk that a motorists may attempt to overtake a slow vehicle with insufficient sight distance to oncoming vehicles resulting in head-on collisions.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to notify locations where overtaking may occur with limited sight distance<br>• Highlight locations where overtaking is permitted with limited sight distance as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **15.**<br>Overhead Utilities<br>Extent of Works | There are locations where there are utilities overhead across the carriageway.<br>There is a risk that an oversized vehicle/load may impact overhead utilities resulting in injury to vehicle occupants.<br>  | Improbable | Minor | Low | • Highlight locations of overhead utilities as part of the CTMP |
| **16.**<br>Overhanging Branches<br>Extent of Works | There are locations where there are branches overhanging the carriageway.<br>There is a risk that a branch may fall on a vehicle or fall into the travel lane and be impacted by a vehicle resulting in injury to vehicle occupants.<br>There is a risk that an oversized vehicle/load may impact branches that fall onto the vehicle or into the travel lane and be impacted by a vehicle resulting in injury to vehicle occupants.<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to manage overhanging vegetation over roads<br>• Highlight locations with overhanging vegetation over roads as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **17.**<br>Barrier Posts<br>Eastern 1.0 km | There are star pickets used as barrier posts.<br>There is a risk that an errant vehicle may not be contained by substandard barrier installations resulting in injury to vehicle occupants.<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to replace star pickets with barrier posts<br>• Highlight locations of substandard barrier systems as part of the CTMP and Driver Induction process |
| **18.**<br>Stockpile<br>Eastern 7.0 km | There is an existing stockpile site on SMH, 7.0km south of Miles Franklin Drive. The stockpile site is a wide, flat area of unsealed pavement located between 2 small radii horizontal curves on a steep vertical grade.<br>There is a risk that a vehicle (public or construction) entering/exiting this location may have insufficient sight to oncoming vehicles resulting in side impact or rear end collisions.<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide adequate warning signage and/or reduce speed limits<br>• Highlight the stockpile site location and insufficient sight distance as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **19.**<br>Overtaking Lane<br>Eastern 31 km | There is an existing overtaking lane southbound on SMH, 31 km south of Miles Franklin Drive. The overtaking lane begins at the same location as the intersection to the Yarrangobilly Caves Visitor Centre.<br>There is a risk that a motorist may enter the overtaking lane and decelerate to turn into the visitor centre and the same time a following vehicle may enter the overtaking lane and accelerate resulting in rear-end collisions.<br>  <br>  | Occasional | Serious | High | • Notify Council/TfNSW of increased risk of rear-end collisions at this location<br>• Highlight this location with increased risk of rear-end collisions as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **20.**<br>Sight to Link Road<br>Eastern 50 km | There is a vertical crest southbound on SMH, on approach to Link Road.<br>There is a risk that a motorist may not sight a decelerating/turning vehicle into/out of Link Road resulting in rear end or side impact collisions.<br>  | Occasional | Serious | High | • Notify Council/TfNSW of increased risk of rear-end/side impact collisions at this location<br>• Highlight this location with increased risk of rear-end/ side impact collisions as part of the CTMP and Driver Induction process |
| **21.**<br>Intersection of SMH and Batlow Road<br>Western 0 km | There is no separation between an eastbound through vehicle on SMH and a right turning vehicle into Batlow Road.<br>There is a narrow shoulder and safety barrier adjacent to the travel lane.<br>There is a risk that a through motorist may not have sufficient time to sight and decelerate to avoid a collision with a queued/turning vehicle.<br>  | Occasional | Serious | High | • Notify Council/TfNSW of increased risk of collisions at this location<br>• Highlight this location with increased risk of collisions as part of the CTMP and Driver Induction process |

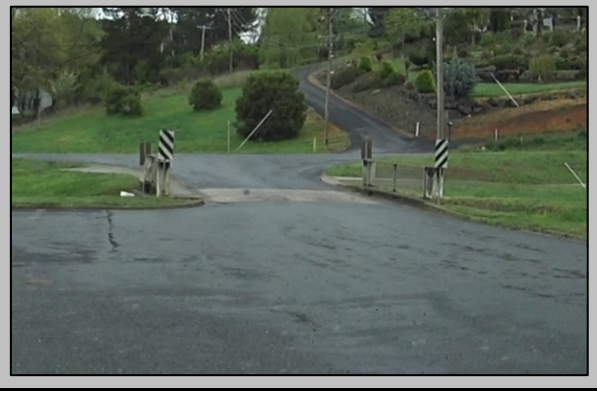
| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **22.**<br>Intersection of Batlow Road and E Gilmore Road<br>Western 3 km | There is insufficient signage and linemarking to delineate the intersection of E Gilmore Road, which is on the back of a small radius curve on Batlow Road.<br>There is a risk that a motorist may not sight the curved through alignment and approach at a speed higher than required to negotiate the curve resulting in run-off-road incidents.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to provide temporary signage and linemarking (to be outlined in the CTMP)<br>• Highlight this location with insufficient signage and linemarking as part of the CTMP and Driver Induction process |
| **23.**<br>Speed Limit<br>Western 20 km | There is a discrepancy between the speed limit signposting (80) and the pavement marking (100).<br>There is a risk that a motorist may drive at a speed higher than the road is designed or anticipated by other motorists resulting in a higher increase of frequency and severity of crash types.<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide consistency with speed limit signposting and pavement marking |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **24.**<br>Pedestrian and Parking<br>Batlow Town Centre<br>Western 24 km | There is pedestrian activity and parallel parking through the Batlow Town Centre.<br>On site it was observed motorists would park on either side of the road and cross the travel lanes to access shops.<br>There are long pedestrian crossing routes across the travel lanes.<br>There is a risk that a pedestrian may attempt to cross in front of or between vehicles resulting in pedestrian-vehicle collisions.<br>  | Occasional | Serious | High | • Highlight locations of increased pedestrian activity as part of the CTMP and Driver Induction process |
| **25.**<br>Line Marking<br>Batlow Town Centre<br>Western 24 km | There is insufficient delineation through the Batlow town centre including lane edge, parking, centreline and delineation for right of way through intersections, particularly where the through lane goes against conventional T-intersection arrangements.<br>There is a risk that a motorist may not appreciate lane discipline or intersection priority resulting in sideswipe or side-impact collisions.<br>  | Occasional | Minor | Medium | • Liaise with Council/TfNSW to provide temporary signage and delineation (to be outlined in the CTMP)<br>• Highlight locations with insufficient signage and delineation as part of the CTMP and Driver Induction process |

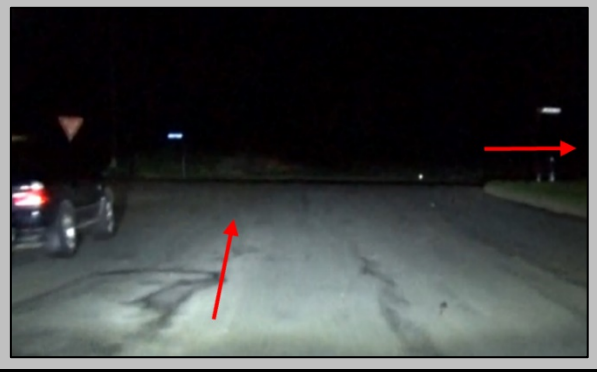
| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **26.**<br>Ponding Water<br>Western 52 km | There is water ponding on the bridge deck adjacent to the barrier.<br>There is a risk that a vehicle may aquaplane on ponding water resulting in run-off-road incidents or head-on collisions.<br>  | Occasional | Minor | Medium | • Liaise with Council/TfNSW to maintain road condition and bridge drainage<br>• Highlight this location with water ponding part of the CTMP and Driver Induction process |
| **27.**<br>Pedestrian and Parking<br>Tumbarumba Town Centre<br>Western 59 km | There is pedestrian activity and 45-degree parking through the Tumbarumba Town Centre.<br>On site it was observed that parked vehicles were overhanging into the travel lane and pedestrians were walking along the travel lane with prams and trolleys from a designated crossing point to their parked vehicle.<br>There is a risk that a pedestrian or parked vehicle may be impacted by a through vehicle.<br>  <br>  | Occasional | Serious | High | • Highlight locations of increased pedestrian activity as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **28.**<br>Line Marking<br>Tumbarumba Town Centre<br>Western 59 km | There is faded or missing delineation through the Tumbarumba Town Centre including lane edge, centreline and delineation for right of way through intersections, particularly where the through lane goes against conventional T-intersection arrangements.<br>There is a risk that a motorist may not appreciate lane discipline or intersection priority resulting in sideswipe or side-impact collisions.<br>  <br>  <br>  | Occasional | Minor | Medium | • Liaise with Council/TfNSW to provide temporary signage and delineation (to be outlined in the CTMP)<br>• Highlight this location with insufficient signage and delineation as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **29.**<br>Lighting<br>Tumbarumba Town Centre<br>Western 59 km | There are locations on approach and departure from the main town centre that has insufficient lighting, particularly at intersections.<br>There is a risk at night that a motorist may not sight roadside infrastructure or another vehicle, pedestrian, cyclist resulting in collisions.<br>  <br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide lighting at intersections near the main town centre<br>• Highlight this location with insufficient lighting as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **30.**<br>Bridge Delineation<br>Kent St - Gilbert St | There is faded or missing delineation at the bridge on Kent Street.<br>There is a risk at night that a vehicle may impact the bridge or travel over the vertical drop into water resulting in injury to vehicle occupants<br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide temporary signage and delineation (to be outlined in the CTMP)<br>• Highlight this location with insufficient signage and delineation as part of the CTMP and Driver Induction process |
| **31.**<br>Bridge Protection<br>Kent St - Gilbert St | There is no barrier-terminal arrangement on approach to the bridge on Kent Street.<br>There is a risk that a vehicle may impact a blunt face of the bridge barrier or travel over the vertical drop into water resulting in injury to vehicle occupants.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to provide a barrier-terminal arrangement at bridge<br>• Highlight this location without a barrier-terminal arrangement as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **32.**<br>Vertical Crests<br>Kent St - Gilbert St | There are 2 vertical crests along Gilbert Street, at a location with an intersection and sign posted as a location of crossing pedestrians.<br>There is a risk that a vehicle travelling along Gilbert Street may have insufficient sight distance to queued or turning vehicles resulting in rear-end or side-impact collisions.<br>There is a risk that a vehicle travelling along Gilbert Street may have insufficient sight distance to pedestrians resulting in pedestrian-vehicle collisions.<br>  <br>  <br>  | Occasional | Serious | High | • Liaise with Council/TfNSW to provide temporary signage to notify road users of intersections and access points (to be outlined in the CTMP)<br>• Highlight this location with insufficient signage as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **33.**<br>Delineation<br>Kent St - Gilbert St | There is insufficient delineation at the intersection of Kent Street and Gilbert Street, and along Gilbert Street.<br>There is a risk that a motorist may not appreciate lane discipline or intersection priority resulting in sideswipe or side-impact collisions.<br>  <br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to provide temporary signage and delineation (to be outlined in the CTMP)<br>• Highlight this location with insufficient signage and delineation as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **34.**<br>School Route<br>Kent St - Gilbert St | There is a school pedestrian route between the town centre and Tumbarumba High School, across Gilbert Street at the intersection of Gilbert Street and William Street.<br>The carriageway at this point requires a considerable crossing width.<br>There is a risk that a pedestrian may not have sufficient sight or time to find a suitable gap between approaching or turning vehicles and may attempt to cross in front of or between vehicles resulting in pedestrian-vehicle collisions.<br>  <br>  | Occasional | Serious | High | • Highlight this location with increased pedestrian activity as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **35.**<br>Barrier Arrangement<br>Western 60 km | There is a barrier installed on the back of a curve, with no terminals, as well as a utility pole within the deflection zone.<br>There is a risk that an errant vehicle may impact the barrier rail resulting in spearing incidents.<br>There is a risk that an errant vehicle may not be contained by the barrier and impact the utility pole.<br>  | Improbable | Serious | Medium | • Liaise with Council/TfNSW to provide a barrier-terminal arrangement at this location<br>• Highlight this location without a barrier-terminal arrangement as part of the CTMP and Driver Induction process |
| **36.**<br>Kerb Ramp<br>Western 61 km | There is a pedestrian path and kerb ramp from the school on the eastern side of William Street with no connectivity to kerb ramps or paths to the west.<br>There is a risk that a pedestrian may cross at this location and continue along the travel lane resulting in pedestrian-vehicle collisions.<br>  | Improbable | Serious | Medium | • Highlight this location with increased pedestrian activity as part of the CTMP and Driver Induction process |

| Item<br>Location | Safety Hazard Finding | Frequency | Severity | Level Of Risk | Project Manager Response |
|---|---|---|---|---|---|
| **37.**<br>Ponding Water<br>Western 76 km | There is water ponding in the travel lane.<br>There is a risk that a vehicle may aquaplane on ponding water resulting in run-off-road incidents or head-on collisions.<br>  <br>  <br>  | Improbable | Minor | Low | • Liaise with Council/TfNSW to maintain road condition and drainage<br>• Highlight this location with water ponding part of the CTMP and Driver Induction process |

# 10 Formal Statement

We, the undersigned, declare that we have reviewed the site and data listed in this report and identified the safety and operational deficiencies above.

It should be noted that while every effort has been made to identify potential safety hazards, no guarantee could be made that every deficiency has been identified.

A project sponsor is under no obligation to accept the findings outlined in this audit report. This report simply provides the opportunity to review potential safety issues highlighted by the auditors.

This audit will be recorded on the NSW Register of Road Safety Auditors and the project sponsor should expect email notification from the register to confirm the audit has been carried out.

We recommend that points of concern be investigated, and necessary corrective actions undertaken.

**Aaron Walton**
*Level 3 Road Safety Auditor*
*Team Leader*

**Tracey Norberg**
*Level 2 Road Safety Auditor*
*Team Member*


TransGrid