Appendix D

TRAFFIC AND TRANSPORT ASSESSMENT

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TransGrid

Potts Hill to Alexandria transmission cable project

Traffic and Transport Assessment

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Traffic and Transport Assessment

Client: TransGrid

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Table of contents

List of figures

List of tables

Glossary, acronyms and abbreviations

Glossary

Term	Definition
Amenity	The quality of a place, its appearance, feel and sound, and the way its community experiences the place. Amenity contributes to a community's identity and its sense of place.
Busbar	A series of elevated metallic bars within an electrical substation which comprises a system of electrical conductors on which power is concentrated for high capacity distribution.
Cable bridges	A purpose built bridge made typically of reinforced concrete structures, through which the transmission cables are integrated for support and protection.
Cable circuit	A series of three phase alternating current transmission cables which make up an electrical circuit to carry an electrical current. A single circuit transmission cable typically comprises a minimum of three cables per circuit.
Capacity (of a road)	The nominal maximum number of vehicles which has a reasonable expectation of passing over a given section of lane or roadway in one direction, during a given time period under prevailing roadway conditions.
Conduit	A protective tube or pipe system for individual electric cables. Sometimes referred to as a 'duct'.
Construction	Includes all physical work required to construct the project and also includes construction planning such as the development of construction management plans.
Construction laydown areas	Areas required for temporarily storing materials, plant and equipment and providing space for other ancillary facilities, such as project offices, during construction. Construction laydown areas would also be used for stockpiling.
Community	A group of people living in a specific geographical area or with mutual interests that could be affected by the project.
Construction Traffic Management Plan (CTMP)	A document prepared prior to the commencement of construction activities. Generally includes details regarding construction works, additional traffic assessment, potential impacts due to construction works, mitigation and management measures, and includes traffic control plans (TCPs).
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own.
Detailed design	The phase of the project following concept design where the design is refined, and plans, specifications and estimates are produced, suitable for construction.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Easement	A 'right of way' around infrastructure that allows access to authorised personnel for inspections, repairs and maintenance. The establishment of an easement also restricts certain activities on the land that could endanger members of the public or impact on the safe operation of the infrastructure.
Egress	Exit.
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle.
Fill	The material placed in an embankment.
Heavy vehicle	A vehicle what has a gross vehicle mass (GVM) or aggregate trailer mass (ATM) of more than 4.5 tonnes.

Term	Definition
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
inner Sydney	Includes the Sydney Central Business District (CBD) and the eastern suburbs.
Joint bay	An enlarged section of excavated trench in which cables are joined together.
Key stakeholders	Government departments/agencies, local councils, utility and service providers.
Light vehicle	A vehicle up to a B99 in size. A B99 vehicle is the 99th percentile vehicle size.
Mid-block capacity	Refers to traffic volumes on sections of road between intersections.
Minor road	A road that is typically defined as a road of less importance at an intersection.
Pre-construction	All work prior to, and in respect of the state significant infrastructure, that is excluded from the definition of construction.
Project area	The project area comprises the overall potential area of direct disturbance by the project, which may be temporary (for construction) or permanent (for operational infrastructure) and extend below the ground surface. The project area includes the location of operational infrastructure and construction work sites for: • the transmission cable route (including the entire road reserve of roads traversed); • special crossings of infrastructure or watercourses; • substation sites requiring upgrades (noting that all works would be contained within the existing site boundaries); and • construction laydown areas.
Road closure	A traffic scenario whereby the roadway is closed to traffic in both directions.
Roadway	Any one part of the width of a road devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes.
Road reserve	The area comprising roads, footpaths, nature strips and public transport infrastructure (including indented bus bays, bus shelters and signage).
Secretary's Environmental Assessment Requirements (SEARs)	Requirements and specifications for an environmental assessment prepared by the Secretary of the NSW Department of the Planning and Environment under section 5.16 of the NSW *Environmental Planning and Assessment Act 1979*.
Shuttle working conditions	A traffic scenario whereby part of the roadway is closed and a single lane is used alternatively by traffic in each direction.
Signalised intersection	An intersection regulated by traffic lights, often installed at the intersection of major roads.
Single carriageway	A road that generally has one traffic lane in each direction.
state significant infrastructure (SSI)	Infrastructure projects for which approval is required under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979*.
Swept path	The area bounded by lines traced by the extremities of the bodywork of a vehicle while turning.
Taper	Shape of merge or diverge.
Traffic Control Plan (TCP)	A graphical plan showing road signs and devices arranged to warn road users and to guide traffic around, or if necessary through, a work site or temporary hazard.
Traffic management approach	An approach to managing impacts to traffic, for example, through lane and/or road closures by way of guidance and control of moving traffic, including pedestrians, cyclists and all types of vehicles.

Term	Definition
Transmission cable	An insulated wire that conducts an electrical current at voltages greater than 132 kV.
Two-way flow (either side of the work site)	A traffic management approach whereby part of the roadway is closed and traffic flow is retained in both directions, either side of the work site.
Two-way flow (along one side of the work site)	A traffic management approach whereby part of the roadway is closed and traffic flow is retained in both directions, along one side of the work site.
Underboring	This is a trenchless method for installing cables involving passing the conduits under infrastructure (such as a road or railway corridor) or a watercourse. Underboring could be via thrust boring (also known as micro tunnelling) or horizontal directional drilling.
Work site	A specific section of the project area for carrying out project construction activities such as trenching and excavation, establishment of a joint bay, underboring or installing a cable bridge. The work site would be fenced off from public access and may include associated activities such as traffic management measures.

Abbreviations and acronyms

Abbreviation/ Acronym	Definition
ACT	Australian Capital Territory
CCF	Community Consultation Framework
CTMP	Construction Traffic Management Plan
DECC	Department of Environment and Climate Change
DPE	NSW Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
kV	kilovolt
LGA	local government area
MRV	Medium Rigid Vehicle
NSW	New South Wales
ROL	Road Occupancy Licence
SEARs	Secretary's Environmental Assessment Requirements
SRV	Small Rigid Vehicle
TCP	Traffic Control Plan
TfNSW	Transport for NSW
TMC	Transport Management Centre

Executive summary

TransGrid is the manager and operator of the major high-voltage electricity transmission network in New South Wales (NSW) and the Australian Capital Territory. TransGrid is seeking approval under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of a new 330 kilovolt (kV) underground transmission cable circuit between the existing Rookwood Road substation in Potts Hill and the Beaconsfield West substation in Alexandria (the project). The transmission cable circuit would be about 20 kilometres long and would generally be located within existing road reserves across three local government areas (LGAs).

This Traffic and Transport Assessment presents an assessment of the likely traffic and transport impacts arising from the project under construction, operation and maintenance conditions. This report identifies potential impacts to road, public transport and active transport networks and provides management measures to mitigate these impacts.

Impacts on the road network

A high level, qualitative assessment was undertaken to identify potential impacts on traffic and transport and to outline the traffic management approach required for construction activities along the transmission cable route on a road by road basis. The methodology for the assessment included:

- development of assumptions for maximum widths of work sites during four key construction activities: trenching and excavation, underboring, excavation and establishment of joint bays, and cable pulling and jointing. These assumptions are described in detail in **Sections 3.3.3, 3.3.4** and **3.3.5** for two different scenarios i.e. a kerbside and non-kerbside arrangement for the construction of the transmission cable circuit;
- identifying the minimum required widths for traffic lanes to maintain either uninterrupted two-way traffic flow or two-way traffic flow under shuttle working conditions, using the Roads and Maritime Services manual and Austroads guide. In addition, the threshold for the road width before a diversion is required was identified. Assumptions were also determined for roads with and without bus routes. These are described in detail in **Section 3.3.2**;
- using the assumptions for the maximum widths for work sites and the minimum widths required for traffic lanes during construction, a set of assumptions were developed for the minimum road widths for two possible traffic management approaches:
    - traffic flow maintained (lane closures that would permit two-way traffic flow under either uninterrupted or shuttle working conditions[1]); and
    - diversion required.

  A summary of these assumptions is presented in **Table 3-2**;
- considering the potential length of the work site required to complete the construction activity to understand the impact on the capacity of the road network at that location. The local impacts would be quantified during the detailed design stage, however, the assumptions and length of the proposed work sites for the four key construction activities is described in **Section 3.3.8**.

The construction activities undertaken along the transmission cable route would require implementation of one of the two possible traffic management approaches outlined above at each work site. Implementation of these traffic management approaches would require lane closures or diversion routes. Lane closures and diversions would have different impacts on traffic depending on the location of the work site and the traffic management approach adopted. Works sites located near signalised intersections would also have traffic impacts. **Table E-2** categorises the potential traffic management approach and provides a summary of the potential impacts.

[1] A traffic scenario whereby part of the roadway is closed and a single lane is used alternatively by traffic in each direction.

Table E-2 Summary of proposed traffic management approach and potential impacts

Traffic management approach	Potential impacts
Mid-block impacts	
Lane closures while retaining two-way traffic flow arrangement	• reduced network mid-block capacity; • delays in travel time; • increased traffic queues; • temporary loss of on-road parking; • reduced speed limits; • traffic controllers present on-site; • potential for works outside of standard construction hours; and • delays to property access.
Lane closures that reduce traffic flow to shuttle working arrangement that requires traffic control to operate	• temporary loss of on-road parking; • reduced speed limits; • traffic controllers present on-site; • potential for works outside of standard construction hours; • delays to property access; • traffic queues on either side of the work site; and • potential diversions of bus routes.
Diversion routes	• temporary loss of on-road parking; • reduced speed limits; • traffic controllers present on-site; • potential for works outside of standard construction hours; • delays to property access; • diversion routes required; and • possible reduction in network performance along diversion route.
Intersection impacts	
Works at signalised intersections	• Road Occupancy Licence (ROL) application approved by Transport Management Centre (TMC); • reduced intersection capacity; • increased traffic queues; • temporary loss of on-road parking; • potential for works outside of standard construction hours; • reduced speed limits; • delays to property access; and • traffic controllers present on-site.
Works at priority intersections/roundabouts	• intersection closures if roads have multiple access points, with diversion routes required; • access maintained at single access points under shuttle working conditions; • reduced intersection capacity; • increased traffic queues; • temporary loss of on-road parking; • potential for works outside of standard construction hours; • delays to property access; and • traffic controllers present on-site.

Should lane closures or diversions be required at locations that experience significant through traffic, the works would likely be restricted to night or off-peak times to minimise disruption, as determined by the relevant roads authority. On local roads, works may be undertaken during the day while maintaining residential access (where possible) and diverting through traffic, due to the lower traffic volumes.

Impacts on parking and residential/commercial access

On-road parking along the transmission cable route would need to be temporarily restricted for the duration of works at specific work sites to ensure that the work site remains clear. Depending on the width of the carriageway, parking on one or both sides of the carriageway may need to be temporarily restricted for the duration of the works to ensure that there is sufficient width for the work site and through traffic to pass. Assuming the work site lengths range between 55 and 95 metres, the existing on-road parking for the length of each work site would be impacted. The design of temporary 'no stopping' restrictions would be undertaken during the detailed design stage and mitigation measures outlined in the CTMP for the project, and managed by the construction contractor. Furthermore, consultation would be required with the relevant road authorities and nearby residents.

In principle, vehicle access to residences and businesses would be retained throughout construction. However, while driveways of private properties would be avoided wherever possible, it is likely that there would be some disruptions to access during activities such as trenching, joint bay establishment and cable jointing. During trenching and joint bay excavations, affected landowners/occupants would be given prior notice about the anticipated access disruptions. Consultation would occur with affected property occupants, in accordance with the Community Consultation Framework (refer to **Appendix C** of the EIS), to identify appropriate timeframes for restricting access or to negotiate alternative arrangements. When cable jointing is occurring at joint bays near driveways, access to these properties would not be possible. As jointing could take up to three weeks, affected owners/occupants would be consulted to determine a workable solution for their specific location.

Access for emergency service vehicles would be maintained at all times though the use of temporary steel plate covers can be placed over the open excavations to allow access. Access for waste collection will be arranged with the local waste collection agency so that bins are located in a suitable area for collection that is accessible by the waste collection vehicles and not obstructed by the work site.

Impacts on the public transport network

An assessment of the public transport network found that there may be some impacts to the bus network along the transmission cable route, depending on the location of the bus stops and the road geometry. Some bus routes would be able to continue uninterrupted with minor amendments to bus stop locations. However, some routes would need to be diverted due to construction activities. In all cases, consultation with Transport for NSW (TfNSW) and the bus operators would be required in advance to ensure the successful diversion of routes and relocation of bus stops as and when required in accordance with the construction program.

Impacts to rail and light rail services would be minimised through consultation with rail authorities. Where rail authorities deem that a track shut down is required for the works to be undertaken, it is proposed to align construction works with scheduled rail maintenance days or during the night where possible. As such, it is expected that there would be minimal impacts to rail (passenger or freight) and light rail services.

Impacts on the active transport network

An assessment was undertaken of the likely impacts to the surrounding active transport network along the transmission cable route.

Where works may be required within the footpath, such as for construction of link and sensor boxes, a diversion for pedestrians around the work site would be required. Where pedestrians would need to be diverted onto the opposite footpath, an appropriate crossing facility would be developed prior to the work site to allow pedestrians to cross in a safe manner. Carriageway diversions would be managed

through the CTMP and the relevant Traffic Control Plan (TCP) prepared to safely allow pedestrians to temporarily pass the work site on the carriageway. However, pedestrians cannot be diverted on to the carriageway during footpath works along roads with high speed and/or traffic volumes and therefore speeds would need to be reduced in order to divert pedestrians safely into the carriageway.

Generally, provided adequate traffic management and/or diversion routes are available, the impacts to pedestrians would be negligible as pedestrian routes would be maintained at all times throughout the life of the project. Furthermore, it is not anticipated that the part-closure of a traffic lane along the transmission cable route would have a significant impact on active transport network performance; however this would be determined when the CTMP is prepared for the project.

The assessment of the cycle network found that there would generally be minimal impacts to the cycle network. Some cycle paths through Sydney Park, the Greenway (at Dulwich Hill), and along the Cooks River Cycleway would be impacted during construction, however, temporary diversions would be put in place and the cycle paths would be reinstated following construction.

Impacts on safety

There would be an increase in the number of construction vehicles and work sites along the transmission cable route and at substations during the construction program. All traffic management devices implemented along the transmission cable route would be designed and implemented by suitably qualified technicians in accordance with the Roads and Maritime Services *Traffic control at work sites manual.* Therefore, it is not anticipated that the increase in construction vehicle volumes and work sites would have detrimental impacts on road safety.

Construction management principles and recommendations

It is anticipated that the traffic impacts from the traffic generated by construction activities would be able to be accommodated within the surrounding road network, with relatively low traffic volumes expected to be generated by the work sites, substation sites and construction laydown areas during peak hours.

To ensure disruption to the road, cycle and pedestrian network is minimised as much as possible, a series of management measures would be implemented as part of construction planning, based on the type of roads impacted and the users that would be affected. A CTMP would be completed for the project to support individual approvals and permits required by the relevant roads authority, which would include the following general principles for traffic management during construction of the project:

- stakeholder consultation;
- approvals and permits, including the application for a ROL for any activity on classified roads or crown roads;
- design and implementation of TCPs to cover works at intersections, mid-block works and works at construction laydown areas;
- speed reductions at work sites;
- working outside of standard construction hours along strategic network links and at signalised intersections as required by the relevant road authorities; and
- where possible, maintaining residential, commercial and emergency vehicle access at all times.

Once construction is completed, the project is likely to have a negligible impact on the traffic network. Ongoing monitoring and maintenance tasks would generally be by light vehicles only and require access to pits installed in footpath areas adjacent to the joint bays. These would be accessible within the verge and would not require detailed traffic management. Inspections of cable bridges would involve maintenance crews and appropriate traffic management measures when undertaking work at the roadside.

1.0 Introduction

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 Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of a new 330 kilovolt (kV) underground transmission cable circuit between the existing Rookwood Road substation in Potts Hill and the Beaconsfield West substation in Alexandria (the project).

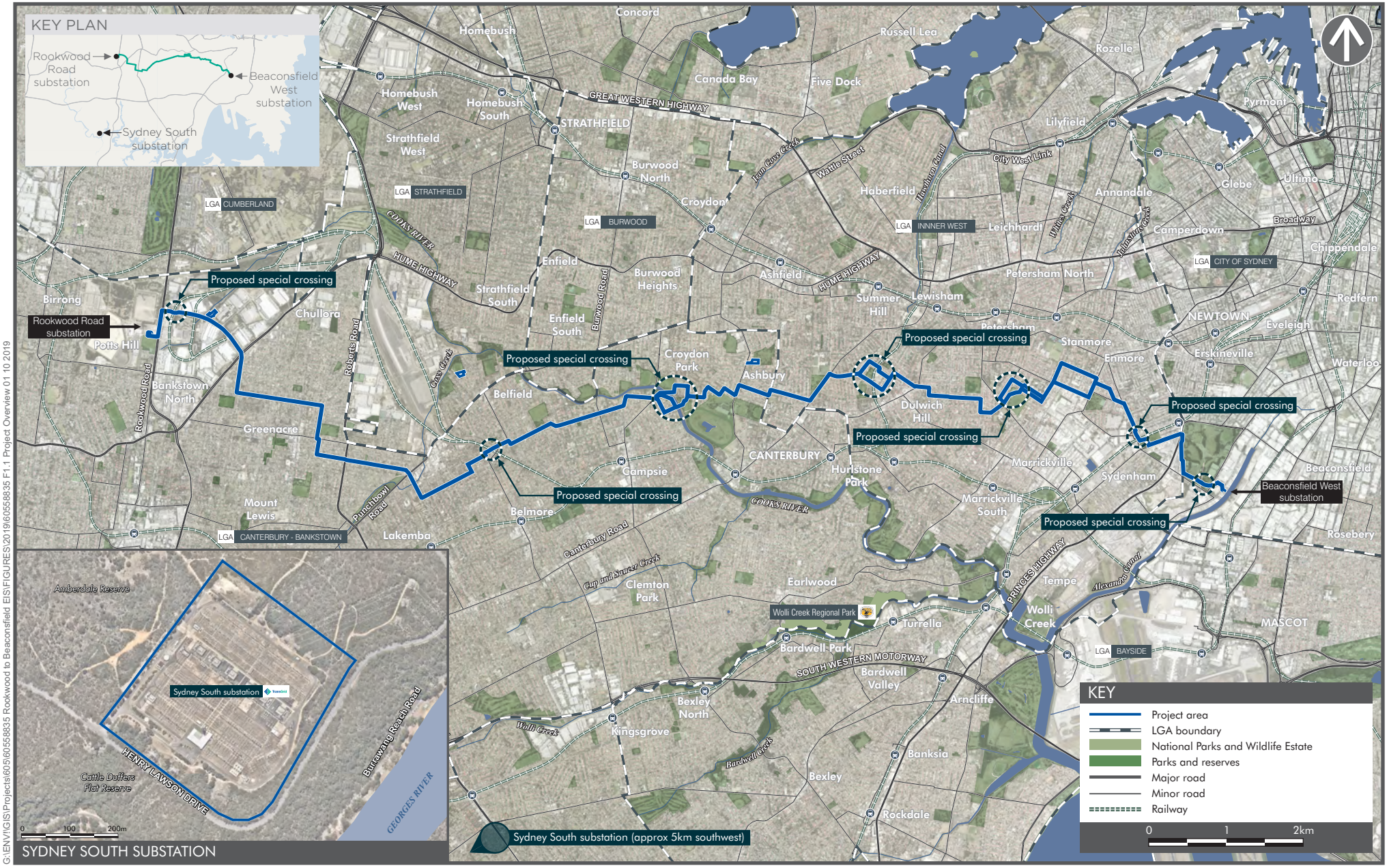
The project has been identified as a solution to address existing issues in the electricity supply network for inner Sydney, which is characterised by ageing and deteriorating electricity infrastructure and forecast increases in consumer demand.

As the project is state significant infrastructure under section 5.12 of the EP&A Act, an Environmental Impact Statement (EIS) has been prepared to assess the impacts of the project. This Traffic and Transport Assessment has been developed in support of the EIS.

1.1 Project overview

The transmission cable circuit would be about 20 kilometres long and would generally be located within existing road reserves, at existing electrical infrastructure sites, within public open space and on previously disturbed areas as shown in **Figure 1-1**. The project would comprise the following key components:

- cable works connecting Rookwood Road substation with the Beaconsfield West substation;
- special crossings of infrastructure or watercourses;
- upgrade works at the Rookwood Road and Beaconsfield West substations;
- conversion works at the Beaconsfield West and Sydney South substations; and
- temporary construction laydown areas to facilitate construction of the project.



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PROJECT OVERVIEW

Powering Sydney's Future
Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 1-1

1.2 Purpose of this technical report

This technical report has been prepared in accordance with the revised Secretary's Environmental Assessment Requirements (SEARs) issued for the project on 20 August 2019 by the Planning Secretary of the NSW Department of Planning, Industry and Environment (DPIE).

The SEARs relevant for this technical assessment are presented in **Table 1-1**.

Table 1-1 SEARs for traffic and transport

SEARs		Section addressed
Traffic and Transport	• a consideration of the nature of existing traffic (types and volume) along the project route, including consideration of peak traffic times and sensitive road users and parking arrangements;	**Annexure B** **Section 3.3**, and **4.0**
	• details of traffic volumes (both light and heavy vehicles) and transport routes to be used during construction of the project, including traffic associated with sourcing raw materials (water, sand and gravel);	**Section 5.2**
	• an assessment of potential impacts on road network function, road safety and access constraints, particularly where the project route would impact a major arterial road (including the Hume Highway, Rookwood Road, Punchbowl Road, Old Canterbury Road, New Canterbury Road, the Princes Highway, Euston Road and Burrows Road);	**Section 5.0**
	• an assessment of the need to close, divert or otherwise reconfigure elements of the road, public transport, pedestrian and bicycle networks (including the proposed Greenway at the Dulwich Hill Light Rail) during the construction of the project, including an estimate of the duration of the altered access arrangements;	**Section 4.0** and **5.0**
	• details of how and when works would be carried out along road and rail transport corridors, outlining the mitigation measures to ensure that regular road and rail operations are not impeded;	**Section 6.0**
	• details regarding the management measures for underground works to maintain the integrity of the road and rail networks;	**Section 6.0**
	• details of the ongoing maintenance works required to service assets, outlining the measures to maintain regular road and rail networks; and	**Section 5.0**
	• details of measures to mitigate and/or manage potential impacts, including measures to maintain pedestrian and cyclist movements along footways and bicycle paths at all times during construction activities, developed in consultation with the relevant roads authority.	**Section 6.0**

1.3 Report structure

This Traffic and Transport Assessment is structured as follows:

- Section 2 – description of the project and a summary description of construction activities;
- Section 3 – outline of the assessment methodology and assumptions;
- Section 4 – description of the existing road, public transport and active transport networks;
- Section 5 – assessment of the potential impacts resulting from construction activities;
- Section 6 – description of the management measures proposed to mitigate the potential impacts; and
- Section 7 – conclusion.

2.0 Description of the project

2.1 Project components

Key components of the project are listed below. A detailed description of the project is provided in **Chapter 4 Project description** of the EIS:

- cable works connecting Rookwood Road substation with the Beaconsfield West substation comprising:
  - a 330 kV underground transmission cable circuit comprising three cables installed in three conduits;
  - another set of three conduits for a possible future 330 kV transmission cable circuit if it is required;
  - four smaller conduits for carrying optical fibres;
  - around 26-30 joint bays, per circuit, where sections of cable would be joined together, located approximately every 600-800 metres along the transmission cable route;
  - link boxes and sensor boxes associated with each joint bay to allow cable testing and maintenance;
  - optical fibre cable pits for optical fibre cable maintenance;
- seven special crossings of infrastructure or watercourses including two rail lines (at Chullora and St Peters), one freight line (Enfield Intermodal, Belfield), one light rail line (at Dulwich Hill), the Cooks River and its associated cycleway (at Campsie/Croydon Park), a playground (at Marrickville) and the southern wetland at Sydney Park (at Alexandria);
- upgrade works at the Rookwood Road and Beaconsfield West substations to facilitate the new 330 kV transmission cable circuit;
- conversion works at the Beaconsfield West and Sydney South substations to transition the existing Cable 41 from a 330 kV connection to a 132 kV connection; and
- five temporary construction laydown areas to facilitate construction of the project.

Associated works required to facilitate the construction of the project, such as potential utility relocations, have been considered. No major relocations are anticipated and where smaller services may need to be moved to accommodate the transmission cable circuit, this relocation would be restricted to within the project area assessed in this EIS.

The project does not include the cable pulling and jointing works for the possible future second transmission cable circuit. This activity, should it be required, would be subject to separate assessment and approval as per the requirements of the EP&A Act.

Several route options and alternative construction methods are being considered as part of the project. These are described further in **Section 2.4.**

2.2 Project location

The project would be located in the suburbs of Potts Hill, Yagoona, Chullora, Greenacre, Lakemba, Belmore, Belfield, Campsie, Croydon Park, Ashbury, Ashfield, Dulwich Hill, Marrickville, Newtown, St Peters, Alexandria and Picnic Point in the following local government areas (LGAs):

- City of Canterbury-Bankstown;
- Strathfield;
- Inner West; and
- City of Sydney.

The location of the project is shown on **Figure 1-1**.

The project would be located primarily within road reserves, at existing electrical infrastructure sites, within public open space and on previously disturbed areas. The project has been and would continue to be designed to avoid impacts to private property and open spaces where possible; however, there would be a need for both the use of public open space and easements over some private commercial properties due to significant existing constraints within the road reserve. Land uses adjacent to the road reserves in which the project would be located are mainly residential, with relatively short sections of commercial and mixed uses in the suburbs of Dulwich Hill and Petersham. The project would be located close to industrial areas at the western and eastern end of the project around Potts Hill, Chullora, Greenacre, Marrickville, St Peters and Alexandria. The existing Sydney South substation at Picnic Point is surrounded by the George's River National Park.

The location of the proposed special crossings is provided in **Table 2-1**.

Table 2-1 Location of proposed special crossings

Location	Crossing type	Infrastructure or watercourse crossed
Muir Road, Chullora	Cable bridge	Rail line
Enfield Intermodal, Belfield	Underbore	Freight rail line
Cooks River, Campsie/Croydon Park/Ashbury	Cable bridge or underbore (preferred)	Cooks River and cycleway
Arlington Light Rail Station, Dulwich Hill	Underbore	Dulwich Hill light rail line or station
Amy Street, Marrickville	Underbore	Playground near Henson Park
Bedwin Road, St Peters	Cable bridge	Rail line
Sydney Park, Alexandria	Underbore	Wetland

2.3 The project area

The project area comprises the overall potential area of direct disturbance by the project, which may be temporary (for construction) or permanent (for operational infrastructure) and extend below the ground surface. It includes all options under consideration for the project, as described in **Section 2.4.**

The project area includes the location of operational infrastructure and construction work sites for:

- the transmission cable route (including the entire road reserve[2] of roads traversed);
- special crossings of infrastructure or watercourses;
- substation sites requiring upgrades (noting that all works would be contained within the existing site boundaries); and
- construction laydown areas.

While the boundaries of the project area represent the physical extent of where project infrastructure may be located, or construction works undertaken, it does not mean that this entire area would be physically disturbed or that indirect impacts would not be experienced beyond this area. Should the project be approved, the detailed design would aim to refine the location of project infrastructure and work sites within the boundaries of the project area, assessed in this EIS.

There is a possibility that to minimise impacts on other utilities or transport corridors (roads and rail), that deviations from the assessed project area may be required. In this event, specific impacts of this approach would be assessed further. Future changes to the project may require additional assessment and approval as described in more detail in **Chapter 5 Statutory planning and approval process**.

[2] Road reserve is defined as the area comprising roads, footpaths, nature strips and public transport infrastructure (including indented bus bays, bus shelters and bus stop signage).

The location of joint bays and the location of the transmission cable circuit within the road reserve (e.g. kerbside or non-kerbside) is yet to be determined and is subject to detailed design.

2.4 Options under consideration

The project includes route options and alternative construction methods in locations as outlined below and shown in Figure 4-6 in **Chapter 4 Project description** of the EIS. As the project design develops, a preferred option would be selected for each location. However, approval may be sought for some options where further design and engineering information is required before a preferred option can be selected.

The project options are discussed below by geographical area, from west to east.

2.4.1.1 Cooks River

There are three options for the transmission cable route in the vicinity of the Cooks River at Campsie/Croydon Park and two options for special crossing methods, including:

- Option 1: the transmission cable route travels in a south-easterly direction along Cowper Street from the intersection with Brighton Avenue, Campsie and then east on Lindsay Street. At the cul-de-sac at the end of Lindsay Street, there are two special crossing options of the Cooks River into Lees Park before the transmission cable route continues on to Harmony Street, Ashbury:
  - Option 1a: construct a cable bridge parallel to and to the north of the existing Lindsay Street pedestrian bridge; or
  - Option 1b: install the conduits under the Cooks River via underboring (this is the preferred option); or
- Option 2: the transmission cable route travels in a north-easterly direction from Byron Street at the intersection with Brighton Avenue, Campsie, through Mildura Reserve. From this parkland, the conduits would be underbored beneath the Cooks River, surfacing in Croydon Park near the cul-de-sac of Croydon Avenue in Croydon Park. The transmission cable route then travels north along Croydon Avenue, east along Dunstan Street, and south along Hay Street, before continuing east along Harmony Street; or
- Option 3: the transmission cable route travels in an easterly direction from Byron Street at the intersection with Brighton Avenue, Campsie, then in a south-easterly direction through Mildura Reserve, between residences and the Cooks River until the cul-de-sac at Lindsay Street. From here, there are two special crossing options of the Cooks River into Lees Park before the transmission cable route continues on to Harmony Street, Ashbury, which are the same for Option 1:
  - Option 3a: construct a cable bridge parallel to and to the north of the existing Lindsay Street pedestrian bridge; or
  - Option 3b: install the conduits under the Cooks River via underboring.

A description of the cable bridge and underboring methods is provided in **Section 2.5** with further detail in **Chapter 4 Project description** of the EIS.

2.4.1.2 Dulwich Hill light rail corridor

There are two options for the transmission cable route crossing of the Dulwich Hill Light Rail corridor in the vicinity of the Arlington Light Rail station, Dulwich Hill. This includes:

- Option 4a: the transmission cable route travels northeast along Windsor Road from the intersection with Arlington Street, then east on Terry Road. At the Terry Road cul-de-sac, the conduits would be underbored beneath the rail corridor, surfacing at the Hill Street cul-de-sac. From here the transmission cable route continues along Hill Street to Denison Road; or
- Option 4b: the transmission cable route travels southeast along Constitution Road from the intersection with Arlington Street, before crossing into the southern end of Johnson Park. From here, the conduits would be underbored beneath the rail corridor near the Arlington light rail

station. The transmission cable route then continues along Constitution Road and then north on Denison Road.

2.4.1.3 Henson Park

There are two options for the transmission cable route crossing in the vicinity of Henson Park, Marrickville including:

- Option 5a: the transmission cable route continues northeast on Centennial Street to a car park. From here it travels in an easterly direction through a grassed verge between the tennis courts and Henson Park oval to near the Amy Street playground. The conduits would be underbored beneath the playground, surfacing at Amy Street. The transmission cable route then turns east on to Horton Street; or
- Option 5b: the transmission cable route travels north on Sydenham Road from Centennial Street, turning northeast on to Neville Street, then southeast on Surrey Street to Amy Street before continuing along Charles Street.

2.4.1.4 Marrickville

There are two options for the transmission cable route in the vicinity of Addison Road, Marrickville. Note that the project may include one or both options at this location including:

- Option 6a: the transmission cable route travels north along Agar Street from the intersection with Illawarra Road, then east on to Newington Road and south down Enmore Road to the intersection with Scouller Street; and/or
- Option 6b: splitting the two circuits as there is insufficient space along Addison Road to accommodate both circuits. One circuit would travel along Newington Road (as for Option 6a) and one circuit would travel east on Addison Road from the intersection with Illawarra Road, then north on Enmore Road to the intersection with Scouller Street.

2.5 Construction works

Construction activities would be limited to the identified project area and include the activities summarised in **Table 2-2**. A substantial portion of the transmission cables would be installed using pre-laid conduits. The conduits would only require the excavation of short sections of trench at a time (an average of 20 metres at any one location), with backfilling occurring as soon as each section of the conduits has been installed. Depending on the overall construction program and associated number of work crews required, it is expected that trenching and excavation would occur concurrently at multiple work sites along the transmission cable route.

The project would involve the construction of seven special crossings that would involve either the installation of a cable bridge or underboring (i.e. an underground crossing). Works for these crossings would be undertaken in coordination with the relevant asset owner (e.g. road or rail authorities).

The construction of the project would require a number of work sites along the transmission cable route and at special crossings. Each work site represents an area of disturbance required to undertake the construction activity (e.g. trenching, cable bridge installation, underboring) and would be located within the project area.

Table 2-2 Summary of construction activities

Construction activity	Description
Site preparation	• implementation of traffic management changes (such as safety barriers and road signage) to facilitate access and egress to/from the work sites; • installation of environmental control measures (such as sediment barriers); • vegetation clearing and tree removal, where required; • establishing construction laydown areas and ancillary facilities including temporary offices and worker amenities, site fencing and provision of power/services; and • delivery and storage of plant and equipment at construction laydown areas and work sites.
Trenching and excavation	• clearing of surface vegetation along excavation area if required; • saw cutting of the road surface/pavement and lifting this material using a backhoe/front end loader. If rock is encountered, a rock breaker may be used to loosen the material; • removal of material down to the base of the trench using an excavator and placement of spoil directly onto trucks to be transported to a licensed facility. The trench would typically be around 3 metres wide and 1.2 metres deep but could be deeper or shallower depending on the presence of utilities; and • installation of shoring as a precaution against slump or collapse where necessary, particularly where deeper sections of trench are required (i.e. deeper than 1.4 metres).
Relocation of minor utilities/services	• use of non-destructive digging methods to expose buried services to guide the excavator; and • minor relocations, if required, would occur within the road reserve and be subject to consultation with the relevant asset owner/operator.
Conduit installation and backfilling	• laying the transmission cable conduits on plastic spacers to provide the required clearance from the side walls and bottom of the trench; • placing the optic fibre communication cable conduits into position; • backfilling the trench with engineered backfill; • laying of polymeric covers and warning tape, marked with appropriate warnings in case of accidental excavation; and • installation of the road base and temporary restoration of the road surface to allow vehicles and other road users to travel across the area.
Excavation and establishment of joint bays	• excavation of joint bays via open trenching; • installation of erosion and stormwater flow controls and barriers; • erecting fencing or hard barriers as required; • provision for vehicle access, worker amenities and equipment storage; • temporary covering with steel plates to provide access to adjacent properties where required; and • excavation of nearby pits to facilitate the installation of link and sensor boxes.
Cable pulling and jointing	• installation of a tent or demountable building over the joint bay to provide a controlled work environment and dry work site; • pulling cables through the conduits which is fed from large drums holding 600-800 metres of cable; and • connecting sections of cables at the joint bay.

Construction activity	Description
Permanent road restoration	• removing the temporary road surface; • backfilling with road base up to surface level, where required; • reinstating pavement; and • reinstating the remaining areas that were excavated with spoil or other fill material to pre-construction levels and final finishing to match existing as appropriate (e.g. footpath and/or kerb and gutter) or as otherwise agreed with the relevant roads authority.
Cable markers	• once restoration activities have been completed, cable markers would be installed along the transmission cable route to give warning of the presence of the cables and the need to make enquiries before digging; • markers may include: - small signs attached to road kerbs; - concrete marker posts (between 800-900 millimetres tall) along the transmission cable route in vegetated areas where surface markers would be difficult to see; or - flush-markers constructed of concrete that are around 50-100 millimetres thick.
Cable bridges	• establishment of the work site and access including vegetation clearing (where required); • boring and earthworks for the bridge piers; • installation of the pre-cast cable bridge and steel cage (where required) by crane; • integration with the conduits in the road reserve; and • reinstatement of the work site.
Underboring	• underboring around 4 to 10 metres below the ground surface by either thrust boring or horizontal directional drilling (HDD); • thrust boring would require a launch pit (at least 4 metres deep) and associated work site of around 800 square metres and a receive pit and work site of about 100 square metres; • HDD would require a work site at the drill launch area of up to around 800 square metres and a receive pit for the drill exit of around 1.5 metres deep; and • work sites would be restricted to the road reserve and public open space areas where feasible and reasonable to limit the need for vegetation removal.
Substation upgrades	• site establishment; • earthworks and excavations needed for cable entries and footings for new equipment; • installation of new infrastructure (such as switchbays and busbars); • removal of redundant infrastructure; • installation and connection of new cables; • commissioning of cables; and • demobilisation.

2.5.1 Staging and timing of construction activities

An indicative duration of construction activities is provided in **Table 2-3**. The timing is subject to detailed design and the final construction approach. For example, some works, such as trenching and excavation, would be undertaken by multiple work crews working along the transmission cable route. Staging of activities outside of certain hours would also influence the construction approach.

Should the project be approved, construction is planned to occur over 24 months, commencing in 2020. It is estimated that around 15 months would be required for civil construction works and conduit installation and about nine months for cable pulling and jointing, testing and commissioning. The transmission cable circuit is expected to be completed and commissioned in 2022/23.

Table 2-3 Indicative timing of typical construction activities

Construction activity	Indicative duration
Excavation, conduit (pipe) installation and trench backfilling	Conduits for each 600-800 metre cable section would take up to eight weeks to install (with most properties exposed to around two weeks of trench excavation activity).
Joint bay construction	Each individual joint bay would take up to three weeks to establish (in addition to trenching works). Each joint bay contains one cable circuit.
Cable pulling	Cable pulling at each joint bay for each 600-800 metre cable section would typically take up to two weeks to complete.
Cable jointing	Cable jointing would typically take up to three weeks to complete at each joint bay.
Cable bridges	Each cable bridge crossing is expected to take up to 10 weeks to complete in total, however works would be staged and not continuous over the 10 week period.
Underboring	Each underboring crossing is expected to take around eight to 10 weeks to complete in total, however works would be staged and not continuous over this period.
Substation works	Construction works at the Rookwood Road substation is expected to take around four to six months, while works at the Beaconsfield West and Sydney South substations are expected to take around six to nine months at each site.

2.5.2 Construction hours

Construction works would be undertaken during standard daytime construction hours as specified in the *Interim Construction Noise Guideline* (DECC, 2009) where reasonable and feasible to do so. However, it is expected that works outside standard construction hours would also be required, as described below.

Standard construction hours are:

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

It is likely that construction works would be required at night time (after 10pm) due to the requirements of relevant road and rail authorities. These works could include, but are not limited to, works within major road reserves (i.e. on State and regional roads such as Rookwood Road and Old Canterbury Road), through signalised intersections, or at special crossings. Work outside standard construction hours may be required for safety reasons and/or to limit disruption to road traffic and rail services.

Cable jointing works at each joint bay would need to be undertaken continuously i.e. 24 hours. Some works at the substation sites may also need to be undertaken outside of standard construction hours due to outage constraints on the existing infrastructure (i.e. the need to maintain power supply to customers).

Cable bridges and underboring at rail corridors would be timed with other rail works to limit disruption to freight and/or passenger rail services. These works could be undertaken outside of standard construction hours including at night time or over weekends, subject to approval of the relevant rail authority.

Scheduled construction activities, work hours and duration would be further refined through consultation with relevant government agencies and would be outlined in the CEMP for the project.

2.5.3 Construction precincts

The transmission cable route has been divided into five construction precincts to aid the characterisation of the existing environment and assessment of project impacts. These precincts broadly align with similar land uses. A description of each precinct follows:

- **Precinct 1** includes the areas between the Rookwood Road substation and the Hume Highway, including the industrial area of Chullora along Muir Road;
- **Precinct 2** includes the areas between the Hume Highway and Brighton Avenue near the Cooks River including the residential areas of Greenacre, Lakemba, Belmore, Belfield and Campsie;
- **Precinct 3** includes the areas from the Cooks River to Illawarra Road including the residential areas of Croydon Park, Ashbury, Ashfield, Dulwich Hill and Marrickville;
- **Precinct 4** includes the area between Illawarra Road and the Bankstown rail line including the residential areas of Marrickville, Enmore and Newtown; and
- **Precinct 5** includes the areas between the Bankstown rail line and the Beaconsfield West substation including the residential areas of St Peters and the recreational area of Sydney Park in Alexandria.

2.5.4 Construction laydown areas

As part of the construction of the project, temporary construction laydown areas would be required to store materials, equipment, excavated spoil and provide space for other ancillary facilities such as site offices. Five locations have been investigated as potential construction laydown areas. The final number and location is subject to ongoing consultation with the relevant landowners and would be determined during detailed design.

Stockpiling of excavated spoil at the construction laydown areas would be ongoing for the duration of the civil works (around 15 months). Stockpiling would be managed by erosion and sediment controls in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) (The Blue Book).

While it is expected that construction would require the use of transportable roadside facilities for individual work sites, provision for temporary site offices would be located within construction laydown areas for the duration of construction (up to two years).

Construction laydown areas would be fenced and would have lighting for security and to facilitate night works.

Driveways may need to be created from gravel or similar material to enable heavy vehicles to enter/exit the site. At construction laydown areas at Cooke Park and Peace Park, extended driveways would be required to access the laydown area. The construction of these driveways would require ground disturbance and potentially tree removal.

Temporary infrastructure at the construction laydown areas, including noise mitigation controls (such as hoardings), driveways and stockpile areas, would involve minimal subsurface ground disturbance (i.e. excavation) and would be removed once construction is complete.

For works at the Rookwood Road and Sydney South substation sites, sufficient space exists at each location to store materials and equipment; therefore, no additional laydown areas would be required.

The proposed locations and areas required for the five potential construction laydown areas are listed in **Table 2-4**.

Table 2-4 Potential construction laydown areas

Potential construction laydown area	LGA	Potential area (hectares)
12 Muir Road, Chullora	City of Canterbury-Bankstown	0.48
Cooke Park, Belfield	Strathfield	0.37
Peace Park, Ashbury	Inner West Council	0.45
Camdenville Park, St Peters	Inner West Council	0.18
Beaconsfield West substation, Alexandria	City of Sydney	0.85

2.6 Cable operation and maintenance

Once the transmission cables have been installed, generally only visual inspections would be required. This would involve regularly driving along the transmission cable route to check for hazards or activities (such as excavation works in the vicinity) that could impact the underground cables or cable bridges. Ongoing physical access to the transmission cables is not required however ongoing monitoring of the cable for damage (missing/worn cable markers) and outages would occur. This would be through access to the link boxes and sensor boxes located near the joint bays. Optical fibre cables installed alongside the transmission cables would be monitored at the optical fibre cable pits.

Pits for link and sensor boxes and optical fibre cables would generally be located in the footpath/road verge but in some cases where there is insufficient space, they may be required in the roadway. Roadway access would be managed with standard traffic controls.

Regular checks of the pits would ensure they are accessible and that the pit does not contain water or tree roots. Cable bridge structures would be inspected to ensure structural integrity and aesthetics are being maintained.

2.7 Other relevant technical information

2.7.1 Site access and traffic movements

Access for heavy vehicles would be required throughout the project area. The standard of access along the transmission cable route would be sufficient to permit passage of excavators, spoil haulage trucks, concrete trucks, low loaders and mobile cranes. The estimated vehicle movements required for construction is outlined in **Table 2-5**. The vehicle numbers estimated do not include private vehicles used by the workforce to arrive at the work site, or traffic management vehicles. The vehicle numbers for the 'transmission cable route' assume four work crews operating concurrently at multiple locations within the project area. The final number of work crews, materials and vehicle movements would be determined during detailed design and construction planning.

Table 2-5 Anticipated vehicle movements

Location	Activity	Number of vehicle movements per day
Construction laydown areas	Delivery/pickup of plant and materials, spoil transfer (at relevant sites)	Vehicle movements per construction laydown area, per day: • Light: 3-4 • Heavy: 4
Transmission cable route – trenching and joint bay excavation	Delivery of plant and materials, removal of spoil, general construction	Vehicle movements for four work sites, per day: • Light: 16 • Heavy: 96
Special crossings	Delivery of plant and materials, removal of spoil, general construction	• Light: 10-12 • Heavy: 8-10

Location	Activity	Number of vehicle movements per day
Substation upgrade – Rookwood Road	Delivery of plant and materials, removal of spoil	• Light: 3-4 • Heavy: 4
Substation upgrade – Beaconsfield West	Delivery of plant and materials, removal of spoil	• Light: 3-4 • Heavy: 4
Substation upgrade – Sydney South	Delivery of plant and materials, removal of spoil	• Light: 5-6 • Heavy: 6

Equipment and materials would be held in storage at the laydown areas until needed and delivered to the relevant work sites. Larger plant and cable materials may be delivered at night to avoid disrupting daytime traffic. Materials such as the cable drums may be temporarily stored near the trench and would be securely stored and barricaded.

Where the trench intersects another road or access to properties is required to enable construction works, vehicle and pedestrian passage would be restored as soon as possible after excavation has passed the intersection or access point.

2.7.2 Workforce

Typical workforce requirements are set out in **Table 2-6**. The numbers presented in **Table 2-6** are an estimate only of the number of workers likely needed to undertake construction activities. Additional workers would be required for traffic management. It is expected that multiple work crews would be spread along the transmission cable route and at the substation sites. A peak construction workforce of around 70 personnel is expected to be required for the project, assuming four work crews operating concurrently on works associated with the transmission cable route (i.e. excluding substation upgrades and special crossings).

Table 2-6 Typical workforce requirements

Construction activity	Workforce estimate (per work site)
Trenching and backfilling	4 to 6
Cable pulling	12 to 15
Permanent road restoration	4 to 6
Cable jointing	4 to 6
Cable bridge construction	8 to 10
Underboring	4 to 6
Substation upgrades	20 to 30

3.0 Assessment methodology

3.1 Study area

The study area for the traffic and transport assessment is the project area as defined in **Section 2.3**. The project area includes the location of operational infrastructure and construction work sites for:

- the transmission cable route (including the entire road reserve[3] of roads traversed);
- special crossings of infrastructure or watercourses;
- substation sites requiring upgrades (noting that all works would be contained within the existing site boundaries); and
- construction laydown areas.

The majority of the transmission cable route is within the road reserve, with small sections through private property, parks/recreational areas and industrial areas. The study area is shown in **Figure 3-1** to **Figure 3-4**.

3.1.1 Assessment precincts

The transmission cable route was divided into five construction precincts for the purposes of assessment. These precincts aim to group specific land uses together. A description of the roads where the precincts start and end is presented in **Table 3-1**. Further detail of the precincts is provided in **Section 2.5.3**.

Table 3-1 Assessment precincts – route start/end

Precinct	Start	End
1	Rookwood Road substation, William Holmes Street	Hume Highway (near Muir Road)
2	Hillcrest Avenue	Brighton Avenue (near the Cooks River)
3	The Cooks River (east of Brighton Avenue)	Illawarra Road (west of Charles Street)
4	Illawarra Road (east of Charles Street and Horton Street)	Bankstown Rail Line (south of Edgeware Road)
5	Camdenville Park (south of Bankstown Rail Line)	Beaconsfield West substation (through Sydney Park)

The transmission cable route principally follows the road reserve and other public land; however, there will be a need to pass through private property in some areas. The project includes roads managed and operated by Roads and Maritime Services (Roads and Maritime), as well as those managed and operated by local councils. A more detailed description of the roads the transmission cable route follows is described in **Annexure A**, and shown graphically in **Figure 3-1** to **Figure 3-4**.

[3] Road reserve is defined as the area comprising roads, footpaths, nature strips and public transport infrastructure (including indented bus bays, bus shelters and bus stop signage).

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TRAFFIC AND TRANSPORT ASSESSMENT STUDY AREA - MAP 1

Powering Sydney's Future
Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 3-1

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TRAFFIC AND TRANSPORT ASSESSMENT STUDY AREA - MAP 2

Powering Sydney's Future

Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 3-2

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TRAFFIC AND TRANSPORT ASSESSMENT STUDY AREA - MAP 3

Powering Sydney's Future
Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 3-3

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TRAFFIC AND TRANSPORT ASSESSMENT STUDY AREA - MAP 4

Powering Sydney's Future
Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 3-4

3.2 Statutory context, policy and guidelines

The following section describes the policy and guidelines used for the traffic and transport assessment.

3.2.1 Roads Act 1993

Section 138 of the *Roads Act 1993* (the Act) requires that a person obtain the consent of the appropriate roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a public road. Approval from the relevant roads authority is required under section 138 of the Act, as the project would involve works within public road reserves on both classified and unclassified roads. In the case of classified roads, consent is required from Roads and Maritime.

Approval is obtained in the form of a Road Occupancy Licence (ROL). The Transport Management Centre (TMC) assesses, manages and issues ROLs for state roads within the Sydney region on behalf of Roads and Maritime. The project would require ROLs for works conducted on state roads.

In the case of unclassified roads, consent from the roads authority (local council) is not required, as under Clause 5 of Schedule 2, TransGrid is a network operator under the *Electrical Supply Act 1995* and can therefore carry out works as part of network operator functions, in, on or over an unclassified road other than a Crown road.

3.2.2 Electricity Supply Act

TransGrid is considered a network operator under the *Electricity Supply Act 1995*. Clause 45(2) states that a network operator may erect, install, alter, extend, maintain and remove electricity works including on a public road or reserve, and is exempt from the requirement for an approval under the *Local Government Act 1993*, except in relation to buildings. Although approval is not required from local council, under clause 45(4), the local council must be notified of the works (on local roads and reserves) and given reasonable opportunity (being not less than 40 days from the date on which the notice was given) to make submissions in relation to the proposed works. The network operator must then give due consideration to any submissions made.

Based on the above, the project would not require approval from the relevant local council to undertake works on local roads.

3.2.3 Roads and Maritime Services – Traffic control at work sites manual

This manual is used by personnel responsible for road and bridge work sites. It contains standard traffic control plans (TCPs) for a range of work activities, instructions on how to select a standard TCP for a specific work activity, instructions on how to design new TCPs and guidance for traffic control in a number of specific situations. The purpose of this manual is to maximise safety by ensuring that traffic control at work sites consistently complies with best practice. It is also intended to help personnel to comply with the *Occupational Health and Safety Act 2000* and the Occupation Health and Safety Regulation 2001.

Specific to the project, the manual describes current Australian practice for the geometric provisions of traffic lanes through or past a work site, which has been used to inform this assessment.

3.2.4 Austroads guide to road design part 3 – Geometric design

The purpose of this guide is to provide the information necessary to enable designers to develop safe and coordinated road alignments that cater for the traffic demand at the chosen speed. This guide also presents information leading to the choice of appropriate cross-section standards, which will enable designers to balance the needs of all road users and the environment in which the road is constructed.

Specific to the project, the guide describes the minimum and desirable geometric requirements for lane widths while considering elements including speed limits, design vehicles and traffic volumes.

3.3 Approach and methodology for transmission cable route

A high level, qualitative assessment was undertaken to identify potential impacts on traffic and transport and to outline the traffic management approach required for construction activities along the transmission cable route on a road by road basis. The methodology for the assessment included:

- development of assumptions for maximum widths of work sites during four key construction activities: trenching and excavation, underboring, excavation and establishment of joint bays, and cable pulling and jointing. These assumptions are described in detail in **Sections 3.3.3, 3.3.4** and **3.3.5** for two different scenarios i.e. a kerbside and non-kerbside arrangement for the construction of the transmission cable circuit;
- identifying the minimum required widths for traffic lanes to maintain either uninterrupted two-way traffic flow or two-way traffic flow under shuttle working conditions, using the Roads and Maritime manual and Austroads guide. In addition, the threshold for the road width before a diversion is required was identified. Assumptions were also determined for roads with and without bus routes. These are described in detail in **Section 3.3.2**;
- using the assumptions for the maximum widths for work sites and the minimum widths required for traffic lanes during construction, a set of assumptions were developed for the minimum road widths for two possible traffic management approaches:
    - traffic flow maintained (lane closures that will permit two way traffic flow under either uninterrupted or shuttle working conditions[4]);
    - diversion required;

  A summary of these assumptions is presented in **Table 3-2**; and
- considering the potential length of the work site required to complete the construction activity to understand the impact on the capacity of the road network at that location. The local impacts would be quantified during the detailed design stage, however, the assumptions and length of the proposed work sites for the four key construction activities is described in **Section 3.3.8**.

A detailed assessment of work site specific impacts and mitigation measures for individual roads will be developed at a later date as the required information to complete a detailed assessment (e.g. the proposed design showing the exact location of the transmission cable circuit and joint bays within the road reserve and construction method at each work site) would only be available during the detailed design stage. The identified impacts, constraints, design criteria and management requirements in this assessment would form the basis for detailed design and construction planning, which would include quantitative site assessments (including traffic counts, where required) to confirm and refine traffic control and management measures at the confirmed work site locations.

Once the detailed design is completed, a CTMP will be prepared for the project. The CTMP will outline the process to manage traffic around the work sites and construction laydown areas. This would typically include traffic modelling (where required) to assess the impacts of any proposed lane closures and/or traffic diversions, and in turn confirm the traffic management approach. The CTMP would also include TCPs identifying how the work site and traffic management devices will be laid out.

The width of road required for kerbside works would be less than if the transmission cable circuit were to be installed away from the kerbside. As such, the construction activities would ideally be undertaken along the kerbside to maximise the available road space for vehicles to pass the work site. However, there may be a requirement for trenches to be excavated away from the kerbside (generally due to the presence of utilities and services within the roadway), and therefore a non-kerbside methodology has also been described in **Sections 3.3.3** through **3.3.5**.

The potential operational and maintenance impacts of the project are discussed in **Section 5.3**.

[4] A traffic scenario whereby part of the roadway is closed and a single lane is used alternatively by traffic in each direction.

3.3.1 Definition of work site

This assessment considered the likely requirements of individual work sites along the transmission cable route. A work site is an area of road, bridge or road reserve where construction (such as trenching and excavation, establishment of a joint bay, underboring or installing a cable bridge) would be undertaken, including any additional length of road or bridge required for traffic controls, such as signage and barriers. The work site would be set out using the required traffic control devices to provide a safe work site for the workers, general public and road users. In relation to the construction activities for the transmission cable route, work sites would vary in width and length depending on the activity being undertaken, as described in **Sections 3.3.3**, **3.3.4** and **3.3.5**.

3.3.2 Traffic lane width assumptions

The Roads and Maritime (2018) *Traffic control at work sites manual* explains that current Australian practice is to provide a minimum single lane width through or past a work site of 3 metres at traffic speeds up to 60 kilometres/hour and 3.5 metres at higher speeds. Additionally, two-way traffic flow can be provided on local roads within a remaining clear roadway width of 5.5 metres or more. If 5.5 metres cannot be achieved, then the roadway should be reduced to a maximum of 3.5 metres to ensure vehicles operate in single file under shuttle working conditions. Shuttle working conditions are where roadworks on single carriageway roads (i.e. a road with one lane in each direction) restrict the movement of the traffic flow to alternate operation along a single running lane, often controlled by a trained traffic controller.

The Austroads *Guide to Road Design Part 3 – Geometric design* states that standard traffic lane widths are 3.5 metres for urban arterial roads, which allows for large vehicles to pass or overtake, without either vehicle having to move sideways towards the outer edge of the lane. However, the required lane width may be reduced to 3-3.4 metres on low speed roads with low truck volumes. Lane widths located within local residential, commercial and industrial areas are typically determined by the local council.

The NSW *State Transit Bus Infrastructure Guide* (NSW Government, 2011) states that along bus routes, the minimum desirable travel lane width for a bus is 3.5 metres on one-way or one-lane sections of road. Additional width may be required on curved sections of roads. On roads with more than one lane, the minimum desirable lane width for a bus is 3.2 metres.

For the purpose of this assessment, the adopted traffic lane width required for passenger car vehicles to pass a work site is 3 metres, and for roads that contain bus routes the adopted traffic lane width required for buses to pass a work site is 3.5 metres[5]. These assumptions provide a conservative and worst case assessment. Narrower lane widths for passenger car vehicles may be approved by the relevant roads authority through the ROL application process with supporting swept path analysis; however, this would be provided on a road by road basis when the CTMP and TCPs are prepared. If narrower lane widths are approved, this would have an impact on the type of traffic management required at each work site.

[5] On roads that are wide enough to accommodate two or more traffic lanes pass the work site, a minimum lane width of 3.2 metres will be assumed. However, the majority of the roads along the transmission cable route will either require a single traffic lane pass the work site, or are wide enough to accommodate multiple lanes. Therefore, the 3.2 metre lane width will not affect the assessment, and has not been summarised in **Table 3-2**.

3.3.3 Trenching and excavation - work site width assumptions

3.3.3.1 Kerbside construction scenario

Trenching and excavation construction activities undertaken along the kerbside would allow vehicles to pass the work site using the remaining available road space. This would result in vehicles passing the work site along one side only. The total construction work site would be 7.7 metres in width. The position of the trench and the tipper truck are interchangeable within the work site. A schematic description of the kerbside construction methodology is presented in **Figure 3-5**.

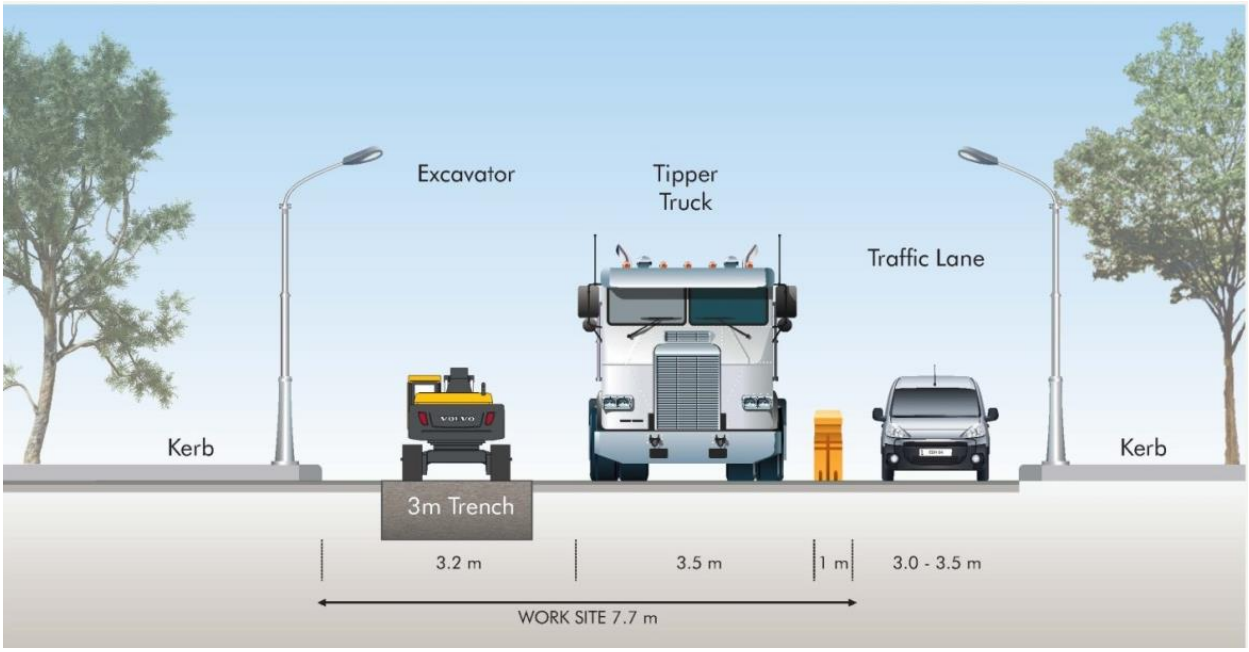

Figure 3-5 Schematic description of the kerbside trenching and excavation construction methodology
Note: This schematic description shows traffic flow maintained under shuttle working conditions. To maintain uninterrupted traffic flow an additional traffic lane would be required.

3.3.3.2 Non-kerbside construction scenario

There may be a requirement for trenches to be excavated away from the kerbside. In this case, if traffic can pass along both sides of the work site, the total construction work site would be 8.7 metres in width as an additional 1 metre clearance is required. A schematic description of the non-kerbside construction methodology where traffic can pass along both sides of the work site is presented in **Figure 3-6**.

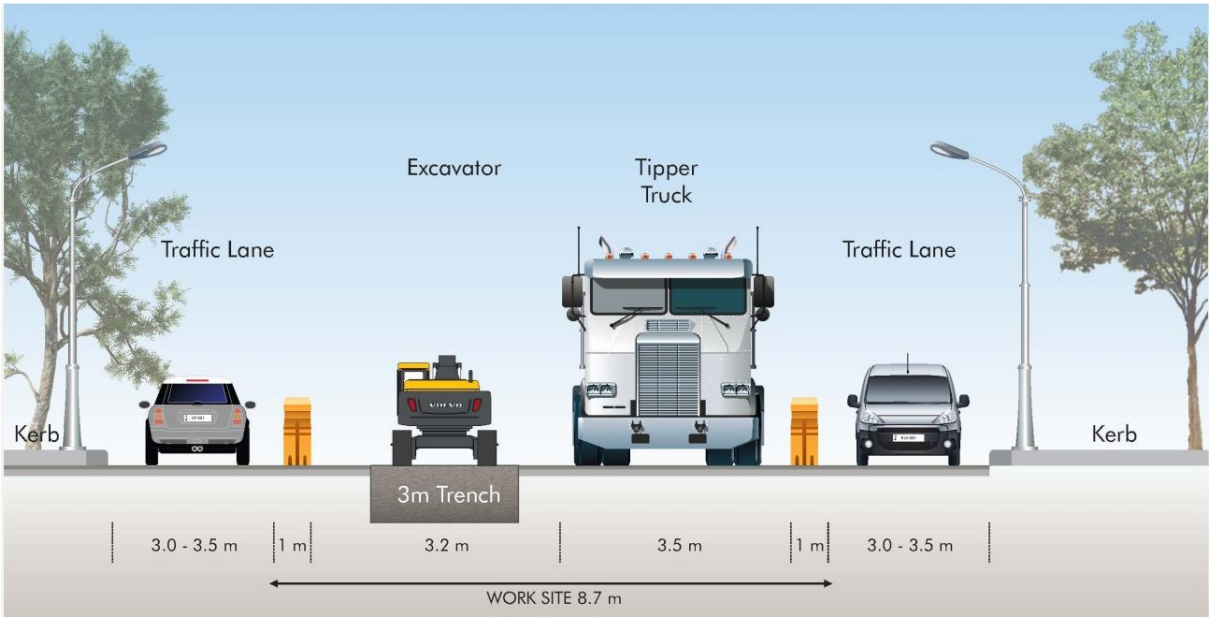

Figure 3-6 Schematic description of the non-kerbside trenching and excavation construction methodology
Note: This schematic description shows maintenance of uninterrupted traffic flow with a lane on either side of the work site.

3.3.4 Excavation and establishment of joint bays - work site width assumptions

3.3.4.1 Kerbside construction scenario

Excavation and establishment of the joint bays construction activities undertaken along the kerbside would provide maximum road space for vehicles to pass the work site. This would result in vehicles passing the work site along one side only and therefore the total construction work site would be 9 metres in width. The position of the joint bays and the tipper truck are interchangeable within the work site. A schematic description of the kerbside construction methodology for joint bays is presented in **Figure 3-7**.

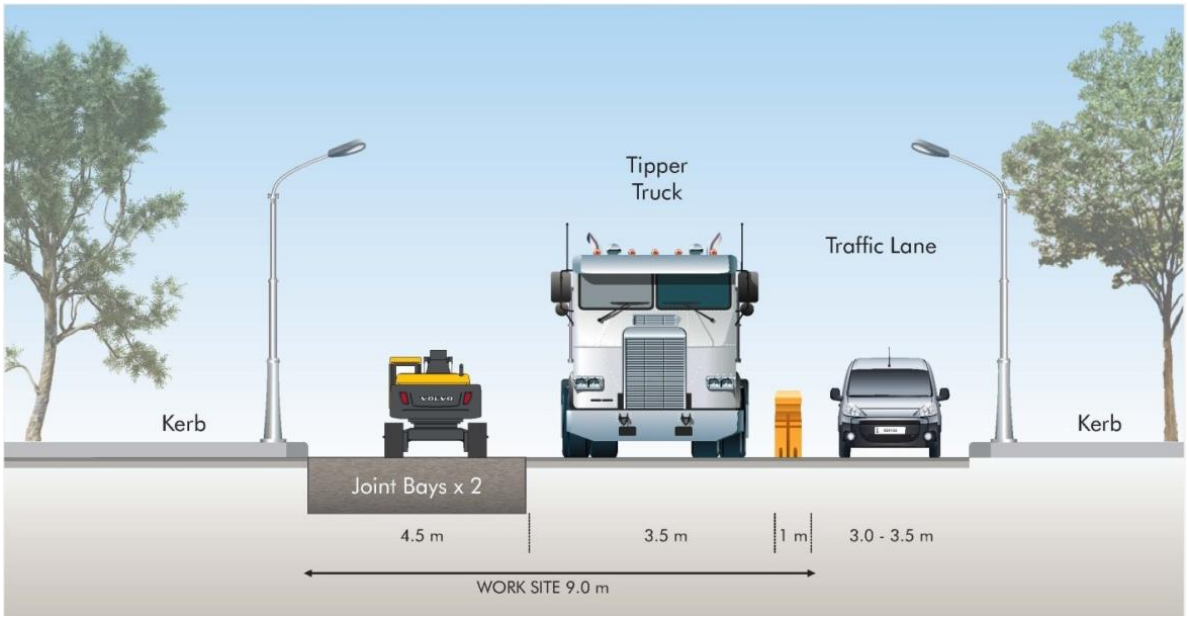

Figure 3-7 Schematic description of the kerbside excavation and establishment of joint bays construction methodology
Note: This schematic description shows traffic flow maintained under shuttle working conditions. To maintain uninterrupted traffic flow an additional traffic lane would be required.

3.3.4.2 Non-kerbside construction scenario

There may be a requirement for joint bays to be excavated away from the kerbside. In this case where traffic can pass along both sides of the work site, the total construction work site would be 10 metres in width as an additional 1 metre clearance is required. A schematic description of the non-kerbside construction methodology where traffic can pass along both sides of the work site is presented in **Figure 3-8**.

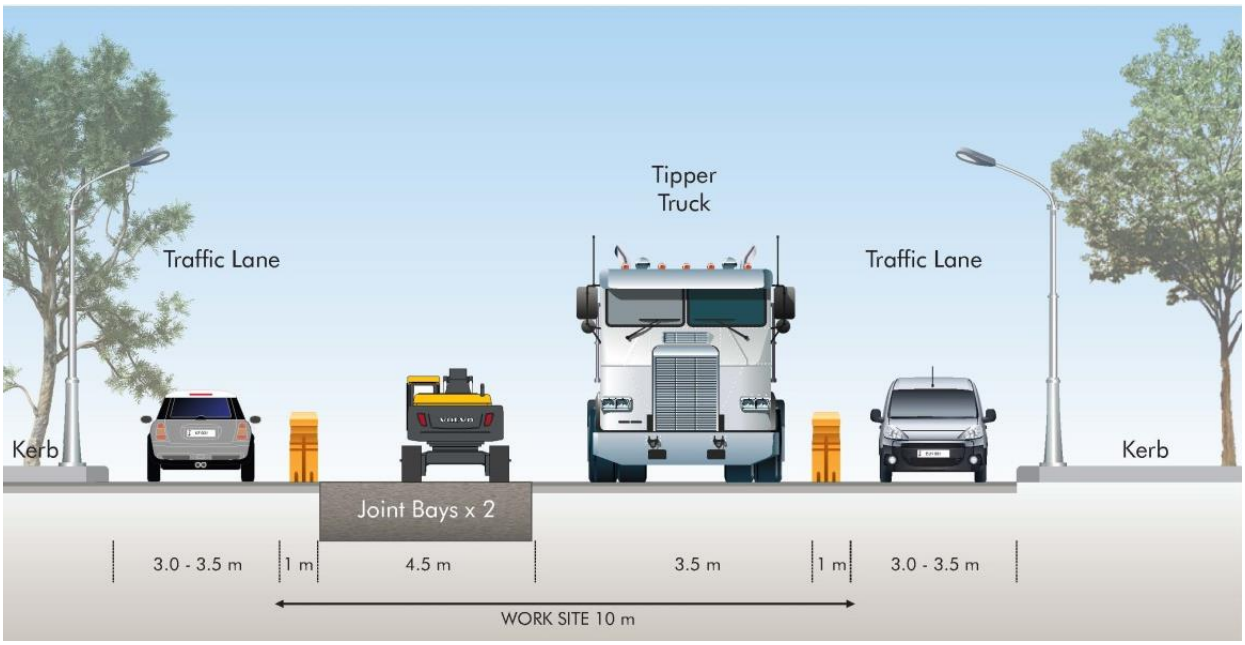

Figure 3-8 Schematic description of the non-kerbside excavation and establishment of joint bays construction methodology

Note: This schematic description shows maintenance of uninterrupted traffic flow with a lane on either side of the work site.

3.3.5 Cable pulling and jointing - work site width assumptions

3.3.5.1 Kerbside construction scenario

Cable pulling and jointing construction activities undertaken along the kerbside would provide maximum road space for vehicles to pass the work site. This would result in vehicles passing the work site along one side only, and therefore the total construction work site would be 4.6 metres in width. A schematic description of the kerbside construction methodology is presented in **Figure 3-9**.

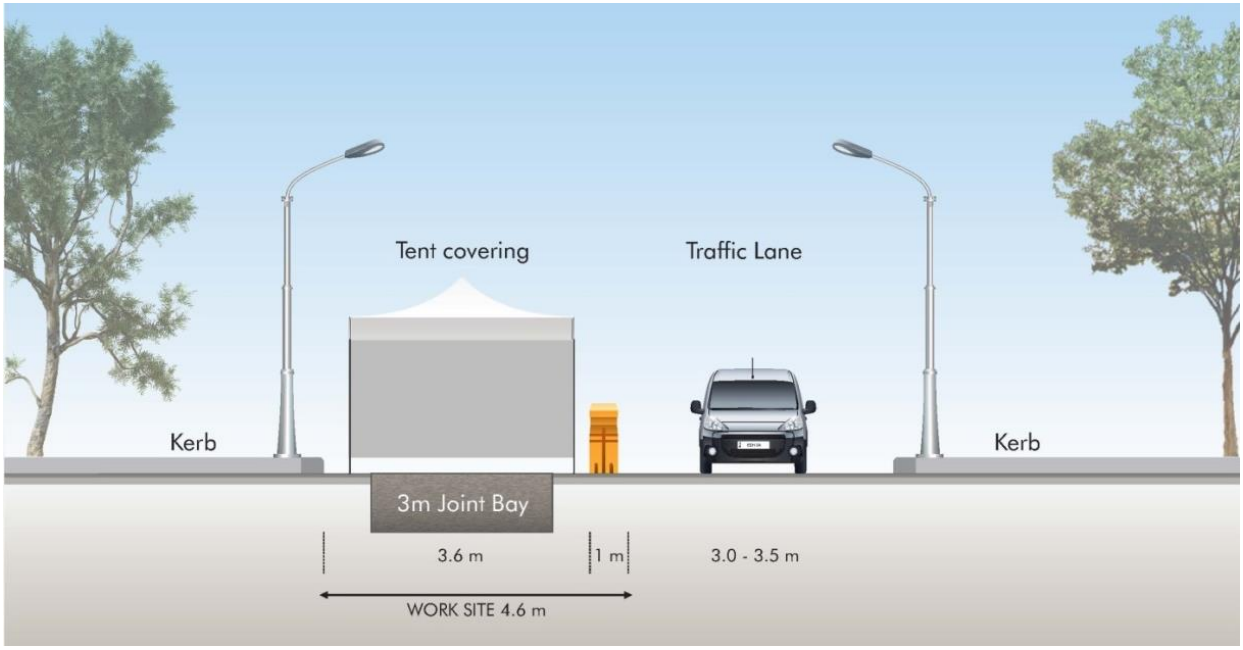

Figure 3-9 Schematic description of the kerbside cable pulling and jointing construction methodology
Note: This schematic description shows traffic flow maintained under shuttle working conditions. To maintain uninterrupted traffic flow an additional traffic lane would be required.

3.3.5.2 Non-kerbside construction scenario

If the joint bays are located away from the kerbside, the work site for cable pulling and jointing would also be in the same location. In this case where traffic can pass along both sides of the work site, the total construction work site would be 5.6 metres in width as an additional 1 metre clearance is required. An example schematic description of the non-kerbside construction methodology where traffic can pass along both sides of the work site is presented in **Figure 3-10**.

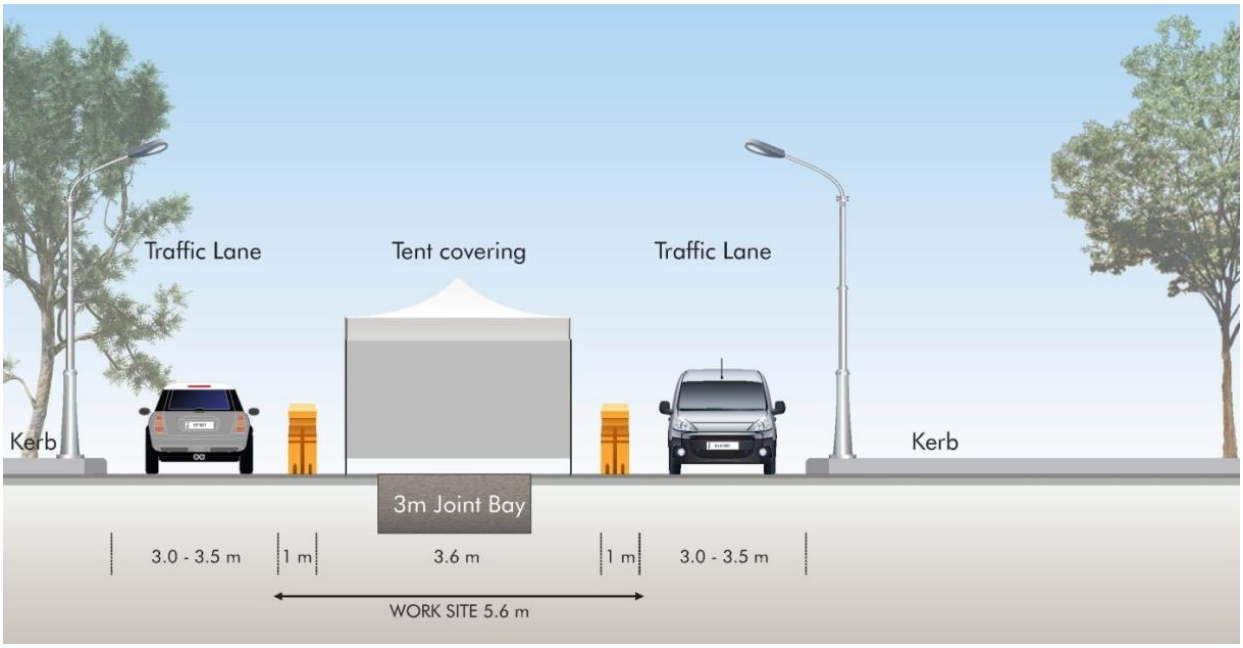

Figure 3-10 Schematic description of the non-kerbside cable pulling and jointing construction methodology
Note: This schematic description shows maintenance of uninterrupted traffic flow with a lane on either side of the work site.

3.3.6 Additional assessment assumptions

For the purpose of this assessment, it has been assumed that construction activities would generally be undertaken within the road reserve. When works are required in the roadway (i.e. between kerbs), in instances where median islands, pedestrian crossings, traffic calming devices and other such traffic management devices are present, it has been assumed that these would be removed to undertake the works and replaced upon completion. Therefore, these devices have not been considered when determining the appropriate traffic management approach. Where works are required within the footpath, additional traffic management would be required to ensure pedestrians have a safe path around the work site. An assessment of potential impacts on pedestrian routes is provided in **Section 5.1.5**.

It has also been assumed that speed limits would be reduced to a maximum limit of 60 kilometres/hour at work sites to ensure the minimum lane width of 3 metres for passenger car vehicles can be provided and to improve safety for workers at the work sites. Furthermore, it has been assumed that on roads with bus routes, the buses would not be diverted and that a 3.5 metre lane width would therefore be required along these roads.

This assessment has considered the three main construction activities of the activities listed in **Table 2-2**. Other activities such as site preparation, conduit installation and backfilling and permanent road restoration would be required for the project. It is anticipated that the spatial requirements to undertake these works would be within the spatial range for the construction activities assessed (i.e. trenching and excavation, excavation and establishment of joint bays and cable pulling and jointing). Furthermore, the traffic generated by these additional construction activities would be less than those included in this assessment, and the vehicle types would be similar. Therefore, the three construction activities chosen for this assessment would cover the range of impacts for the whole project, including the ‘worst case’ scenario. The potential impacts to the road network from these other construction activities would be able to be mitigated by similar management measures recommended for the construction activities that have been assessed. More specific mitigation measures and traffic management plans would be developed at a later stage, as part of detailed design and/or construction planning for the project.

3.3.7 Summary of assumptions for required road widths

The traffic assessment has identified a number of assumptions that inform the likely traffic management approach and traffic impacts associated with the project, which are based on the construction management principles described in this section. The road width requirements are based on the combination of the width of the work site and the minimum width for traffic to pass the work site under either uninterrupted two-way traffic flow or under shuttle working conditions. Together, these provide the high level assumptions to identify what traffic management approach is required at each work site.

A summary of the assumptions used for the selection of the traffic management approach at work sites is presented in **Table 3-2**.

Table 3-2 Summary of assumptions for the selection of the traffic management approach at work sites

Traffic management	Road width (no bus route)	Road width (bus route)
Trenching and excavation		
Traffic flow maintained (uninterrupted two way flow)	• Kerbside: More than 13.7 metres • Non-kerbside: More than 14.7 metres	• Kerbside: More than 14.7 metres • Non-kerbside: More than 15.7 metres
Traffic flow maintained (shuttle working conditions)	Between 10.7 and 13.7 metres	Between 11.2 and 14.7 metres
Diversion required	Less than 10.7 metres	Less than 11.2 metres
Excavation and establishment of joint bays		
Traffic flow maintained (uninterrupted two way flow)	• Kerbside: More than 15 metres • Non-kerbside: More than 16 metres	• Kerbside: More than 16 metres • Non-kerbside: More than 17 metres
Traffic flow maintained (shuttle working conditions)	Between 12 and 15 metres	Between 12.5 and 16 metres
Diversion required	Less than 12 metres	Less than 12.5 metres
Cable pulling and jointing		
Traffic flow maintained (uninterrupted two way flow)	• Kerbside: More than 10.6 metres • Non-kerbside: More than 11.6 metres	• Kerbside: More than 11.6 metres • Non-kerbside: More than 12.6 metres
Traffic flow maintained (shuttle working conditions)	Between 7.6 and 10.6 metres	Between 8.1 and 11.6 metres
Diversion required	Less than 7.6 metres	Less than 8.1 metres

3.3.8 Transmission cable route work site length assumptions

The length of the work site will depend on the type of construction activity being undertaken. The length of the work site will take into consideration traffic control devices, including the signage and barriers, as well as the length of the trench and ancillary construction activities. Signage is required to give road users advance warning of the presence of a work site in the roadway and barriers are required to direct traffic safely around the work site. The length of the barrier taper would be dependent on the speed of the road.

The traffic impacts are likely to occur for the duration that the work site is operating. Works on busy and/or strategic routes and at signalised intersections are likely to be restricted to outside of standard construction hours to avoid congestion during peak periods, with a requirement for the road to be reopened for traffic prior to the following peak period.

The approximate length of work sites for trenching and excavation, excavation and establishment of joint bays and cable pulling and jointing are summarised below.

3.3.8.1 Trenching and excavation construction activity

Trenching and excavation for each 600-800 metre section of cable would be undertaken at an average rate of 20 metres per work site per day. It is anticipated that multiple work crews on multiple sites would be working simultaneously along the transmission cable route, however these sites are unlikely to be adjacent to one another. A 20 metre long trench would generally require a work site of between 55-95 metres depending on the speed of the road.

3.3.8.2 Excavation and establishment of joint bays construction activity

Joint bays would be required every 600-800 metres along the transmission cable route to connect the cables between each section. It is estimated that up to 60 joint bays would be required for the two transmission cable circuits. The excavation required for each joint bay would be about 10 metres in length. To excavate and establish two joint bays (one for each transmission cable circuit), a trench 35

metres long would be required to accommodate the two joint bays (of 10 metres each) plus a required separation of 15 metres between joint bays. A 35 metre trench would generally require a work site of between 80-95 metres depending on the speed of the road.

3.3.8.3 Cable pulling and jointing construction activity

Cable pulling and jointing would only be required at each of the joint bay sites. As only one of the transmission cable circuits is being installed as part of the project, cable pulling and jointing is only required at up to 30 joint bays. With the joint bays being 10 metres in length, a work site of between 55-70 metres would be required, depending on the speed of the road.

3.3.9 Underboring construction activity

Underboring activities at special crossings would generate some disruption to local access and vehicle movements, especially where send or receive pits are located within the road reserve. However, the scale and duration of activities (i.e. generally involving an excavation for up to 10 weeks) is similar to the impacts assessed for the excavation and establishment of joint bays scenario and therefore underboring has not been assessed separately. The mitigation measures identified for the project regarding managing property access, diversions and road/lane closures, are therefore applicable to underboring activities Approach and methodology for substation upgrade works and construction laydown areas

A high level, qualitative assessment of the substation upgrade works and construction laydown areas was undertaken for the project. This is due to the low traffic generation numbers for each site, where traffic modelling would not be sensitive to traffic volume increases of this scale. The works are proposed to be undertaken fully within the existing substation site or proposed construction laydown area, which would be located off-road, and is not expected to impact the road, public transport or active transport networks. A summary of the construction traffic generation impacts for the substation upgrade works and construction laydown areas, as well as the transmission cable route, are provided in **Section 5.2**.

4.0 Existing transport network

4.1 Road network

A road index of all of the roads along the transmission cable route is provided in **Annexure B**, which also includes an inventory of the road characteristics (including road widths, speed limits, parking and bus stops). Publicly available traffic count data is only available for a small number of the roads along the transmission cable route. Traffic counts at critical segments of the network have not been undertaken at this stage of the assessment and would be undertaken during detailed design and construction planning, where needed, in order for any potential impacts to network performance arising from lane closures or diversions to be assessed.

Primarily, the road network along the transmission cable route is made up of the following types of roads, with definitions provided in the following sections:

- primary arterial roads (state);
- sub arterial roads (regional); and
- local access roads (local).

4.1.1 State roads – primary arterial road network

The state road network forms the primary network of principal traffic carrying and linking routes for the movement of people and goods within the urban centres of Sydney, Newcastle, Wollongong and Central Coast, and throughout NSW. State roads can be defined as roads which:

- provide links for vital or major movements of goods and services, people and public transport;
- are essential to network performance; and
- provide goods and services, mobility, public transport, tourism and community functions to centres of regional economic or social significance.

State roads are generally managed by Roads and Maritime and the TMC, which is a division within Transport for NSW (TfNSW).

4.1.2 Regional roads – sub arterial road network

Regional roads comprise the secondary road network. They provide for travel between smaller towns and districts and perform a sub arterial function within major urban centres. The primary purpose of regional roads is to:

- provide for medium level movements of people, goods and services and public transport;
- support and link state roads; and
- provide those functions to centres of local economic or social significance.

Regional roads are generally managed by either Roads and Maritime or the local council.

4.1.3 Local roads – collector and local access road network

Collector roads collect and distribute traffic to the arterial road network. Local roads serve local or neighbourhood facilities and their primary purpose is to:

- provide for local circulation and access to property;
- provide connection to the state and regional roads; and
- support the living environment in which they are located.

Local roads are generally managed by the local council.

4.1.4 Signalised intersections

All of the signalised intersections along the transmission cable route are managed by Roads and Maritime and the TMC. A list of signalised intersections along the transmission cable route is presented in **Table 4-1**.

Table 4-1 List of signalised intersections along the transmission cable route

Precinct	Signalised intersections
1	William Holmes Drive/Rookwood Road Rookwood Road/Muir Road Muir Road/Worth Street Muir Road/Hume Highway
2	Rawson Road/Waterloo Road Wangee Road/Punchbowl Road
3	Seventh Avenue/Fifth Avenue Centennial Street/Sydenham Road
4	Illawarra Road/Addison Road/Agar Street Addison Road/Enmore Road Enmore Road/Llewellyn Street Llewellyn Street/Edgeware Road/Alice Street Edgeware Road midblock crossing
5	May Street/Princes Highway

G:\ENV\GIS\Projects\605\60558835 Rookwood to Beaconsfield EIS\FIGURES\Traffic\60558835 F4-1 Road Types along the Transmission Route 26 08 2019

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ROAD TYPES ALONG THE TRANSMISSION CABLE ROUTE

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Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 4-1

4.2 Public transport corridors

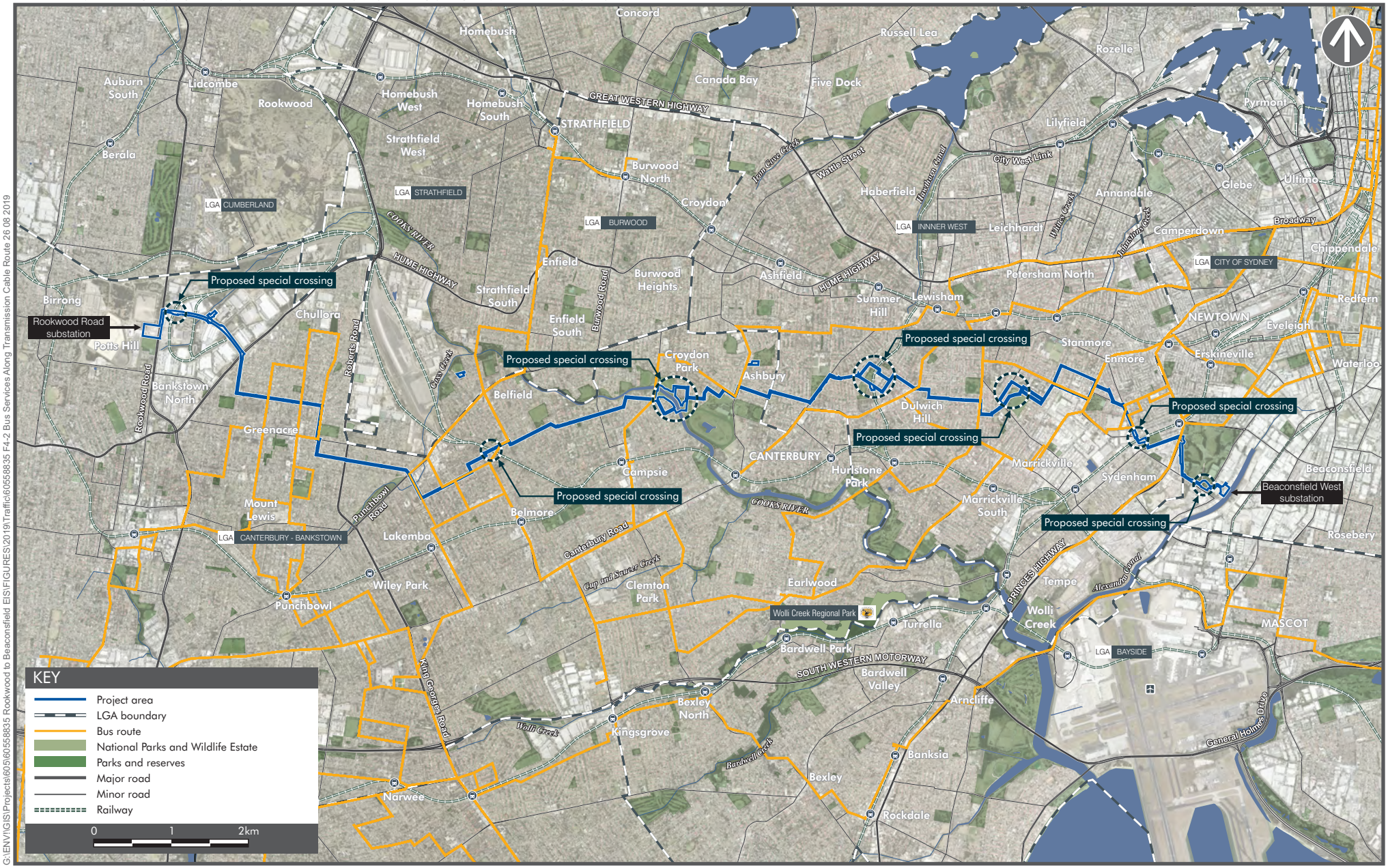
The project would involve work being undertaken along some public transport corridors, specifically along bus routes and in the vicinity of rail and light rail infrastructure.

4.2.1 Bus routes

There are a number of bus services that utilise streets that may be impacted by the transmission cable route. These bus routes provide local and regional connectivity across Sydney, which include key commuter routes, accessibility to services and local amenity. These are presented in **Table 4-2** and **Figure 4-2**.

Table 4-2 Bus services operating along streets impacted by the transmission cable route

Bus routes		
• L23	• 410	• 450
• M30	• 412	• 491
• M92	• 413	• 913
• N40	• 415	• 914
• 308	• 422	• 925
• 348	• 423	• 939
• 352	• 426	• 941
• 355	• 428	• 942
• 406		



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BUS ROUTES NEAR THE PROJECT AREA

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Note: The project area is confined to the roadway reserve with the exception of parks and existing substations
Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

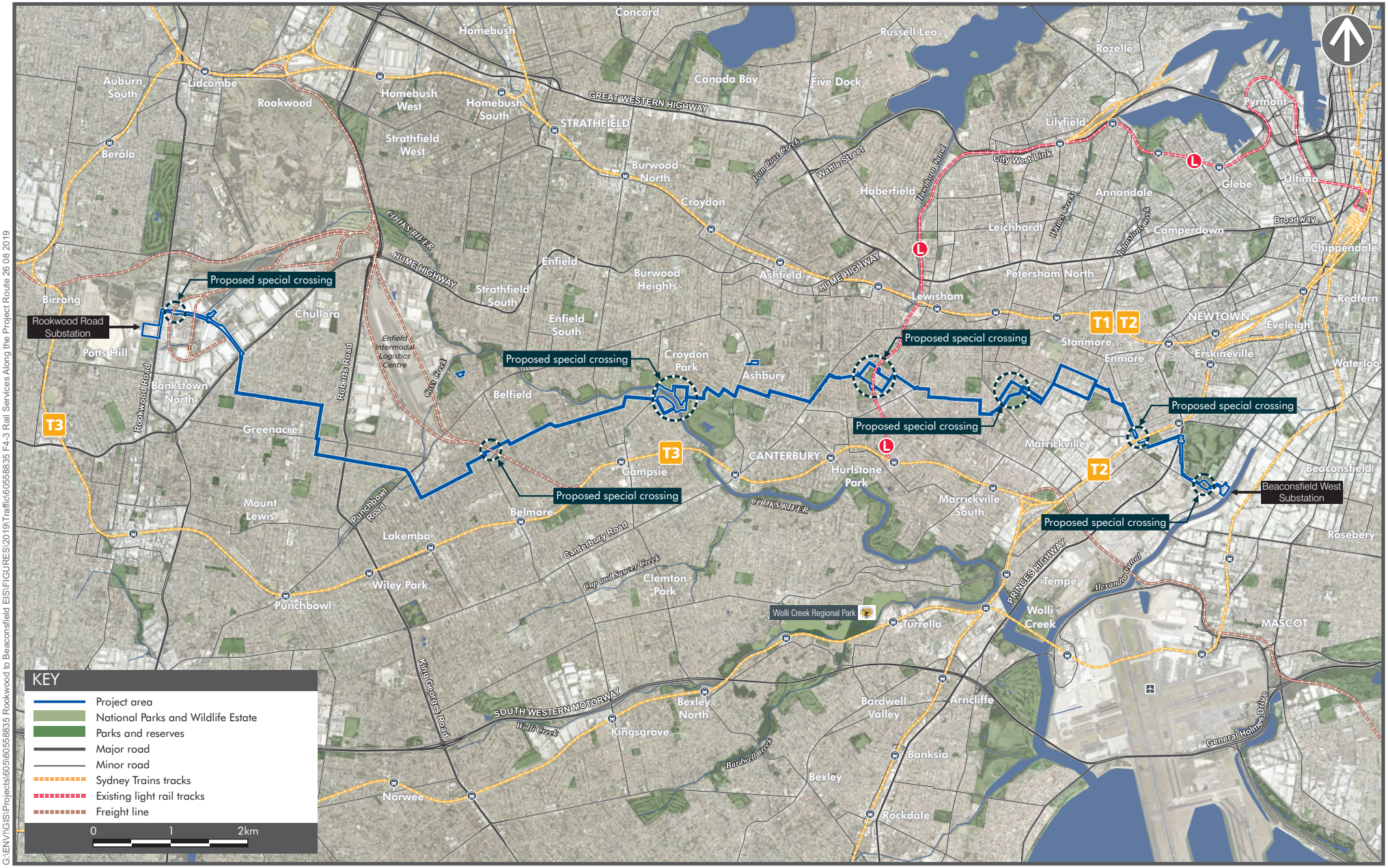
FIGURE 4-2

4.2.2 Rail and light rail route

There are several rail and light rail lines that are crossed by the transmission cable route. These rail lines provide local and regional connectivity across Sydney, which include key commuter routes, accessibility to services and local amenity. These locations are presented in **Table 4-3** and **Figure 4-3**.

Table 4-3 Rail and light rail special crossings locations along the transmissions cable route

Railway	Light rail
• Carter Street and Walker Street (near the Enfield Intermodal freight line) • Bedwin Road – T3, T4 and T8 passenger lines	• Terry Road – L1 passenger line • Constitution Road – L1 passenger line



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RAIL AND LIGHT RAIL SERVICES ALONG THE TRANSMISSION CABLE ROUTE

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Potts Hill to Alexandria Transmission Cable Project

Note: The project area is confined to the roadway reserve with the exception of parks and existing substations

Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 4-3

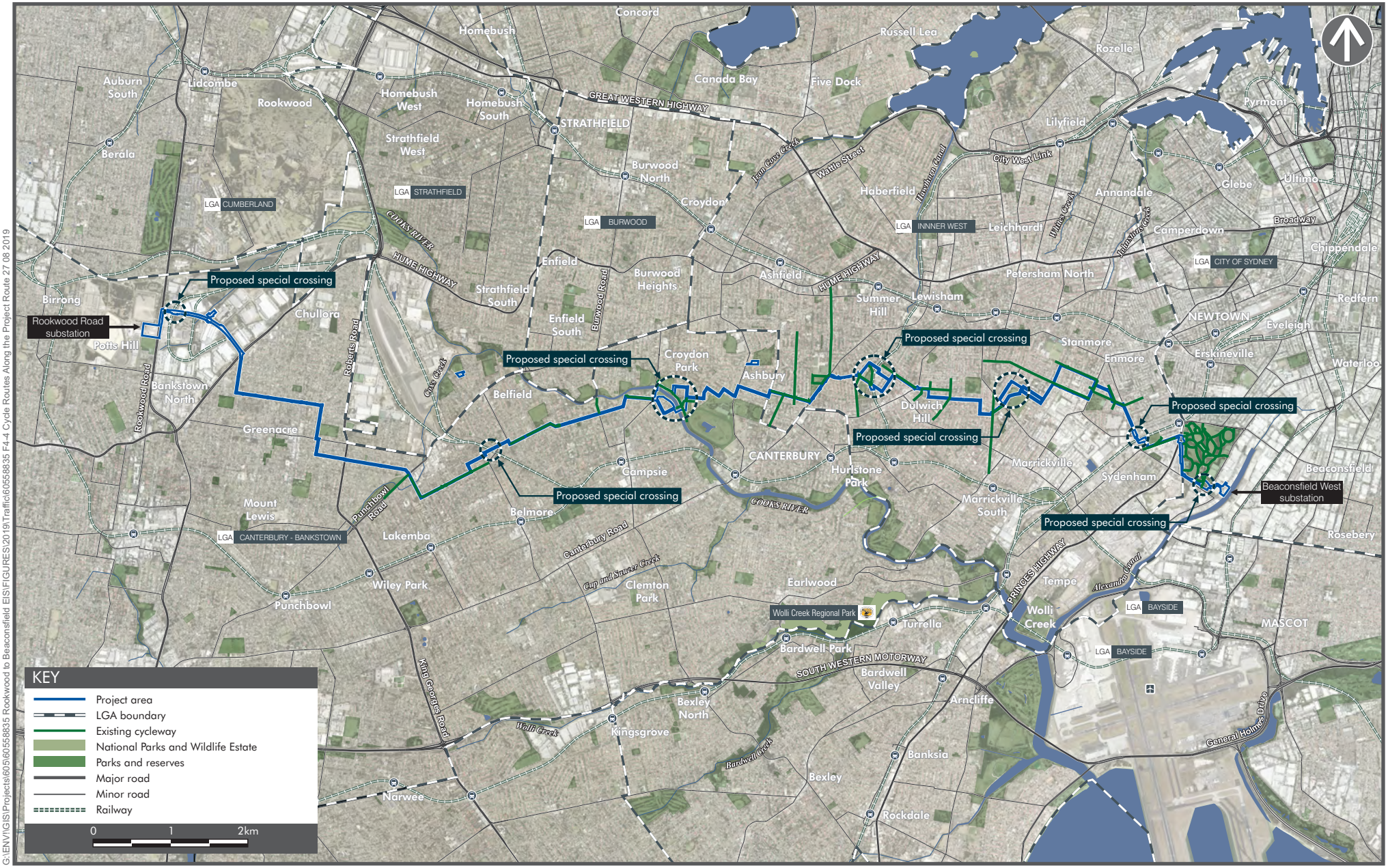
4.3 Cycle network

The transmission cable route crosses along some sections of the road network identified by Roads and Maritime as cycle routes. The cycle network is generally managed by local authorities. Roads and Maritime classifies cycleways into bicycle friendly roads (ranging between low, moderate and high difficulty roads), on-road cycle lanes and off-road shared paths as defined on the Roads and Maritime cycleway finder (http://www.rms.nsw.gov.au/maps/cycleway_finder).

Roads along the transmission cable route that are part of the Roads and Maritime cycleways are outlined in **Table 4-4** and presented in **Figure 4-4**.

Table 4-4 Impacted roads on the Local Authority Cycleways Network

Cycleway type	Roads forming part of the Local Authority Cycleways Network
Bicycle friendly roads	• Punchbowl Road near Wangee Road (high difficulty) • Wangee Road between Punchbowl Road and Yangoora Road (moderate difficulty) • Yangoora Road between Wangee Road and Neale Street (low, moderate and high difficulty) • Omaha Street between Bruce Avenue and First Avenue (moderate difficulty) • Fifth Avenue north of Seventh Avenue (moderate difficulty) • Byron Street west of Brighton Avenue (low difficulty) • Hanks Street between Holden Street and Old Canterbury Road (low and moderate difficulty) • Pigott Street between Denison Road and New Canterbury Road (moderate difficulty) • Herbert Street between Seaview Street and Fairfowl Street (moderate difficulty) • Wardell Road near Pile Street (moderate difficulty) • Centennial Street between Petersham Road and Sydenham Road (moderate difficulty) • Newington Road between Agar Street and Enmore Road (low difficulty) • Enmore Road between Newington Road and Scouller Street (moderate difficulty) • Addison Road between Agar Street and Enmore Road (moderate difficulty) • Enmore Road between Llewellyn Street and Scouller Street (moderate difficulty) • Juliett Street between Scouller Street and Llewellyn Street (moderate difficulty) • Llewellyn Street between Juliett Street and Edgeware Road (moderate difficulty) • May Street from east of Bedwin Road to Applebee Street (low difficulty)
On-road cycle lanes	• None
Off-road shared paths	• Lees Park (Cooks River Cycleway) • Croydon Park (Cooks River Cycleway) • Arlington Light Rail Station (The Greenway) • May Street between Campbell Street and Applebee Street • multiple paths through Sydney Park



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CYCLE ROUTES IN THE VICINITY OF THE TRANSMISSION CABLE ROUTE

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Note: The project area is confined to the roadway reserve with the exception of parks and existing substations

Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018)

FIGURE 4-4

4.3.1 The Greenway – Cooks River to Iron Cove

The Greenway is a 5.8 kilometre environmental and active travel corridor located in Sydney's inner west. It is a hub for community arts and groups, bush care sites, walking and cycling and features bike paths and foreshore walks, cultural and historical sites, cafes and a range of parks, playgrounds and sporting facilities. The Greenway corridor follows the Inner West light rail corridor and Hawthorne Canal and runs from Iron Cove in the north to the Cooks River to the south. There is currently an existing shared walking/cycle path that runs from Iron Cove to the rail bridge west of Lewisham station. The route to the Cooks River is then completed via a combination of shared paths and on-road bike routes. An existing shared walking/cycle path is provided at Johnson Park, near Arlington Light Rail Station, which crosses the project area at Constitution Road and travels along Windsor Road.

There are proposals for a new Greenway shared path along the entirety of the Greenway corridor between Iron Cove and the Cooks River, which would pass the transmission cable route near Arlington Light Rail Station (refer to **Figure 4-5**). The proposed shared path would cross the project area at Constitution Road and Terry Road.

The Greenway Master Plan was adopted by Inner West Council on 14 August 2018 and includes proposals for $57 million of works to be implemented over the long term. High priority works are anticipated to be completed by 2022 and may overlap with the anticipated construction of the project. The proposed shared path interface with the transmission cable route is presented.

G:\ENVIGIS\Projects\605\60558835 Rookwood to Beaconsfield EIS\FIGURES\2019\Traffic\60558835 F4-5 Greenway Proposed Shared Path Crossing the Project Route 26 08 2019

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GREENWAY PROPOSED SHARED PATH CROSSING THE PROJECT ROUTE

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Note: The project area is confined to the roadway reserve with the exception of parks and existing substations

Source: Department of Finance, Services and Innovation - Spatial Services (2018), Nearmap (2018), Inner West Council (www.greenway.org.au, 2019)

FIGURE 4-5

5.0 Assessment of potential impacts

This section focuses on the assessment of potential impacts on the roadways (including bus, bicycle and pedestrian networks) from the construction of the project. Potential impacts of construction traffic generated by the project and the potential for traffic impacts during project operation are also addressed.

5.1 Transmission cable route

5.1.1 Road network

To understand the potential impacts of construction of the proposed transmission cable circuit, a number of assumptions were made, as outlined in **Section 3.3.2** to **3.3.8**. Using these assumptions, the required width of a work site and area required to maintain traffic flow was compared with the existing width of individual roads to determine if traffic flow can be maintained around a work site or if a diversion route would be required.

5.1.1.1 Trenching and excavation – kerbside work site traffic management approach

The proposed traffic management approach for each road along the transmission cable route is presented in **Table 5-1** for trenching and excavation construction activities. The table indicates that traffic flow is maintained on all state roads, with diversions required on some sections of the regional and local road network. The information presented is based on the kerbside scenario only, which is intended to reflect a realistic assessment of the likely traffic management approach. Under the kerbside scenario, the location of the trench and tipper truck are interchangeable, and therefore it is expected that the outcome of the majority of the locations along the route during trenching and excavation would be covered by assessing this scenario.

The assumptions used represent a conservative assessment, which considered the narrowest 'pinch-point' along each road, the typical maximum width required for a work site, and the required available space for vehicles to pass (including buses where the work site is located along a bus route). As a conservative assessment, the outcome of the assessment also assumed buses would not be diverted. If buses were able to be diverted, an additional half a metre could be used for the assessment along roads containing bus routes, and the number and location of any lane closures/diversions could differ from those presented in **Table 5-1**.

A summary of the percentage of local, regional and state roads where traffic flow is likely to be maintained or where diversions may be required are illustrated in **Figure 5-1**.

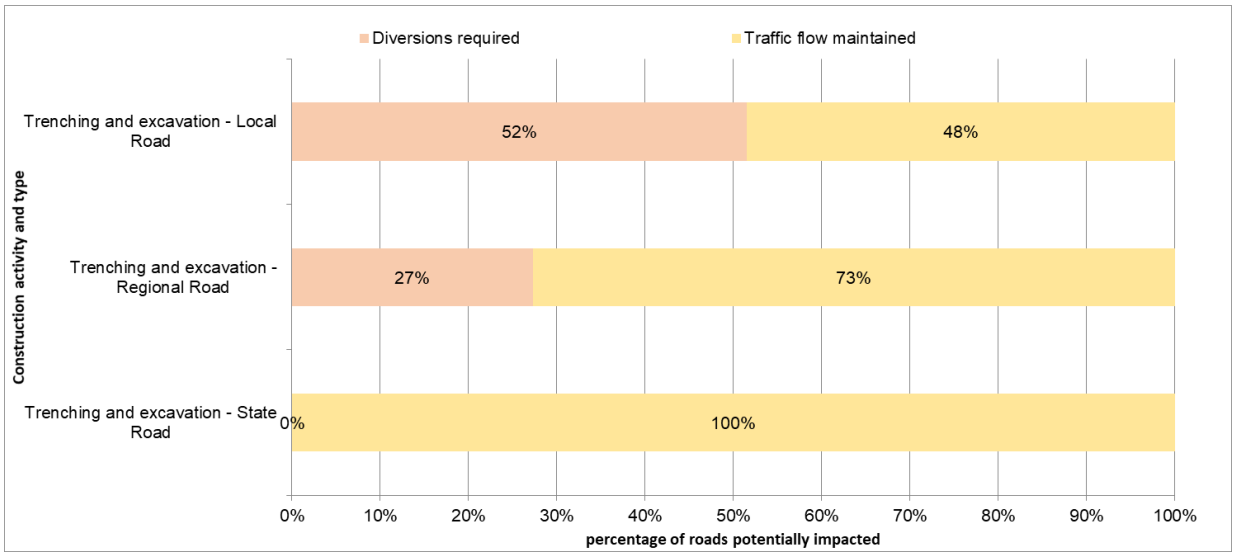


Figure 5-1 Summary of traffic management approaches during trenching and excavation

Table 5-1 Summary of traffic management approach for each road along transmission cable route

Precinct	Road name	Classification	Minimum road width (metres)	Bus Route	Traffic management approach for trenching and excavation
Precinct 1	William Holmes Street	Local Road	9	No	Diversions required
	Rookwood Road	State Road 190	23	Yes	Traffic flow maintained
	Muir Road	Local Road	20	Yes	Traffic flow maintained
	Hume Highway*	State Road 2	23	Yes	Traffic flow maintained
Precinct 2	Hillcrest Avenue	Local Road	11	Yes	Diversions required
	Rawson Road (between Hillcrest Avenue and Waterloo Road)	Local Road	10.5	No	Diversions required
	Waterloo Road*	Regional Road 7118	12	Yes	Traffic flow maintained
	Rawson Road (between Waterloo Road and Maiden Street)	Local Road	10	Yes	Diversions required
	Maiden Street	Local Road	9	No	Diversions required
	Juno Parade (between Maiden Street and Acacia Avenue)	State Road 636	12.5	Yes	Traffic flow maintained
	Acacia Avenue	Local Road	10.5	No	Diversions required
	Wangee Road (between Acacia Avenue and Roberts Road)	Local Road	9.5	Yes	Diversions required
	Roberts Road*	State Road 200	24	No	Traffic flow maintained
	Wangee Road (between Roberts Road and Skyline Street)	Local Road	10.5	No	Diversions required
	Wangee Road (between Skyline Street and Punchbowl Road)	Local Road	10.5	No	Diversions required
	Punchbowl Road*	State Road 549	19.5	Yes	Traffic flow maintained
	Wangee Road (between Punchbowl Road and Yangoora Road)	Local Road	12	No	Traffic flow maintained
	Yangoora Road (between Wangee Road and Neale Street)	Local Road	9.5	No	Diversions required
	Neale Street	Local Road	10.5	No	Diversions required
	Lucerne Street (between Neale Street and Knox Street)	Local Road	11.5	No	Traffic flow maintained
	Knox Street	Local Road	12	No	Traffic flow maintained

Precinct	Road name	Classification	Minimum road width (metres)	Bus Route	Traffic management approach for trenching and excavation
	Walker Street (east of Knox Street)	Local Road	9	No	Diversions required
	Carter Street (west of Burwood Road)	Local Road	11	No	Traffic flow maintained
	Burwood Road (between Carter Street and Bruce Avenue)	Regional Road 7047	11	Yes	Diversions required
	Bruce Avenue*	Local Road	12.5	No	Traffic flow maintained
	Omaha Street (between Bruce Avenue and First Avenue)	Local Road	12	No	Traffic flow maintained
	Seventh Avenue (between First Avenue and Fifth Avenue)	Local Road	10.5	Yes	Diversions required
	Fifth Avenue*	Regional Road 7067	12	No	Traffic flow maintained
	Seventh Avenue (between Fifth Avenue and Beamish Street)	Local Road	10.5	Yes	Diversions required
	Beamish Street	Local Road	10.5	No	Diversions required
	Byron Street (between Beamish Street and Brighton Avenue)	Local Road	10.5	No	Diversions required
Precinct 3	Option 2: Croydon Avenue (east of Dunstan Street)	Local Road	18	No	Traffic flow maintained
	Option 2: Dunstan Street (between Croydon Avenue and Hay Street)	Local Road	12.5	No	Traffic flow maintained
	Option 2: Hay Street	Local Road	12	No	Traffic flow maintained
	Option 1: Cowper Street (between Brighton Avenue and Lindsay Street)	Local Road	12	No	Traffic flow maintained
	Option 1: Lindsay Street	Local Road	12	No	Traffic flow maintained
	Harmony Street (between Hay Street and Malleny Street)	Local Road	12.5	No	Traffic flow maintained
	Malleny Street	Local Road	12.5	No	Traffic flow maintained
	Cheviot Street (between Malleny Street and Roslyn Street)	Local Road	12.5	No	Traffic flow maintained
	Roslyn Street (between Cheviot Street and King Street)	Local Road	12	Yes	Traffic flow maintained
	King Street	Regional Road 2040	12	Yes	Traffic flow maintained
	Second Street (between King Street and Holden Street)	Local Road	10	No	Diversions required
	Holden Street	Local Road	12	No	Traffic flow maintained

Precinct	Road name	Classification	Minimum road width (metres)	Bus Route	Traffic management approach for trenching and excavation
	Hanks Street (between Holden Street and Old Canterbury Road)	Local Road	12	No	Traffic flow maintained
	Old Canterbury Road	State Road 652	12.5	Yes	Traffic flow maintained
	Arlington Street (between Old Canterbury Road and Constitution Road)	Local Road	10	No	Diversions required
	Option 4b: Constitution Road (between Windsor Road and west of the rail corridor)	Local Road	9	No	Diversions required
	Option 4a: Windsor Road	Local Road	10	No	Diversions required
	Option 4a: Terry Road (between Windsor Road and west of the rail corridor)	Local Road	12.5	No	Traffic flow maintained
	Option 4b: Constitution Road (East of the rail corridor and west of Grove Street)	Local Road	10	No	Diversions required
	Option 4b: Constitution Road (between Grove Street and Denison Road)	Local Road	10	No	Diversions required
	Option 4b: Denison Road (between Constitution Road and Hill Street)	Local Road	10	No	Diversions required
	Option 4a: Hill Street (east of the rail corridor and west of Denison Road)	Local Road	9	No	Diversions required
	Denison Road	Local Road	10	No	Diversions required
	Pigott Street (between Denison Road and New Canterbury Road)	Local Road	9.5	No	Diversions required
	New Canterbury Road*	State Road 167	12.5	No	Traffic flow maintained
	Herbert Street (between New Canterbury Road and Fairfowl Street)	Local Road	12	No	Traffic flow maintained
	Fairfowl Street	Local Road	5.5	No	Diversions required
	Pile Street (between Fairfowl Street and Livingstone Road)	Local Road	12	No	Traffic flow maintained
	Livingstone Road	Local Road	12.5	Yes	Traffic flow maintained
	Hawkhurst Street	Local Road	12.5	No	Traffic flow maintained
	Centennial Street	Local Road	8	Yes	Diversions required

Precinct	Road name	Classification	Minimum road width (metres)	Bus Route	Traffic management approach for trenching and excavation
	Sydenham Road	State Road 664	12.5	No	Traffic flow maintained
	Option 5b: Neville Street (between Sydenham Road and Surrey Street)	Local Road	7	No	Diversions required
	Option 5b: Surrey Street	Local Road	7	No	Diversions required
	Option 5b: Charles Street	Local Road	12.5	No	Traffic flow maintained
	Option 5a: Centennial Street (east of Sydenham Road)	Local Road	12.5	No	Traffic flow maintained
	Option 5a: Amy Street (south of Horton Street)	Local Road	12.5	No	Traffic flow maintained
	Option 5a: Horton Street	Local Road	12.5	No	Traffic flow maintained
	Option 5a: Illawarra Road (between Horton Street and Charles Street)	Local Road	9	No	Diversions required
Precinct 4	Illawarra Road (north of Charles Street)	Local Road	9	No	Diversions required
	Option 6b: Addison Road	Regional Road 7018	10.5	Yes	Diversions required
	Option 6a: Agar Street	Local Road	9	No	Diversions required
	Option 6a: Newington Road (between Agar Street and Enmore Road)	Local Road	6.5	No	Diversions required
	Option 6b: Enmore Road (between Newington Road and Scouller Street)	Regional Road 2021	13	Yes	Traffic flow maintained
	Option 6b: Addison Road	Regional Road 7018	10.5	Yes	Diversions required
	Option 6b: Enmore Road (between Addison Road and Scouller Street)	Regional Road 2021	13	Yes	Traffic flow maintained
	Scouller Street	Local Road	12.5	No	Traffic flow maintained
	Juliett Street	Local Road	12	No	Traffic flow maintained
	Llewellyn Street	Regional Road 7018	12	No	Traffic flow maintained
	Edgeware Road (between Llewellyn Street and south of Darley Street)	Regional Road 7017	12	Yes	Traffic flow maintained
Precinct 5	May Street (west of Campbell Street to Princes Highway)	Regional Road 2099	7	No	Diversions required

Precinct	Road name	Classification	Minimum road width (metres)	Bus Route	Traffic management approach for trenching and excavation
	Princes Highway*	State Road 1	21[1]	Yes	Traffic flow maintained
	Barwon Park Road	Local Road	12.5	No	Traffic flow maintained
	Euston Road*	Local Road	12	No	Traffic flow maintained
	Burrows Road	Local Road	12	No	Traffic flow maintained

Notes:

1 The width of the western end of May Street near Bedwin Road is currently under construction. At the time of preparation of this report, it is unknown what the final width of the road will be at this location. As such, the narrowest road width of May Street, excluding the construction zone has been taken for the purpose of this assessment.

* The transmission cable route only crosses these roads. The crossing works would be done in stages to maintain traffic flow.

5.1.1.2 Trenching and excavation – non-kerbside work site traffic management approach

At locations where the trenching and excavation cannot be completed at the kerbside, the non-kerbside construction methodology would be used. Under this scenario, the work site would likely be located close to the centre of the carriageway, and if possible, traffic would be diverted along either side of the work site. This would only be possible on roads that are between 14.7 – 15.7 metres wide, as a minimum. The majority of the roads along the route are narrower than this, and therefore it is probable that more diversions would be required than those presented in **Table 5-1**. However, the non-kerbside scenario would only apply as an exception at locations where kerbside construction is not possible, and therefore the number of roads likely to be impacted would be significantly less.

It is anticipated that where non-kerbside construction is required along the state road network, all of these roads along the transmission cable route would be able to maintain traffic flow based on the dimensions presented in **Table 5-1**.

5.1.1.3 Excavation and establishment of joint bays - work site traffic management approach

Joint bays are generally required to connect two sections of transmission cable circuit. It is anticipated that joint bays would be located approximately every 600-800 metres along the transmission cable route and as such not all roads would be impacted by joint bay construction works. The location of the joint bays have not yet been confirmed, and therefore more detailed impacts from the excavation and establishment of joint bays will be assessed during the detailed design stage on a site by site basis.

In summary, as described in **Section 3.3.4**, the required work site width for this construction activity is wider than for trenching and excavation construction activities. Therefore it is likely that where joint bays are required along local and regional roads, it is probable that more diversions would be required than those presented in **Table 5-1**. However, as the joint bays would be located approximately every 600-800 metres, the number of roads likely to be impacted would be significantly less.

It is anticipated that where joint bays are required along the state road network, all of these roads along the transmission cable route would be able to maintain traffic flow based on the dimensions presented in **Table 5-1**.

5.1.1.4 Cable pulling and jointing - work site traffic management approach

As discussed in **Section 5.1.1.2**, not all roads would be impacted by joint bay construction works. The cable pulling construction activity would only occur at locations that contain joint bays. As the location of the joint bays have not yet been confirmed, a more detailed assessment of impacts of the cable pulling and jointing construction activities will be assessed during the detailed design stage on a site by site basis.

In summary, as described in **Section 3.3.5,** the required work site width for this construction activity is narrower than for trenching and excavation construction activities. Therefore, where cable pulling and jointing construction activities are required along local and regional roads, it is probable that less diversions would be required than those presented in **Table 5-1.** However, as the joint bays will be located approximately every 600-800 metres, the number of roads likely to be impacted would be significantly less.

It is anticipated that where joint bays are required along the state road network, all of these roads along the transmission cable route would be able to maintain traffic flow based on the dimensions presented in **Table 5-1.**

5.1.1.5 Summary of potential impacts on the road network

Table 5-2 categorises the potential impacts resulting from any proposed lane closures and diversions required along the transmission cable route.

Table 5-2 Summary of potential impacts resulting from the traffic management approaches

Traffic management approach	Potential impacts
Mid-block impacts	
Lane closures while retaining two-way traffic flow arrangement	• reduced network mid-block capacity • delays in travel time • increased traffic queues • temporary loss of on-road parking • reduced speed limits • traffic controllers present on-site • potential for works outside of standard construction hours • delays to property access
Lane closures that reduce traffic flow to shuttle working arrangement that requires traffic control to operate	• temporary loss of on-road parking • reduced speed limits • traffic controllers present on-site • potential for works outside of standard construction hours • delays to property access • traffic queues on either side of the work site • potential diversions of bus routes
Diversion routes	• temporary loss of on-road parking • reduced speed limits • traffic controllers present on-site • potential for works outside of standard construction hours • delays to property access • diversion routes required • possible reduction in network performance along diversion route
Intersection impacts	
Works at signalised intersections	• ROL application approved by TMC • reduced intersection capacity • increased traffic queues • temporary loss of on-road parking • potential for works outside of standard construction hours • reduced speed limits • delays to property access • traffic controllers present on-site
Works at priority intersections/roundabouts	• intersection closures if roads have multiple access points, with diversion routes required • access maintained at single access points under shuttle working conditions • reduced intersection capacity • increased traffic queues • temporary loss of on-road parking • potential for works outside of standard construction hours • delays to property access • traffic controllers present on-site

A quantitative assessment of the likely impacts on network performance has not been undertaken at this stage of the project. This would occur after the detailed design where each work site would be included in the CTMP and the CTMP would, outline the proposed methodology for managing traffic flow around the work site and mitigation measures to reduce any potential impacts, including the preparation of a TCP. A detailed assessment of the traffic impacts would be undertaken at this time, which would consider traffic modelling and mid-block capacity assessments (where required) to identify the potential impacts of lane closures and proposed diversion routes.

During construction planning, alternative construction methodologies and traffic management approaches to those outlined in this assessment would be considered to identify additional measures that may reduce traffic impacts. Management and mitigation measures are discussed further in **Section 6.0**.

5.1.2 Bus routes

The majority of the bus routes would be able to continue to operate uninterrupted with minor temporary amendments to the location of the bus stops when the construction works are near a bus stop. However, some bus routes may need to be diverted due to instances where roads are too narrow for a bus to pass when construction works are in progress.

Table 5-3 presents the roads that contain bus stops and the likely impact to the bus route. In all cases, consultation with TfNSW and the bus operators would be required in advance to ensure the successful diversion of routes and relocation of bus stops as and when required in accordance with the construction program.

Table 5-3 Summary of potential impacts along bus routes

Precinct	Street name	Bus routes	Trenching and excavation
Precinct 1	Rookwood Road	M92	Relocate bus stop
	Muir Road	925	Relocate bus stop
	Hume Highway	925	Relocate bus stop
Precinct 2	Hillcrest Avenue	913, 941	Divert bus route
	Waterloo Road	939	Divert bus route
	Rawson Road (between Waterloo Road and Maiden Street)	941	Divert bus route
	Wangee Road (between Acacia Avenue and Roberts Road)	914	Divert bus route
	Yangoora Road (between Wangee Road and Neale Street)	450	Divert bus route
	Burwood Road (between Carter Street and Bruce Avenue)	415	Relocate bus stop
	Seventh Avenue (between First Avenue and Fifth Avenue)	942	Relocate bus stop
	Seventh Avenue (between Fifth Avenue and Beamish Street)	410, 942	Divert bus route
Precinct 3	Roslyn Street (between Cheviot Street and King Street)	413	Relocate bus stop
	King Street	413, 491	Relocate bus stop
	Old Canterbury Road	406	Relocate bus stop
	Livingstone Road	412, 428	Relocate bus stop
	Centennial Street	428	Relocate bus stop
Precinct 4	Enmore Road	355,423,426,428,M30, N40 L23	Relocate bus stop
	Addison Road	428	Divert bus route
	Edgeware Road (between Llewellyn Street and south of Darley Street)	308, 352	Relocate bus stop

5.1.3 Rail and light rail

Impacts to rail and light rail services are associated with the construction works at special crossings (cable bridges and underboring). Impacts would be minimised through consultation with rail authorities.

Where rail authorities deem that a track shut down is required for the works to be undertaken, it is proposed to align construction works with scheduled rail maintenance days or during the night where possible. As such, it is expected that there would be minimal impacts to rail (passenger or freight) and light rail services.

5.1.4 Bicycle routes

5.1.4.1 Bicycle-friendly roads

Where the transmission cable route is located along bicycle-friendly roads (which do not have dedicated bicycle lanes), cyclists would follow the same diversion routes as vehicles (if required). As such, it is anticipated that consideration would be given during the diversion route selection process to include bicycle-friendly roads in order to ensure cycling connectivity and safety is maintained. Provided the affected roads remain open for traffic, cyclists would still be able to use these routes, subject to traffic control. However as with general traffic conditions, there is the potential for increased journey time due to changes in road conditions under traffic control, which may temporarily discourage cyclists from using affected sections of the transmission cable route.

Traffic control measures, including cyclist safety, would be managed through the CTMP.

5.1.4.2 Dedicated cycling lanes

Dedicated cycling lanes are generally provided on-carriageway and are signposted and delineated by line-marking. The transmission cable route is not expected to impact any dedicated on-road cycling lanes.

5.1.4.3 Separate dedicated cycleways

Separate dedicated cycleways are provided away from the carriageway, where cyclists have priority. These are generally provided as lanes within the carriageway and separated by a median strip, or as shared pedestrian/cycle paths along the footpath. This cycling infrastructure would be carefully managed so that cycle access is maintained at all times by either keeping the cycleway clear of obstruction or providing a diversion route. The sections of the cycleway network likely to be impacted are:

- Lees Park and Croydon Park (Cooks River Cycleway);
- Johnson Park at Arlington Light Rail Station (The Greenway shared path);
- May Street between Campbell Street and Applebee Street (shared path); and
- Sydney Park.

The cycleways through Lees Park and Croydon Park are shared path facilities. Through Lees Park, parts of the shared path linking Harmony Street to Lindsay Street across the Cooks River may be impacted during construction. Similarly for Croydon Park, access to the shared path from Croydon Avenue, which runs along the northern side of the Cooks River and links to Lees Park would be impacted by the project.

Similarly, the construction period for the southern section of the Greenway shared path from Parramatta Road through Lewisham West and Dulwich Hill is planned for completion in 2021. This may overlap with the anticipated construction of the project. Consultation with Inner West Council would be ongoing during project construction in this location. The project has two possible routes that would cross the Greenway shared path, being between Terry Road and Hill Street where the route crosses the rail line, or along Constitution Road. All efforts would be made to ensure access is maintained along the path by locating the send and receive pits for the underbore away from the shared path.

Construction works at these locations may have an impact on users of the shared path facilities (cyclists and pedestrians). If required, sections of the shared path would be closed during construction

periods and depending on the construction activity this could last for a period of up to 8 – 10 weeks. During these construction periods, an alternative shared route would be provided. This could be through identifying a suitable diversion along existing roads and signposting, or if the alternative route is too onerous in terms of distance or grade for example, a temporary surface may be provided around the work site. However, the shared facilities would be reinstated after the completion of the construction works. Further detail on the management of these operations would be prepared during the detailed design stage, in consultation with the relevant local council and outlined in the CTMP.

The cycleway on May Street is provided along the southern footpath as a shared pedestrian/cycle path, which is separate from the carriageway. It is anticipated that generally the works would be undertaken within the channels of the carriageway, so it is not expected that this cycleway would be impacted. However, if works are required within the shared path, a diversion route would be signposted for cyclists, which may involve using the carriageway on May Street or alternative diversion routes.

The cycleway through Sydney Park is a dedicated off-road cycleway facility for cyclists. Some parts of the cycleway would be impacted during construction but would be reinstated as soon as possible to minimise disruption to the cycleway. However, in all instances an alternative cycle route within the park would be signposted for cyclists with prior warning to guide them around work sites. There are multiple cycle routes within the park which allows for internal diversions to occur as the cycle paths will not all be closed simultaneously. Further detail on the management of these operations would be prepared during the detailed design stage, in consultation with the relevant local council and outlined in the CTMP.

5.1.5 Pedestrian routes

Where works are required within the footpath, a diversion around the work site would be required. Generally, as stated in the Austroads *Guide to Road Design Part 3*, the desirable minimum width of a footpath is 1.2 metres. These widths should be increased where high pedestrian volumes are anticipated, on a shared path, or where the footpath is to cater for people with disabilities. As such, provided that there is a minimum of 1.2 metres along one side of the work site, pedestrians can be diverted while continuing to remain on the footpath. Where this minimum width cannot be achieved, pedestrians would need to be diverted onto the opposite footpath prior to the work site at an appropriate crossing location (generally as a marked pedestrian crossing or at a signalised intersection), or be diverted onto the carriageway. Carriageway diversions would be managed through the CTMP and relevant TCPs prepared to safely allow pedestrians to pass the work site on the carriageway. This would further require roadside parking to be prohibited and part of a traffic lane closed to achieve this. However, pedestrians cannot be diverted on to the carriageway during footpath works along roads with high speed and/or traffic volumes.

Generally, provided adequate traffic management and/or diversion routes are available, the impacts to pedestrians would be negligible as pedestrian routes would be maintained at all times throughout the life of the project. Furthermore, it is not anticipated that the part-closure of a traffic lane along the transmission cable route would have a significant impact on pedestrian route network performance; however this would be determined when the CTMP is prepared.

5.1.6 Car parking

On-road parking along the transmission cable route would need to be temporarily restricted for the duration of works at specific work sites to ensure that the work site remains clear. Depending on the width of the carriageway, parking on one or both sides of the carriageway may need to be temporarily restricted for the duration of the works to ensure that there is sufficient width for the work site and through traffic to pass. As discussed in **Section 3.3.8**, the length of a work site would generally be between 55 and 95 metres. Assuming the work site lengths range between 55 and 95 metres, existing on-road parking for the length of each work site would be impacted. The design of temporary ‘no stopping’ restrictions would be undertaken during the detailed design stage and mitigation measures outlined in the CTMP for the project, and managed by the construction contractor. Furthermore, consultation would be required with the relevant road authorities and nearby residents.

In addition, it is noted the transmission cable route follows a path through the western car park at Sydney Park. The section of the car park to the south of May Street would be closed for the duration of the construction works at this location. The car park contains around 83 car parking spaces, and

during construction 19 of these car parking spaces in the area to the north of May Street would be able to remain open provided sufficient access/egress can be managed. The remainder of the car parking spaces would be closed. Alternative parking would still be available at the northern car park, accessed from Sydney Park Road. During works at this location, some users of the car park would need to find alternative parking arrangements potentially adding to the demand for on-road parking on nearby roads. However, impacts would be temporary and existing parking arrangements would be re-instated upon completion of construction works at this location.

5.1.7 Road safety

There would be an increase in the number of construction vehicles and multiple work sites along the transmission cable route during the construction program. All traffic management controls implemented along the transmission cable route would be designed and implemented by suitably qualified technicians in accordance with the *Traffic control at work sites manual* (Roads and Maritime 2018). Furthermore, the proposed traffic management approaches would be subject to the road safety audit process. A specially trained road safety auditor would provide commentary on the proposed traffic management approach and identify any areas of risk. Therefore, it is not anticipated that the increase in construction vehicle volumes and work sites would have detrimental impacts on road safety.

5.1.8 Property access

In principle, vehicle access to residences and businesses would be retained throughout construction. However, while driveways of private properties would be avoided wherever possible, it is likely that there will be some disruptions to access during activities such as trenching, joint bay establishment and cable jointing. During trench and joint bay excavations, affected landowners/occupants would be given prior notice about the anticipated access disruptions. Consultation would occur with affected property occupants, in accordance with the Community Consultation Framework (CCF) (refer to **Appendix C** of the EIS), to identify appropriate timeframes for restricting access or to negotiate alternative arrangements.

When cable jointing is occurring at joint bays near driveways, access to these properties would not be possible. As jointing could take up to three weeks, affected owners/occupants would be informed and feasible and reasonable solutions for access to their specific location discussed.

Access for emergency service vehicles would be maintained at all times. Access for waste collection would be arranged with the local waste collection agency. The contractor will relocate bins to a suitable area for collection that is accessible by the waste collection agency and does not obstruct the work site.

5.1.9 Night works and off-peak works

Works would be required outside of standard construction hours at work sites that contain signalised intersections or along strategic and busy sections of the arterial and sub arterial road network. It is likely that this would be a condition required by the TMC, where works are proposed that would impact the performance (especially during peak periods) of its network assets. Working outside of standard construction working hours would allow the impacts of the proposed works to be mitigated by working at a time where road network demand is at its lowest, and the impact of lane closures or diversions can be accommodated within the surrounding road network.

Furthermore, should diversion routes be required along strategic local roads that experience significant through traffic, the construction activity would likely be restricted to outside of standard construction hours or off-peak times to minimise disruption. The implementation of proposed diversion routes would be made in consultation with the relevant roads authority and other stakeholders as required. Where diversion routes are required on local roads, consultation with residents will be undertaken in accordance with the CCF, to ensure they are informed of potential impacts. Where access to a property cannot be guaranteed, consultation would be undertaken with affected property occupiers to identify appropriate timeframes for restricting access, or to negotiate an alternative solution.

5.2 Construction vehicle traffic generation

5.2.1 Vehicle classification

The largest heavy vehicle that would require access to a work site would generally be a 19 metre truck and dog trailer, which would transport spoil from the work site. There would be a variety of different vehicle types used on-site depending on their function, including Small Rigid Vehicles (SRV), Medium Rigid Vehicles (MRV) and 10 tonne tipper trucks.

5.2.2 Heavy vehicle routes

Generally, heavy vehicles would use the arterial road network to travel to/from the work sites and construction laydown areas and would avoid using local residential roads, where possible. It is likely that heavy vehicles would follow the routes classified as heavy vehicle routes by Roads and Maritime, which includes bus routes, where possible, as these routes are already designed to accommodate the turning paths of heavy vehicles. Detailed turning path analysis would be undertaken when the CTMP is prepared for the project to ensure that the vehicles can complete the required turning movements along the nominated route to/from the work site or construction laydown area. If the desired vehicle type cannot be accommodated on the nominated route, smaller vehicles would be required.

5.2.3 Traffic generation

Construction activities would generate a number of vehicle trips across the project area. Standard working hours have been assumed for the duration of works at the various work sites for the purposes of a worst case assessment as they include the peak traffic periods (7:00 am – 9:00 am and 4:00 pm – 6:00 pm). The following section describes the forecast construction traffic generation impacts at the work sites, substations and construction laydown areas.

5.2.3.1 Construction works at laydown areas

Five construction laydown areas have been assessed in the project area. It is assumed that they are in operation at the same time, for the duration of the construction period (up to two years). Each construction laydown area is expected to generate in the region of about four light vehicle trips and twelve heavy vehicle trips per day. If the expected daily trip generation occurred during the network peak hour (AM or PM as a worst case scenario and unlikely to occur), this would represent a trip rate of around one trip every four minutes over the network peak hour. Net traffic volume increases of such a low order are not expected to have a material impact on the operation or performance of the surrounding road network.

5.2.3.2 Construction at transmission cable route work site

It is forecast that up to four work sites would be in operation at any time along the route during trenching and excavation and joint bay excavation. Each work site is expected to generate in the region of four light vehicle trips and 24 heavy vehicle trips per day. With heavy vehicle trips accounting for the transportation of spoil and construction materials, it is not expected that all 24 trips would occur within the network peak hour. It is therefore assumed that during the network peak hour, only around eight combined light and heavy vehicle trips would be generated. This would represent a trip rate of one trip every seven and a half minutes for each work site. Net traffic volume increases of such a low order are not expected to have a material impact on the operation or performance of the surrounding road network.

5.2.3.3 Construction works at substations

It is forecast that works could occur simultaneously at each of the three substations, located at Rookwood Road, Beaconsfield West and Sydney South. The forecast traffic generation for each of the work sites is presented in **Table 5-4**.

Table 5-4 Summary of substation trip generation and access/egress driveways

Substation	Number of vehicle trips per day	Driveway location
Rookwood Road	Light vehicles: 3-4 Heavy vehicles: 4	William Holmes Street
Beaconsfield West (site also identified as a construction	Light vehicles: 3-4 Heavy vehicles: 12	Burrows Road

Substation	Number of vehicle trips per day	Driveway location
laydown area)		
Sydney South	Light vehicles: 5-6 Heavy vehicles: 6	Henry Lawson Drive

If the expected daily trip generation occurred during the network peak hour, this would represent a trip rate of one trip every seven and a half minutes at Rookwood Road substation, one trip every four minutes at Beaconsfield West substation, and one trip every five minutes at Sydney South substation. Net traffic volume increases of such a low order are not expected to have a material impact on the operation or performance of the surrounding road network.

5.2.4 Work crews

5.2.4.1 Typical work crew size

A typical work crew would have between four and six workers during trenching and backfilling, and between 12 and 15 workers during cable pulling. Works at substations would have between 20 and 30 workers. Some workers would have their own trucks containing tools and materials, which would need to be brought to site. It is envisaged that the number of trucks required to be brought to site would be minimised and managed by the site supervisor. Worker parking on local roads would be restricted where possible, and management measures implemented to ensure work vehicles are parked in designated public parking areas and workers transported to and from the work sites.

5.2.4.2 Workforce parking

In general, workers would be encouraged to use public transport to reduce the amount of parking on local roads. Requirements for on-road parking on local roads would be managed by the construction contractor. At the substations, parking for the workforce would generally be made available on-site to ensure impacts to on-road parking are kept to a minimum. As the workforce numbers are small and time spent in any one location along the transmission cable route is temporary, impacts to network performance and surrounding on-road parking are expected to be minimal.

5.2.4.3 Light vehicle trip generation

Light vehicles would be required for the site supervisor and site and traffic management crews. Although workers would be encouraged to use public transport to access the work sites to reduce the burden of parking on local roads, it is anticipated that a number of light vehicle trips would be generated by workers. Where construction works start at 7:00 am, it is anticipated that the light vehicle trips would be generated before the AM peak hour. During the PM peak period, trips are expected to be distributed across the PM peak period as workers tend to leave in a staggered fashion. Based on the typical workforce numbers described in **Table 2-6**, under a worst case assessment it is assumed that a maximum of 12-15 vehicles trips would be generated from transmission cable route construction activities, and a maximum of 20-30 vehicle trips at the substations during the PM peak hour. This represents a trip rate of one trip every four minutes along the transmission cable route, and one trip every two minutes at the substations. Net traffic volume increases of such a low order are not expected to have a material impact on the operation or performance of the surrounding road network.

5.2.5 Summary of construction traffic generation impacts

It is anticipated that the traffic impacts from the traffic generated by construction activities would be able to be accommodated within the surrounding road network, with relatively low traffic volumes expected to be generated by the work sites, substation sites and construction laydown areas during peak hours. It is noted that the location of the work sites, construction laydown areas and substations are distributed across the project area. Although multiple construction activities are expected to be undertaken simultaneously, the impacts of the construction activities would also be distributed across the network depending on the location of the work site.

5.3 Operation and maintenance

Once construction is complete, the project is likely to have a negligible impact on the traffic network. Ongoing monitoring and maintenance tasks would generally be by light vehicles only and require

access to pits installed in footpath areas adjacent to the joint bays. These would be accessible within the verge and would not require detailed traffic management. Relevant management measures would be implemented to allow pedestrians to safely pass the work site.

The duration of impacts to access would depend on the nature of the maintenance activities being undertaken i.e. if routine or in response to a major fault, the latter being quite rare. Maintenance crews would utilise appropriate traffic management measures when undertaking work within the road reserve and given the generally infrequent and temporary nature of maintenance works, impacts to traffic and transport are expected to be minimal.

Inspections of cable bridges would involve maintenance crews and appropriate traffic management measures when undertaking work at the roadside, including barricades to restrict approach by the public as required. If railway possessions are required for maintenance works, these would be undertaken during rail possessions planned by the relevant rail network authority so as to not disrupt rail services. Work within the rail corridors would be planned, coordinated and executed in close consultation with the relevant rail network authority, with all relevant access and safety requirements met.

Operation and maintenance at the substations would be within the existing operating footprint. Any vehicles associated with these works can be accommodated within the substation site. Operation of the project at the substations would not increase the number of vehicles required and as such no additional traffic and transport impacts at the substations have been identified.

Maintenance activities would also be undertaken in accordance with existing TransGrid procedures and management systems.

6.0 Management measures

6.1 Management objectives

The main objectives of the proposed management measures are to minimise the impacts that the project would have on road, public transport and active transport networks.

A high level, qualitative assessment was undertaken to provide an understanding of the overall impacts on traffic and transport and to identify the traffic management approach required for construction activities along the transmission cable route. This assessment considered a conservative scenario based on assumptions for maximum widths of work sites, minimum required widths for traffic lanes (including to allow buses to pass, where relevant) and potential lengths of the work sites.

During detailed design and construction planning, alternative construction methodologies and traffic management approaches to those outlined in this assessment would be considered to identify additional measures that may reduce traffic impacts. For example, an alternative construction methodology may reduce the width requirements for the work site, which could result in more roads being able to remain open for two-way traffic flow under shuttle working conditions. It may also be possible to divert bus routes, which would allow light vehicles to pass the work site, resulting in the road operating under shuttle working conditions rather than requiring diversions. Therefore, it is possible that less diversions may be required and traffic flow maintained along a larger proportion of the transmission cable route. Implementation of these measures would be assessed on a site specific basis.

During the detailed design, a quantitative assessment would be undertaken to assess the impacts on road network performance. Where diversion routes are proposed, the impact of additional traffic using these diversions will be tested and assessed, and the diversion route option that maintains the best network level of service will be selected. Where lane closures are proposed, mid-block capacity assessments will be undertaken to ensure the network can still operate at a satisfactory level of performance. On high demand routes, where reducing the road capacity would have unsatisfactory impacts on network performance (as determined by the relevant roads authority), work will need to be undertaken at a time where the network impact is reduced to a satisfactory level.

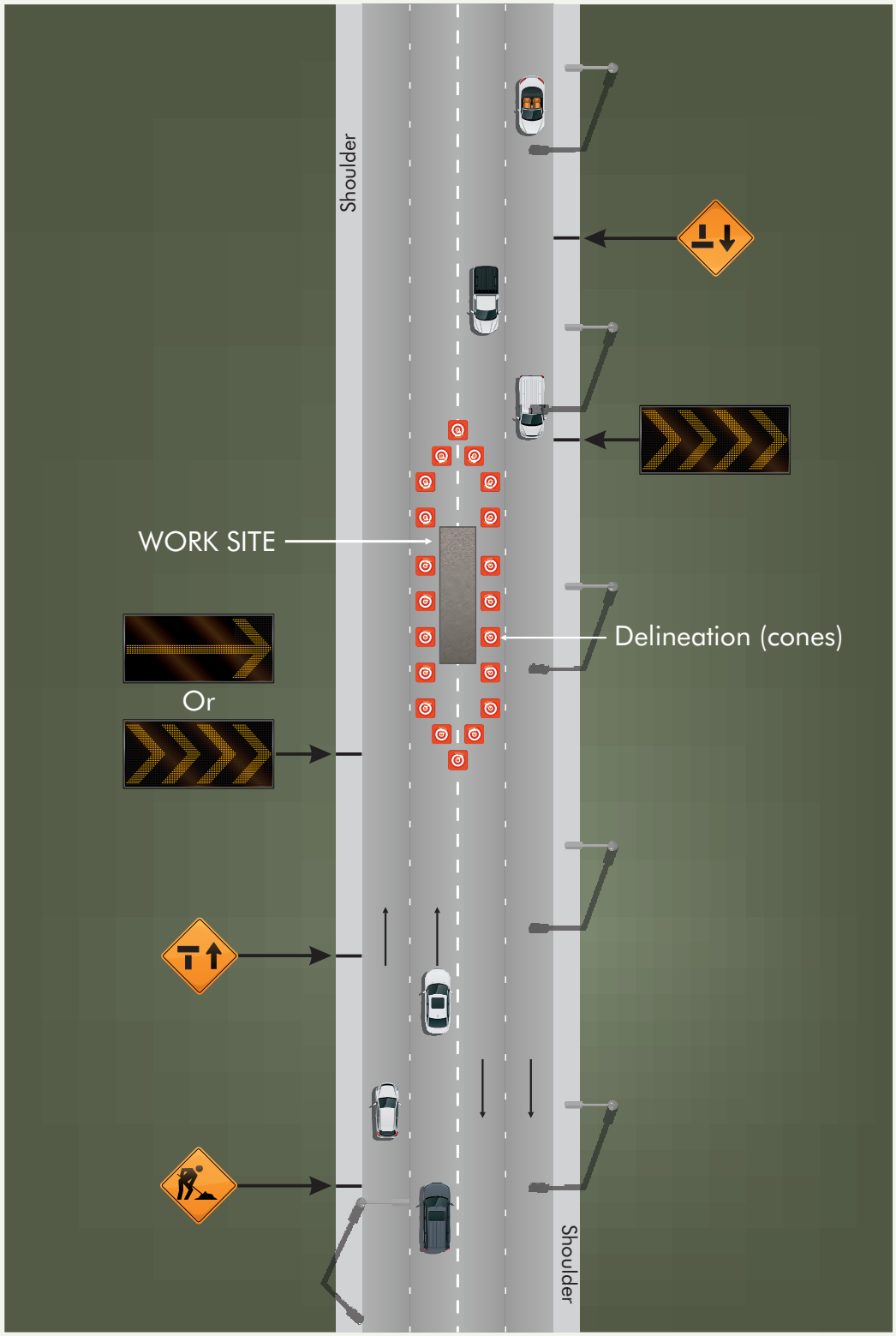
6.2 Environmental management and mitigation measures

6.2.1 Construction traffic management plan

A CTMP will be produced for the project that will describe the construction activities being proposed, assess the impact at each work site and on the general area (including public transport passengers, cyclists, pedestrians, motorists and commercial operations) and detail how these impacts are being addressed. The CTMP will outline:

- the construction activities being proposed at the work sites;
- traffic assessment, including traffic counts, modelling and/or mid-block capacity assessments (where required), to identify the potential impacts of lane closures and proposed diversion routes;
- traffic management measures to ensure the construction activities can be undertaken within the road reserve at the work sites in a safe manner;
- traffic management measures to be put in place to manage network performance from lane closures, and proposed diversion routes; and
- measures to minimise parking impacts to surrounding receivers as far as possible.

The CTMP will be supported by work site specific TCPs and Speed Limit Sign Location Plans. The TCP shows how traffic would be safely separated from other road users and is usually in the form of a diagram (refer to **Figure 6-1** for an example TCP). It is also an occupational health and safety requirement and will comply with Australian Standard *AS1743.3 Road Signs - Specifications*. The Speed Limit Sign Location Plan marks the exact location and speed limit of all speed limit signs at or in a work site as outlined in the *NSW Speed Zoning Guidelines* (Roads and Maritime, 2011).



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EXAMPLE TCP TO RETAIN TWO-WAY FLOW EITHER SIDE OF A WORK SITE

Powering Sydney's Future

Potts Hill to Alexandria Transmission Cable Project

FIGURE 6-1

6.2.2 Stakeholder consultation

Stakeholders impacted by works along the transmission cable route need to be well informed of the proposed works and likely impacts at all stages of planning and construction. Community consultation and communication with government agencies and public transport service providers will assist in the development of appropriate and comprehensive traffic control measures. A CCF has been prepared for the project (refer to **Appendix C** of the EIS). The CCF identifies relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving key stakeholder and community complaints during construction and operation. The CCF also addresses traffic management issues.

6.2.3 Approvals and permits

A number of approvals and permits would be required to undertake the proposed construction work along the transmission cable route on state roads only. Works on local roads do not require local council authorisation under the *Roads Act 1993* or under the *Electricity Supply Act 1995* (as network operators do not require approval to carry out electricity works on land under the control and management of a public or local authority) - refer to **Section 3.2** for further information.

For works on state roads, a ROL allows the proponent to use a specified road space at approved times, and is required for any activity likely to impact on traffic flow. As such, with the majority of the transmission cable route being located along the carriageway and impacting traffic flow, ROLs on state roads will be required. ROLs on state roads will be licenced by the TMC.

The ROL application will be supported by the submission of the CTMP, which will include the TCPs and Speed Limit Sign Location Plans.

Summary of environmental management and mitigation measures

Management measures for the project are listed in **Table 6-1**.

Table 6-1 Environmental management and mitigation measures

No.	Impact/issue	Environmental management and mitigation measures	Timing
TT1	General traffic impacts	Alternative construction methodologies and traffic management approaches will be considered to identify additional measures that may reduce potential impacts.	Detailed design and construction
TT2	General traffic impacts	A CTMP will be produced for the project that will outline the proposed methodology for managing traffic flow around the work sites, traffic assessment, traffic counts, modelling and/or mid-block capacity assessments to confirm measures to be put in place to manage network performance from lane closures and proposed diversion routes. The CTMP will include effective traffic management measures for the proposed work sites to ensure the construction activities can be undertaken in a safe manner. The CTMP will also consider worker parking requirements and the temporary loss of on-road parking. The CTMP will be supported by TCPs.	Detailed design and construction
TT3	General traffic impacts	TCPs will be prepared for each work site. The TCP will graphically show the required traffic control at the work site, which will include, for example, lengths of merge/diverge tapers, location of traffic cones, traffic controllers, warning signage and speed limit sign locations, as required. Each TCP will be prepared by a suitably qualified technician in accordance with the *Traffic control at work sites manual* (Roads and Maritime 2018) and will comply with the requirements of *AS1743.3 Road Signs - Specifications*.	Detailed design and construction

No.	Impact/issue	Environmental management and mitigation measures	Timing
TT4	Road closures	In the event of road closures, diversion routes will be provided along with an assessment of the likely network performance of the proposed diversion. Where required, demand management measures will be considered in consultation with the relevant roads authorities to reduce traffic on key corridors affected by construction activities for the project, by directing traffic to other appropriate roads. Diversion routes and demand management measures will be documented in the CTMP.	Detailed design and construction
TT5	Active transport impacts	Where feasible, reasonable and safe, impacts on active transport (walking and cycling) modes and routes will be minimised by maintaining access around work sites or providing diversion routes.	Construction
TT6	Vehicle access	Vehicle access to residential and business properties will be maintained at all times, where possible. Where restricting access to properties is required to enable construction works, vehicle access will be restored as soon as possible. Where access to a property cannot be maintained, affected owners/occupants will be informed and feasible and reasonable solutions for access to their specific location discussed.	Construction
TT7	Emergency access	Access for emergency services vehicles will be maintained at all times.	Construction
TT8	Community and stakeholder consultation	TransGrid will engage with relevant stakeholders including Roads and Maritime, TfNSW TMC, public transport service providers (e.g. Sydney Trains, Transdev and the State Transit Authority), waste collection agencies, local councils and local residents and businesses regarding potential traffic and access impacts and management options, in accordance with the CCF. TransGrid will work with TfNSW and bus operators to ensure that sufficient lead time and comprehensive public notification is provided, regarding changes to bus stops and services, and that alternative arrangements are in place to minimise disruption during road changes. Consultation regarding the potential overlap of construction works for the project and other adjacent projects will be undertaken during detailed design to ensure that the works are coordinated, where possible.	Detailed design and construction
TT9	Impacts to bus routes	All diversions of bus routes will be agreed with TfNSW and bus operators prior to the traffic management approach being finalised; and will consider acceptable routes based on the turning paths of these vehicles.	Detailed design and construction

No.	Impact/issue	Environmental management and mitigation measures	Timing
TT10	Laydown areas	The construction laydown areas will undergo a detailed design to ensure that access/egress is possible for the nominated construction design vehicle, and to ensure that impacts to the road network are mitigated and managed. This design would be presented within the CTMP for the project.	Detailed design and construction
TT11	Parking	Workers will be encouraged to travel to the work sites using public/active transport where possible. However, some on-street parking may be required at work sites. The CTMP will detail measures to minimise parking impacts to surrounding receivers as far as possible (e.g. not parking near schools/child care centres during drop off and pick up times or not parking close to sensitive land uses with high on-road parking demand, such as hospitals).	Construction

7.0 Conclusion

This Traffic and Transport Assessment presents a high level assessment of the likely impacts to the transport network along the transmission cable route and from upgrades to the substations.

The method of assessment for the transmission cable route used a number of assumptions to establish the maximum width of the required work sites during the three key construction activities: trenching and excavation, excavation and establishment of joints bays, and cable pulling/jointing. The assessment was carried out for two options: works undertaken along the kerbside and non-kerbside. Once the available road space remaining for traffic was calculated, the potential traffic management measures were identified, which included lane closures allowing for uninterrupted two-way traffic flow, two-way traffic flow under shuttle working conditions or diversion routes required.

The assessment of the transmission cable route concluded that traffic flow is maintained on all state roads, with diversions required on some sections of regional and local roads. About 50% of the affected regional roads and 51% of the affected local roads on the transmission cable route would require diversions during the trenching and excavation stage.

The number of diversions required would likely be higher during the excavation and establishment of joint bays, and lower during cable pulling and jointing. However, it should be noted that if a joint bay is located along a state road, traffic flow would be maintained.

Lane closures and diversions could result in reduced mid-block and/or intersection capacity along affected roads and delays in travel times. The quantification of these impacts would occur during the detailed design stage.

The assessment also considered potential impacts on the public transport and active transport networks. It determined that some bus routes would be able to operate with minor amendments to the bus stop locations; however some routes may need to be diverted due to the available road width not being sufficient for a bus to pass the work site. At this stage, the quantum of impact is unknown as several factors may influence the impact on public transport, including the final alignment of the transmission cable route, further detailed design, method of construction selected by TransGrid, and consultation with TfNSW and bus operators, who would provide authorisation to relocate stops and divert bus routes. It is anticipated that there would be minimal impacts to rail and light rail services as it is proposed to align the works with scheduled rail maintenance days or during the night where possible.

It was concluded that there would be minimal impacts on the cycling infrastructure/bicycle network along the route. Where diversion routes are proposed along bicycle friendly roads, cyclists would follow these diversion routes. The transmission cable route does not impact any dedicated cycling lanes, but would impact the separate shared path along the Cooks River. Some pedestrian and cyclist paths through Lees Park, Croydon Park, the Greenway and Sydney Park may also be temporarily impacted. Further detail on the management of these operations would be prepared during the detailed design stage and in consultation with the local councils.

On-road parking along the transmission cable route would need to be temporarily restricted for the duration of works at specific work sites to ensure that the work site remains clear. Depending on the width of the carriageway, parking on one or both sides of the carriageway may need to be temporarily restricted for the duration of the works to ensure that there is sufficient width for the work site and through traffic to pass. The design of temporary ‘no stopping’ restrictions would be undertaken during the detailed design stage, and mitigation measures outlined in the CTMP. Furthermore, consultation with the relevant road authorities and residents would be undertaken, where required, in accordance with the CCF.

The works at the substations would not have adverse impacts on the surrounding road network, due to the works being contained within the site and the low traffic generation numbers for each site. Parking would also be provided on-site where possible.

The management measures outlined within the report are aimed at ensuring that disruptions to the existing transport networks are minimised as much as possible during construction works. The general principles for traffic management measures would include:

- stakeholder consultation;

- approvals and permits, including the application for a ROL for any activity on classified roads, crown roads, or at signalised intersections;
- design and implementation of TCPs to cover works at intersections, mid-block works and works at construction laydown areas;
- speed reduction at work sites;
- working outside of standard construction hours along strategic network links and signalised intersections as required by the relevant road authorities; and
- where possible, maintaining residential, commercial and emergency vehicle access at all times.

Once construction is completed, the project is likely to have a negligible impact on the traffic network. Ongoing monitoring and maintenance tasks would generally be by light vehicles only and require access to pits installed in footpath areas adjacent to the joint bays. These would be accessible within the verge and would not require detailed traffic management. Inspections of cable bridges would involve maintenance crews and appropriate traffic management measures when undertaking work at the roadside.

8.0 References

Austroads 2016 *Guide to Road Design Part 3: Geometric Design.*

Australian Standard 2001 *AS1743.3 Road Signs – Specifications.*

Department of Environment & Climate Change (DECC) 2009 *Interim Construction Noise Guideline*.

Landcom 2004 *Managing Urban Stormwater: Soils and Construction*.

New South Wales Government – State Transit 2011 *State Transit Bus Infrastructure Guide.*

Roads and Maritime Services 2011 *NSW Speed Zoning Guidelines Version 4.0.*

Roads and Maritime Services 2018 *Traffic control at work sites – Technical manual Version 5.0.*

Annexure A

Transmission cable route description

Annexure A Transmission cable route description

Precinct 1 - City of Canterbury Bankstown

- Exit the Rookwood Road substation via William Holmes Drive
- North on Rookwood Road until the intersection of Muir Road
- East on Muir Road until the intersection of the Hume Highway

Precinct 2 - City of Canterbury Bankstown

- Cross the Hume Highway to Hillcrest Avenue
- South on Hillcrest Avenue until the intersection of Rawson Road
- East on Rawson Road until the intersection of Maiden Street
- South on Maiden Street until the intersection of Juno Parade
- East on Juno Parade until the intersection of Acacia Avenue
- South on Acacia Avenue until the intersection with Wangee Road
- East on Wangee Road (crossing Roberts Road and Skyline Street) until the intersection with Punchbowl Road
- South on Wangee Road until the intersection of Yangoora Road
- East on Yangoora Road until the intersection of Neale Street
- North on Neale Street until the intersection of Lucerne Street
- East on Lucerne Street until the intersection of Knox Street
- East on Walker Street and across the rail corridor to Carter Street
- East on Carter Street until the intersection of Burwood Road
- East on Burwood Road until the intersection of Bruce Avenue
- South on Bruce Avenue until the intersection of Omaha Street
- East on Omaha Street until the intersection of First Avenue
- East on Seventh Avenue (crossing Fifth Avenue) until the intersection of Beamish Street
- North on Beamish Street until the intersection of Byron Street
- East on Byron Street until the intersection of Brighton Avenue

Precinct 3 - City of Canterbury Bankstown/Inner West

- Option 2: East crossing the Cooks River at Croydon Park until Croydon Avenue, then north on Croydon Avenue until the intersection of Dunstan Street, east on Dunstan Street until the intersection of Hay Street and south on Hay Street until the intersection of Harmony Street
- Option 3: South along the Mildura Reserve until Lindsay Street pedestrian bridge, then east across the Cooks River and north across Lees Park until the intersection of Harmony Street
- Option 1: South on Cowper Street until the intersection of Lindsay Street, east on Lindsay Street and across the Cooks River then north across Lees Park until the intersection of Harmony Street
- East on Harmony Street until the intersection of Malleny Street
- North on Malleny Street until the intersection of Cheviot Street
- Southeast on Cheviot Street until the intersection of Roslyn Street
- Southeast on Roslyn Street until the intersection of King Street
- North on King Street until the intersection of Second Street
- East on Second Street until the intersection of Holden Street
- North on Holden Street until the intersection of Hanks Street
- East on Hanks Street until the intersection of Old Canterbury Road
- Northeast on Old Canterbury Road until the intersection of Arlington Street
- East on Arlington Street until the intersection of Windsor Road/Constitution Road
- Option 4b: Southeast on Constitution Road crossing Arlington Light Rail Station and Grove Street until the intersection of Constitution Road then southeast on Constitution Road until the intersection of Denison Road and north on Denison Road until the intersection of Hill Street
- Option 4a: North on Windsor Road until the intersection of Terry Road, southeast on Terry Road and across the light rail corridor until the intersection of Hill Street then southeast on Hill Street until the intersection of Denison Road
- Northeast on Denison Road until the intersection of Pigott Street
- Southeast on Pigott Street until the intersection of New Canterbury Road

- East on Herbert Street until the intersection of Fairfowl Street
- South on Fairfowl Street until the intersection of Pile Street
- East on Pile Street until the intersection of Livingstone Road
- South on Livingstone Road until the intersection of Hawkhurst Street
- East on Hawkhurst Street until the intersection of Centennial Street
- Northeast on Centennial Street until the intersection of Sydenham Road
- Option 5b: Northwest on Sydenham Road until the intersection of Neville Street then northeast on Neville Street until the intersection of Surrey Street, southeast on Surrey Street until the intersection of Charles Street and southeast on Charles Street until the intersection of Illawarra Road
- Option 5a: Northeast on Centennial Street until the Henson Park carpark then across Henson Park to Amy Street, southeast on Horton Street until the intersection of Illawarra Road and northeast on Illawarra Road until the intersection of Charles Street

Precinct 4 - Inner West

- Northeast on Illawarra Road until the intersection of Addison Road
- Northeast on Agar Street until the intersection of Newington Road then southeast on Newington Road until the intersection of Enmore Road and southwest on Enmore Road until the intersection of Scouller Street
- Southeast on Addison Road until the intersection of Enmore Road then northeast on Enmore Road until the intersection of Scouller Street
- East on Scouller Street until the intersection of Juliett Street
- South on Juliett Street until the intersection of Llewellyn Street
- East on Llewellyn Street until the intersection of Edgeware Road
- South on Edgeware Road to the intersection of Bedwin Road

Precinct 5 - Inner West/City of Sydney

- Across the parkland to May Street
- East on May Street until the intersection of Princes Highway
- Cross Princes Highway and east on Barwon Park Road
- Cross Sydney Park to Euston Road
- Cross Euston Road through to Burrows Road
- Cross Burrows Road to the Beaconsfield West substation

Annexure B

Road inventory

	Street name	Classification		Speed limit	Road Width (m)	LGA	Parking	Bus Route
		Classification	Functional class					
Precinct 1	William Holmes Street		Local	50	9	Canterbury - Bankstown	No	No
	Rookwood Road	State Road 190	Arterial	80	23	Canterbury - Bankstown	No	Yes
	Muir Road		Local	60	20	Canterbury - Bankstown	Yes	Yes
	Hume Highway	State Road 2	Arterial	70	23	Canterbury - Bankstown	No	Yes
Precinct 2	Hillcrest Avenue		Collector	50	11	Canterbury - Bankstown	Yes	Yes
	Rawson Road (between Hillcrest Avenue and Waterloo Road)		Collector	60	10.5	Canterbury - Bankstown	Yes	No
	Waterloo Road	Regional Road 7118	Sub arterial	50	12	Canterbury - Bankstown	No	Yes
	Rawson Road (between Waterloo Road and Maiden Street)		Collector	50	10	Canterbury - Bankstown	Yes	Yes
	Maiden Street		Local	50	9	Canterbury - Bankstown	Yes	No
	Juno Parade (between Maiden Street and Acacia Avenue)	State Road 636	Arterial	60	12.5	Canterbury - Bankstown	No	Yes
	Acacia Avenue		Collector	50	10.5	Canterbury - Bankstown	Yes	No
	Wangee Road (between Acacia Avenue and Roberts Road)		Local	50	9.5	Canterbury - Bankstown	Yes	Yes
	Roberts Road	State Road 200	Arterial	70	24	Canterbury - Bankstown	No	No
	Wangee Road (between Roberts Road and Skyline Street)		Local	50	10.5	Canterbury - Bankstown	Yes	No
	Wangee Road (between Skyline Street and Punchbowl Road)		Local	50	10.5	Canterbury - Bankstown	Yes	No
	Punchbowl Road	State Road 549	Arterial	60	19.5	Canterbury - Bankstown	No	Yes
	Wangee Road (between Punchbowl Road and Yangoora Road)		Local	50	12	Canterbury - Bankstown	Yes	No
	Yangoora Road (between Wangee Road and Neale Street)		Local	40	9.5	Canterbury - Bankstown	Yes	No
	Neale Street		Local	40	10.5	Canterbury - Bankstown	Yes	No
	Lucerne Street (between Neale Street and Knox Street)		Local	40	11.5	Canterbury - Bankstown	Yes	No
	Knox Street		Local	40	12	Canterbury - Bankstown	Yes	No
	Walker Street (east of Knox Street)		Local	40	9	Canterbury - Bankstown	No	No
	Carter Street (west of Burwood Road)		Local	50	11	Canterbury - Bankstown	Yes	No
	Burwood Road (between Carter Street and Bruce Avenue)	Regional Road 7047	Sub arterial	50	11	Canterbury - Bankstown	Yes	Yes
	Bruce Avenue		Collector	50	12.5	Canterbury - Bankstown	No	No
	Omaha Street (between Bruce Avenue and First Avenue)		Collector	50	12	Canterbury - Bankstown	Yes	No
	Seventh Avenue (between First Avenue and Fifth Avenue)		Collector	50	10.5	Canterbury - Bankstown	Yes	Yes
	Fifth Avenue	Regional Road 7067	Sub arterial	50	12	Canterbury - Bankstown	No	No
	Seventh Avenue (between Fifth Avenue and Beamish Street)		Collector	50	10.5	Canterbury - Bankstown	Yes	Yes
	Beamish Street		Local	50	10.5	Canterbury - Bankstown	Yes	No
	Byron Street (between Beamish Street and Brighton Avenue)		Local	50	10.5	Canterbury - Bankstown	Yes	No
	Option 2: Croydon Avenue (east of Dunstan Street)		Local	50	18	Canterbury - Bankstown	Yes	No
	Option 2: Dunstan Street (between Croydon Avenue and Hay Street)		Local	50	12.5	Canterbury - Bankstown	Yes	No
	Option 2: Hay Street		Local	50	12	Canterbury - Bankstown	Yes	No
	Option 1: Cowper Street (between Brighton Avenue and Lindsay Street)		Local	50	12	Canterbury - Bankstown	Yes	No
	Option 1: Lindsay Street		Local	50	12	Canterbury - Bankstown	Yes	No
	Harmony Street (between Hay Street and Malleny Street)		Local	50	12.5	Canterbury - Bankstown	Yes	No
	Malleny Street		Local	50	12.5	Canterbury - Bankstown	Yes	No

	Cheviot Street (between Malleny Street and Roslyn Street)		Local	50	12.5	Canterbury - Bankstown	Yes	No
	Roslyn Street (between Cheviot Street and King Street)		Local	50	12	Canterbury - Bankstown	Yes	Yes
	King Street	Regional Road 2040	Sub arterial	50	12	Canterbury - Bankstown	Yes	Yes
	Second Street (between King Street and Holden Street)		Local	50	10	Canterbury - Bankstown	Yes	No
	Holden Street		Collector	50	12	Canterbury - Bankstown	Yes	No
	Hanks Street (between Holden Street and Old Canterbury Road)		Local	50	12	Inner West	Yes	No
	Old Canterbury Road	State Road 652	Arterial	50	12.5	Inner West	Yes	Yes
	Arlington Street (between Old Canterbury Road and Constitution Road)		Local	50	10	Inner West	Yes	No
	Option 4b: Constitution Road (between Windsor Road and west of the rail corridor)		Collector	50	9	Inner West	Yes	No
	Option 4a: Windsor Road		Local	50	10	Inner West	Yes	No
Precinct 3	Option 4a: Terry Road (between Windsor Road and west of the rail corridor)		Local	50	12.5	Inner West	Yes	No
	Option 4b: Constitution Road (East of the rail corridor and west of Grove Street)		Local	50	10	Inner West	Yes	No
	Option 4b: Constitution Road (between Grove Street and Denison Road)		Collector	50	10	Inner West	Yes	No
	Option 4b: Denison Road (between Constitution Road and Hill Street)		Local	50	10	Inner West	Yes	No
	Option 4a: Hill Street (east of the rail corridor and west of Denison Road)		Local	50	9	Inner West	Yes	No
	Denison Road		Local	50	10	Inner West	Yes	No
	Pigott Street (between Denison Road and New Canterbury Road)		Local	50	9.5	Inner West	Yes	No
	New Canterbury Road	State Road 167	Arterial	60	12.5	Inner West	No	No
	Herbert Street (between New Canterbury Road and Fairfowl Street)		Local	50	12	Inner West	Yes	No
	Fairfowl Street		Local	50	5.5	Inner West	Yes	No
	Pile Street (between Fairfowl Street and Livingstone Road)		Local	50	12	Inner West	Yes	No
	Livingstone Road		Local	50	12.5	Inner West	Yes	Yes
	Hawkhurst Street		Local	50	12.5	Inner West	Yes	No
	Centennial Street		Collector	50	8	Inner West	Yes	Yes
	Sydenham Road	State Road 664	Arterial	50	12.5	Inner West	Yes	No
	Option 5b: Neville Street (between Sydenham Road and Surrey Street)		Local	50	7	Inner West	Yes	No
	Option 5b: Surrey Street		Local	50	7	Inner West	Yes	No
	Option 5b: Charles Street		Local	50	12.5	Inner West	Yes	No
	Option 5a: Centennial Street (east of Sydenham Road)		Collector	50	12.5	Inner West	Yes	No
	Option 5a: Amy Street (south of Horton Street)		Local	50	12.5	Inner West	Yes	No
	Option 5a: Horton Street		Local	50	12.5	Inner West	Yes	No
	Option 5a: Illawarra Road (between Horton Street and Charles Street)		Local	50	9	Inner West	Yes	No
	Illawarra Road (north of Charles Street)		Local	50	9	Inner West	Yes	No
	Option 6b: Addison Road	Regional Road 7018	Sub arterial	50	10.5	Inner West	Yes	Yes
	Option 6a: Agar Street		Collector	50	9	Inner West	Yes	No
	Option 6a: Newington Road (between Agar Street and Enmore Road)		Local	50	6.5	Inner West	Yes	No
	Option 6b: Enmore Road (between Newington Road and Scouller Street)	Regional Road 2021	Sub arterial	50	13	Inner West	Yes	Yes
Precinct 4	Option 6b: Addison Road	Regional Road 7018	Sub arterial	50	10.5	Inner West	Yes	Yes
	Option 6b: Enmore Road (between Addison Road and Scouller Street)	Regional Road 2021	Sub arterial	50	12.5	Inner West	Yes	Yes
	Scouller Street		Local	50	12.5	Inner West	Yes	No
	Juliett Street		Local	50	12	Inner West	Yes	No
	Llewellyn Street	Regional Road 7018	Sub arterial	50	12	Inner West	Yes	No

	Edgeware Road (between Llewellyn Street and south of Darley Street)	Regional Road 7017	Sub arterial	60	12	Inner West	Yes	Yes
Precinct 5	May Street (west of Campbell Street to Princes Highway)	Regional Road 2099	Sub arterial	50	7	Inner West	Yes	No
	Princes Highway	State Road 1	Arterial	60	21	Inner West / Sydney	No	Yes
	Barwon Park Road		Local	50	12.5	Inner West / Sydney	Yes	No
	Euston Road		Local	50	12	Sydney	Yes	No
	Burrows Road		Local	50	12	Sydney	Yes	No