Appendix F

Utilities Management Strategy

WestConnex

Roads and Maritime Services

WestConnex – M4-M5 Link

Utilities Management Strategy

August 2017

Client: Roads and Maritime Services

ABN: 76 236 371 088

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Glossary of terms and abbreviations

Term	Meaning
A	
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, song lines and places) cultural practices and traditions associated with past and present day Aboriginal communities
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (eg peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid
AHD	Australian Height Datum (AHD)
AHIMS	Aboriginal Heritage Information Management System A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical)
Areas of interest	Areas within and adjacent to the project footprint as defined in the Utilities Management Strategy where utility works are proposed as part of the M4-M5 Link project
Arterial roads	The main or trunk roads of the state road network that carry predominantly through traffic between region
B	
Bore	Constructed connection between the surface and a groundwater source that enables groundwater to be transferred to the surface either naturally or through artificial means
C	
Campbell Road civil and tunnel site	A construction ancillary facility for the M4-M5 Link project at St Peters
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes
CBD	Central business district
CEMP	Construction Environmental Management Plan A site specific plan developed for the construction phase of the project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that the environmental risks are properly managed
Concept design	Initial functional layout of a road/road system or other infrastructure. Used to facilitate understanding of a project, establish feasibility and provide basis for estimating and to determine further investigations needed for detailed design
Construction	Includes all physical work required to construct the project
Construction ancillary facilities	Temporary facilities during construction that include, but are not limited to construction sites (civil and tunnel), sediment basins, temporary water treatment plants, pre-cast yards and material stockpiles, laydown areas, parking, maintenance workshops and offices
CSSI	Critical State significant infrastructure
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own
Cut-and-cover	A method of tunnel construction whereby the structure is built in an open excavation and subsequently covered
D	
Darley Road civil and tunnel site	A construction ancillary facility for the M4-M5 Link project located at Leichhardt

Term	Meaning
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
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (eg metres per second (m/s))
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water
DBYD	Dial-Before-You-Dig
E	
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock
EIS	Environmental impact statement
EMF	Electric and magnetic fields
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPL	Environment Protection Licence under the *Protection of the Environment Operations Act 1997* (NSW)
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle
F	
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami
Feeder	A power line for transmitting electric power from a generation station to a distribution network
G	
GST	Galvanised steel trough
Groundwater	Water that is held in rocks and soil beneath the earth's surface
H	
Haberfield civil and tunnel site/Haberfield civil site	Construction ancillary facilities for the M4-M5 Link project located at Haberfield
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System
Heritage Act	*Heritage Act 1977* (NSW)
Heritage item	Any place, building or object listed on a statutory heritage register
HV	High voltage
HVCs	High voltage connections
I	
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007 (NSW).
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways
Iron Cove Link	Around one kilometre of twin tunnels that would connect Victoria Road near the eastern abutment of Iron Cove Bridge and Anzac Bridge
Iron Cove Link civil site	A construction ancillary facility for the M4-M5 Link project located at Rozelle
J	
K	

Term	Meaning
KGRIU	King Georges Road Interchange Upgrade A component of the WestConnex program of works. Upgrade of the King Georges Road interchange between the M5 West and the M5 East at Beverly Hills, in preparation for the New M5 project
kPa	Kilopascal
kV	Kilovolt
L	
Lane	A portion of the carriageway allotted for the use of a single line of vehicles
LEP	Local environmental plan
M	
M4 East Motorway/project	A component of the WestConnex program of works. Extension of the M4 Motorway in tunnels between Homebush and Haberfield via Concord. Includes provision for a future connection to the M4-M5 Link at the Wattle Street interchange
M4 Widening	A component of the WestConnex program of works. Widening of the existing M4 Motorway from Parramatta to Homebush
M4-M5 Link	The project which is the subject of this EIS. A component of the WestConnex program of works
Mainline tunnels	The M4-M5 Link mainline tunnels connecting with the M4 East at Haberfield and the New M5 at St Peters
Motorway	Fast, high volume controlled access roads. May be tolled or untolled
MVA	Mega Volt Amp
N	
New M5 Motorway/project	A component of the WestConnex program of works. Located from Kingsgrove to St Peters (under construction)
NCA	Noise catchment area
Northcote Street civil site	A construction ancillary facility for the M4-M5 Link project located at Haberfield
NSW	New South Wales
NSW EPA	NSW Environment Protection Authority
O	
OOHW	Out-of-hours work
P	
Parramatta Road East civil site	A construction ancillary facility for the M4-M5 Link project at Haberfield
Parramatta Road West civil and tunnel site	A construction ancillary facility for the M4-M5 Link project at Ashfield
Portal	The entry and/or exit to a tunnel
Pre-construction	All work prior to, and in respect of the State significant infrastructure, that is excluded from the definition of construction
Project	A new multi-lane road link between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters. The project would also include an interchange at Lilyfield and Rozelle (the Rozelle interchange) and a tunnel connection between Anzac Bridge and Victoria Road, east of Iron Cove Bridge (Iron Cove Link). In addition, construction of tunnels, ramps and associated infrastructure to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project would be carried out at the Rozelle interchange
Project footprint	The land required to construct and operate the project. This includes permanent operational infrastructure (including the tunnels), and land required temporarily for construction
Property	Based on ownership, with the potential to contain more than one lot and deposited plan (DP)

Term	Meaning
Proponent	The person or organisation that proposes to carry out the project or activity. For the purpose of the project, the proponent is NSW Roads and Maritime Services
Pyrmont Bridge Road tunnel site	A construction ancillary facility for the M4-M5 Link project at Annandale
Q	
R	
RL	Reduced level
Risk	Chance of something happening that will potentially have an undesirable effect. It is measured in terms of consequence and likelihood
ROL	Road Occupancy Licence
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel
Roadheader	A commonly used machine for excavation in sandstone using picks mounted on a rotary cutter head attached to a hydraulically operated boom
Rozelle civil and tunnel site	A construction ancillary facility for the M4-M5 Link project located at Lilyfield and Rozelle
Rozelle interchange	A new interchange at Lilyfield and Rozelle that would connect the M4-M5 Link mainline tunnels with City West Link, Anzac Bridge, the Iron Cove Link and the proposed future Western Harbour Tunnel and Beaches Link
Rozelle Rail Yards	The Rozelle Rail Yards is bound by City West Link to the south, Lilyfield Road to the north, Balmain Road to the west, and White Bay to the east. Note that the project only occupies part of the Rozelle Rail Yards site
S	
SEARs	Secretary's Environmental Assessment Requirements Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of the Planning and Environment under section 115Y of the *Environmental Planning and Assessment Act 1979* (NSW)
Sensitive receiver/receptor	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises)
Settlement	Refers to how ground can move due to the construction of new infrastructure
Shoring	A process for temporarily supporting a building, vessel, structure, or trench with shores (propos) when in danger of collapse or during repairs or alterations
Socio-economic	Involving combination of social and economic matters
Spoil	Surplus excavated material
SSI	State significant infrastructure
STA	State Transit Authority
St Peters interchange	A component of the New M5 project, located at the former Alexandria Landfill site at St Peters. Approved and under construction as part of the New M5 project. Additional construction works proposed as part of the M4-M5 Link project

Term	Meaning
Stub tunnel	Driven tunnels constructed to connect to potential future motorway links
Substation	A set of equipment reducing the high voltage of electrical power transmission to that suitable for supply to consumers
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape
Sydney Gateway	A high-capacity connection between the St Peters interchange (under construction as part of the New M5 project) and the Sydney Airport and Port Botany precinct
T	
The Crescent civil site	A construction ancillary facility for the M4-M5 Link project located at Annandale
TMC	Traffic Management Centre
U	
URMP	Utilities Relocation Management Plan. The Plan which outlines the environmental management practices and procedures for utility works which are carried out prior to the approval of the Construction Environmental Management Plan
Utility service provider	Includes Telstra, Jemena, Ausgrid, Sydney Trains, Sydney Water and relevant local councils (Inner West Council and City of Sydney Council)
Utility services	Includes communication, gas, electricity, water, sewer and drainage services and associated infrastructure
Utility works	Includes utility installation, relocations and adjustments of utility services. Also includes protection of existing utility services and removal of redundant utility services
V	
Ventilation facility	Facility for the mechanical removal of air from the mainline tunnels, or mechanical introduction of air into the tunnels. May comprise one or more ventilation outlets
Ventilation outlet	The location and structure from which air within a tunnel is expelled
Victoria Road civil site	A construction ancillary facility for the M4-M5 Link project located at Rozelle
V	voltage
W	
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent)
Wattle Street civil and tunnel site	A construction ancillary facility for the M4-M5 Link project located at Haberfield
Wattle Street interchange	An interchange to connect Wattle Street (City West Link) with the M4 East and the M4-M5 Link tunnels. Approved and to be constructed as part of the M4 East project, with minor construction works associated with the M4-M5 Link project
W	watts
Western Harbour Tunnel and Beaches Link	The Western Harbour Tunnel component would connect to the M4-M5 Link at the Rozelle interchange, cross underneath Sydney Harbour between the Birchgrove and Waverton areas, and connect with the Warringah Freeway at North Sydney. The Beaches Link component would comprise a tunnel that would connect to the Warringah Freeway, cross underneath Middle Harbour and connect with the Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Seaforth. It would also involve the duplication of the Wakehurst Parkway between Seaforth and Frenchs Forest
WestConnex program of works	A program of works that includes the M4 Widening, King Georges Road Interchange Upgrade, M4 East, New M5 and M4-M5 Link projects

1 Introduction

1.1 M4-M5 Link project

1.1.1 Overview

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the WestConnex M4-M5 Link (the project), which would comprise a new multi-lane road link between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters. The project would also include an interchange at Lilyfield and Rozelle (the Rozelle interchange) and a tunnel connection between Anzac Bridge and Victoria Road, east of Iron Cove Bridge (Iron Cove Link). In addition, construction of tunnels, ramps and associated infrastructure to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project would be carried out at the Rozelle interchange.

Together with the other components of the WestConnex program of works and the proposed future Sydney Gateway, the project would facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-western Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and local communities.

Approval is being sought under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) for the project. A request has been made for the NSW Minister for Planning to specifically declare the project to be State significant infrastructure (SSI) and also critical State significant infrastructure (CSSI). An environmental impact statement (EIS) is therefore required.

1.1.2 Staging and program

It is anticipated the project would be constructed and opened to traffic in two stages (as shown in **Figure 1-1**).

Stage 1 would include:

- Construction of the mainline tunnels between the M4 East at Haberfield and the New M5 at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5)
- These works are anticipated to commence in 2018 with the mainline tunnels open to traffic in 2022. At the completion of Stage 1, the mainline tunnels would operate with two traffic lanes in each direction. This would increase to generally four lanes at the completion of Stage 2, when the full project is operational.

Stage 2 would include:

- Construction of the Rozelle interchange and Iron Cove Link including:
  - Connections to the stub tunnels at the Inner West subsurface interchange (built during Stage 1)
  - Ancillary infrastructure at the Rozelle West motorway operations complex (MOC2), Rozelle East motorway operations complex (MOC3) and Iron Cove Link motorway operations complex (MOC4)
  - Connections to the surface road network at Lilyfield and Rozelle
  - Construction of tunnels, ramps and associated infrastructure as part of the Rozelle interchange to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project
- Stage 2 works are expected to commence in 2019 with these components of the project open to traffic in 2023.

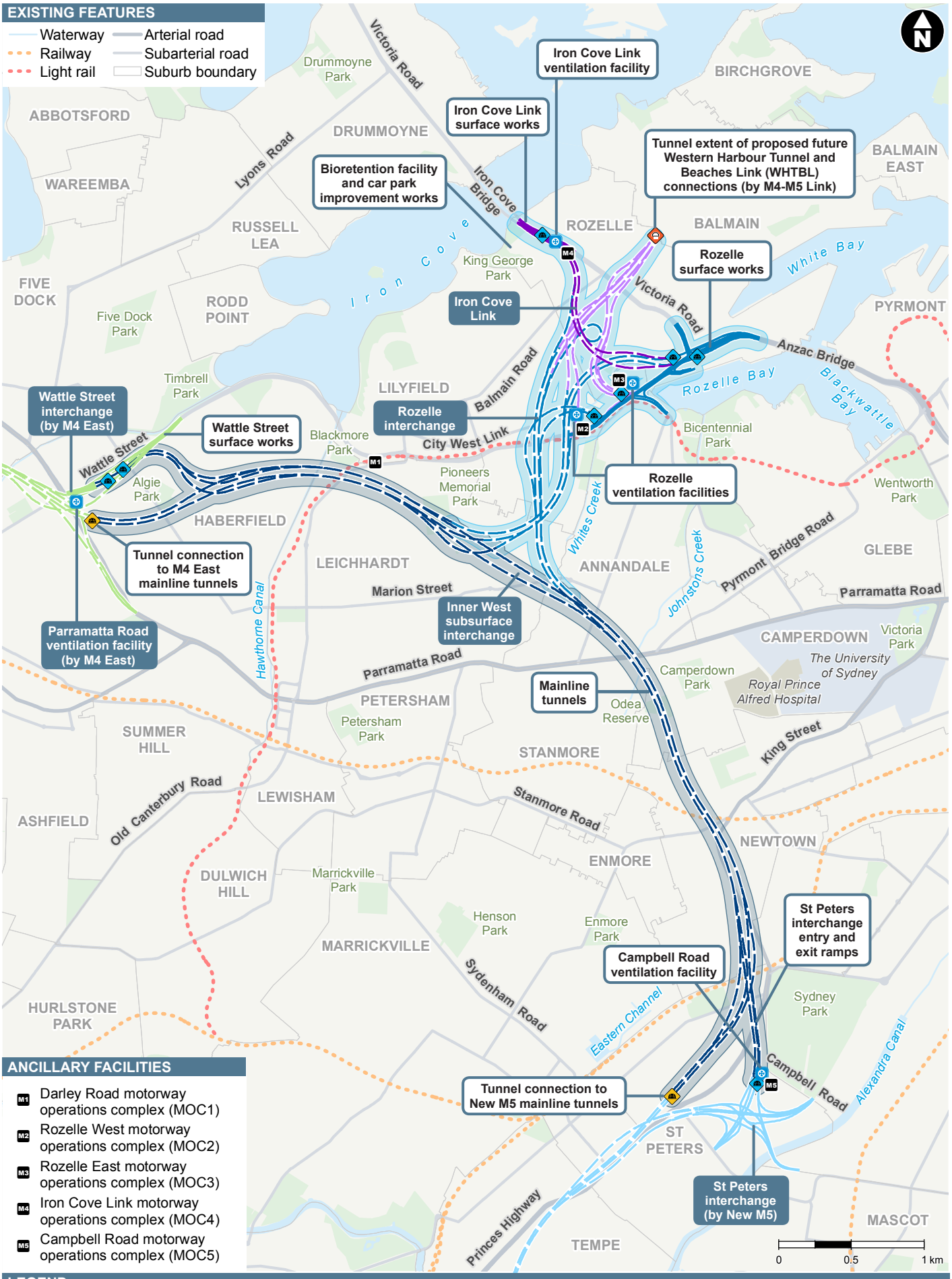


Figure 1-1 Overview of the project

1.1.3 Construction

Twelve construction ancillary facilities are described in this EIS (as listed below). To assist in informing the development of a construction methodology that would manage constructability constraints and the need for construction to occur in a safe and efficient manner, while minimising impacts on local communities, the environment, and users of the surrounding road and other transport networks, two possible combinations of construction ancillary facilities at Haberfield and Ashfield have been assessed in this EIS. The construction ancillary facilities that comprise these options have been grouped together in this EIS and are denoted by the suffix a (for Option A) or b (for Option B).

The construction ancillary facilities required to support construction of the project include:

- Construction ancillary facilities at Haberfield (Option A), comprising:
  - Wattle Street civil and tunnel site (C1a)
  - Haberfield civil and tunnel site (C2a)
  - Northcote Street civil site (C3a)
- Construction ancillary facilities at Ashfield and Haberfield (Option B), comprising:
  - Parramatta Road West civil and tunnel site (C1b)
  - Haberfield civil site (C2b)
  - Parramatta Road East civil site (C3b)
- Darley Road civil and tunnel site (C4)
- Rozelle civil and tunnel site (C5)
- The Crescent civil site (C6)
- Victoria Road civil site (C7)
- Iron Cove Link civil site (C8)
- Pyrmont Bridge Road tunnel site (C9)
- Campbell Road civil and tunnel site (C10).

The location of the construction ancillary facilities is shown in **Figure 1-2**.

The number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning during detailed design.

Existing utility services would potentially be impacted during construction of the project. These utility services would need to be either avoided or protected during construction, or relocated to a different location within, or in proximity, to the project footprint. In addition, temporary and permanent power supply connections and new drainage infrastructure would be required within and outside of the project footprint to service the construction and operation of the project.

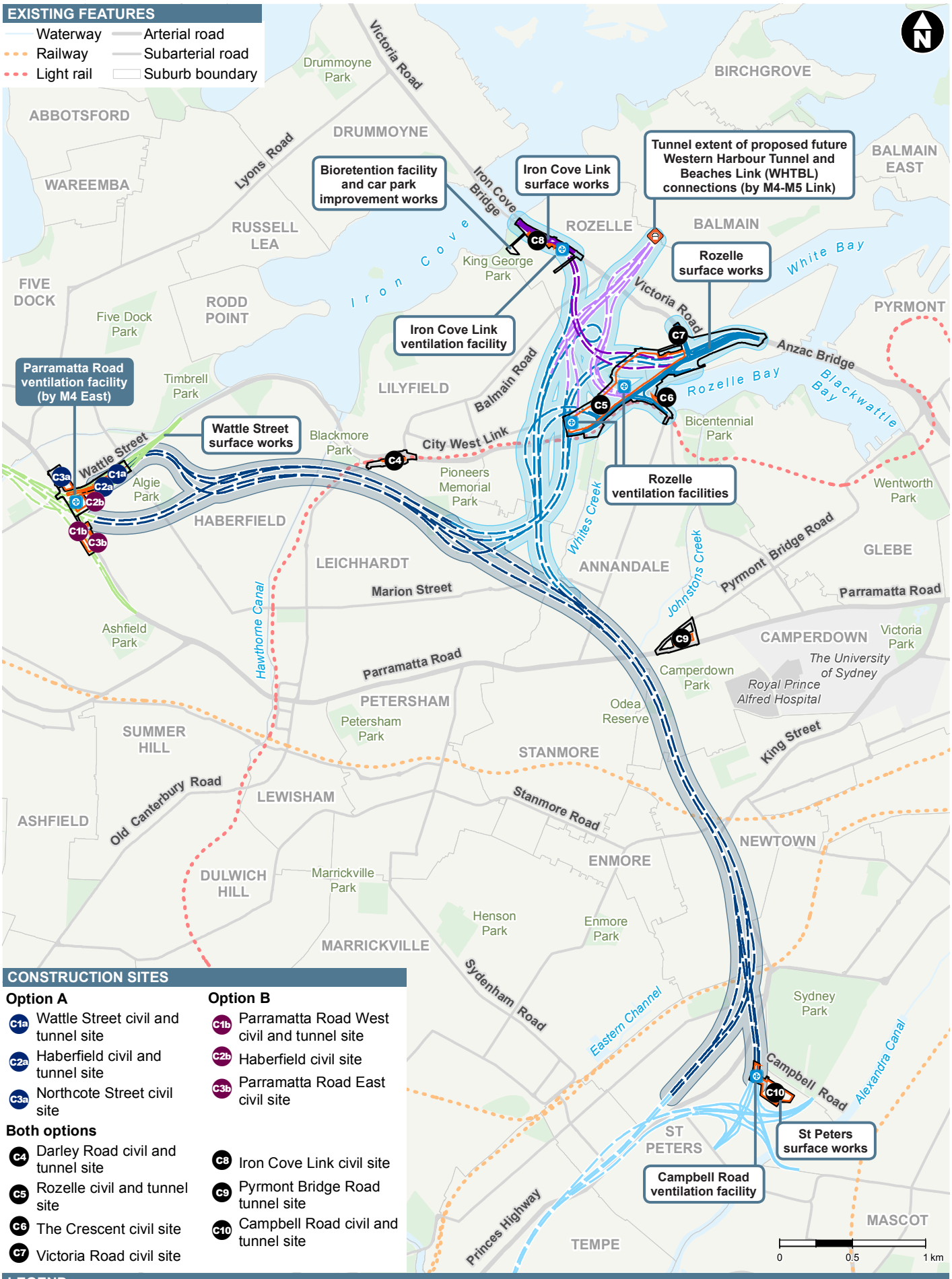


Figure 1-2 Overview of project footprint and ancillary facilities

1.2 WestConnex program of works

The M4-M5 Link is part of the WestConnex program of works. Separate planning applications and assessments have been completed for each of the approved WestConnex projects. Roads and Maritime has commissioned Sydney Motorway Corporation (SMC) to deliver WestConnex, on behalf of the NSW Government. However, Roads and Maritime is the proponent for the project.

In addition to linking to other WestConnex projects, the M4-M5 Link would provide connections to the proposed future Western Harbour Tunnel and Beaches Link, the Sydney Gateway (via the St Peters interchange) and the F6 Extension (via the New M5) projects.

The WestConnex program of works as well as related projects, are shown in **Figure 1-3**.

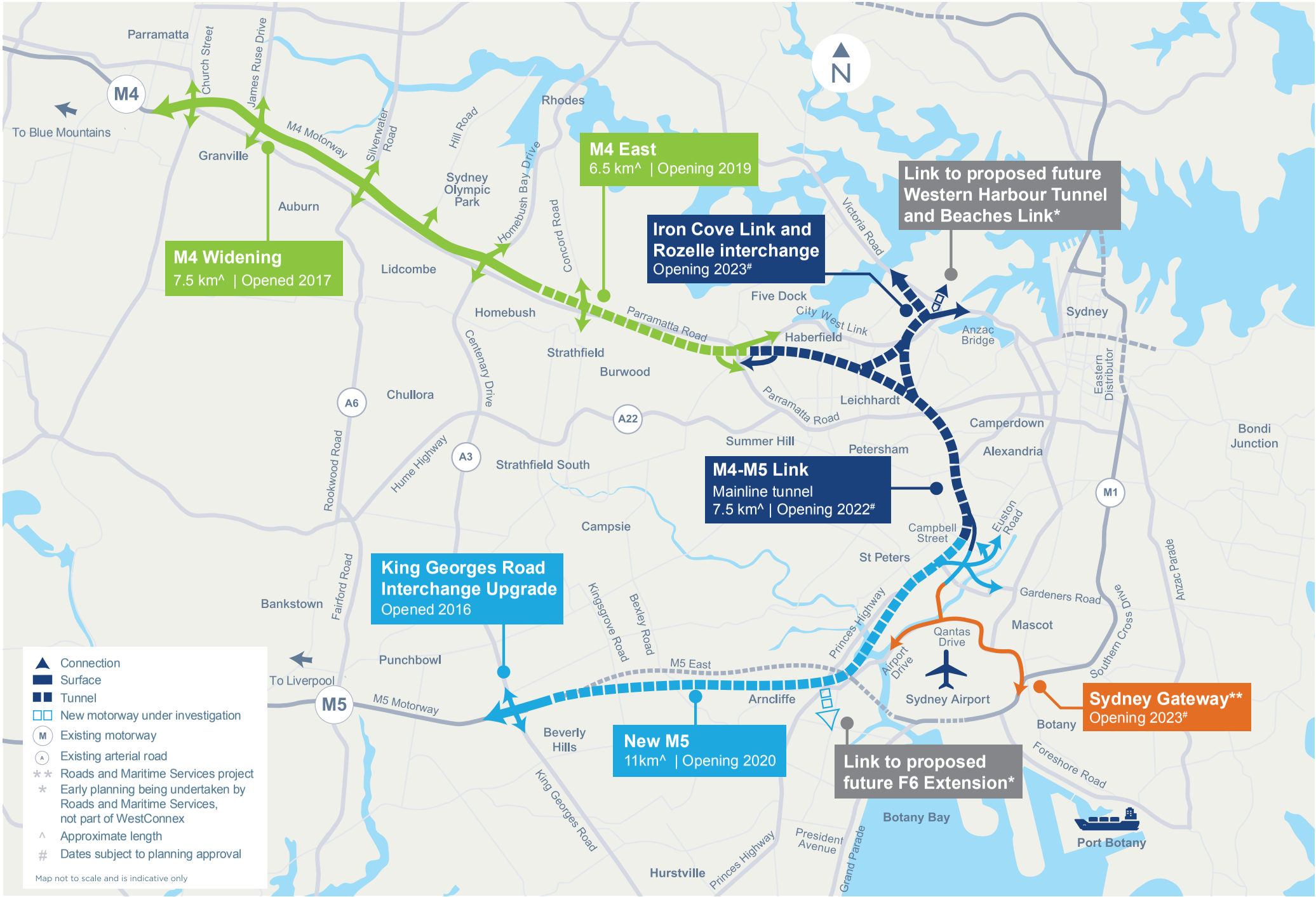


Figure 1-3 Overview of WestConnex and related projects

1.3 Secretary's Environmental Assessment Requirements

In preparing this Utilities Management Strategy, the revised Secretary's Environmental Assessment Requirements (SEARs) issued for the M4-M5 Link project on 3 May 2017 have been addressed. The key matters raised by the SEARs in relation to the potential impacts of the project on utilities and where these issues have been addressed in this Utilities Management Strategy are detailed in **Table 1-1**.

Table 1-1 Relevant SEARs addressed in this report

SEARs	
Socio-economic, Land Use and Property	
Requirement	**Section where addressed in report**
6. The Proponent must assess potential impacts on utilities (including communications, electricity, gas, and water and sewerage) and the relocation of these utilities. 7. Where the project is predicted to affect trunk utilities, the Proponent must undertake a utilities management strategy. The strategy must identify proposed management strategies, including relocations or adjustments of the utilities, and their estimated timing and duration. This strategy must be developed in consultation with the relevant utility owners or providers.	Potential impacts on utilities are detailed in **Chapters 3, 4 and 5**. Management strategies are identified in **Chapter 10**. Details of estimated timing and duration of utility works are identified in **section 6.5**. Details of consultation with utility service providers are identified in **section 1.6**.

1.4 Purpose of this strategy

The purposes of this Utilities Management Strategy are:

- To outline the main (trunk) utility works currently proposed as part of the project
- To outline the options currently being considered for the provision of construction power supply and permanent operational power supply for the project
- To outline the options currently being considered for the upgrade of existing drainage infrastructure or provision of new drainage infrastructure for the project
- To provide an overview of how the utility works, including power supply and drainage works would be carried out
- To assess the range of potential environmental impacts associated with utility works, including cumulative impacts
- To identify and assess potential impacts to existing utility assets
- To provide an environmental constraints analysis for areas outside of the project footprint where utility works, such as construction and operational power supply connections, are likely to be required
- To outline a range of mitigation measures which would be applied to minimise the potential environmental impacts
- To outline a process for how utility works that are not assessed as part of the EIS would be managed including requirements for:
  - Obtaining agreements with utility service providers
  - Effective co-ordination of utility adjustment works
  - Consideration of route options where appropriate
  - Undertaking environmental constraints analysis and risk assessment to confirm potential environmental impacts and appropriate management measures

- Stakeholder and community consultation and notification.

The Utilities Management Strategy details the major (trunk) utility works proposed as part of the project as these works have the longest lead times and may potentially result in more substantial environmental and community impacts. This approach is consistent with the requirements of the SEARs.

1.5 Scope of this strategy

This Utilities Management Strategy provides information in relation to:

- Utility installation, protection, relocations, adjustments and new connections (defined as utility works) which are proposed within the project footprint. These utility works have been assessed as part of the EIS and would be subject to a Utilities Relocation Management Plan, if the works are to be carried out prior to approval of a Construction Environmental Management Plan (CEMP), or otherwise would be subject to the CEMP
- Utility works which may be required outside of the project footprint. This Utilities Management Strategy provides information on the type of utility works likely to occur outside of the project footprint, the areas where this work is likely to occur and the framework for how these utility works would be managed. This includes requirements for stakeholder and community consultation, environmental constraints analysis and environmental risk assessment.

The utility services which have been considered in this Strategy include: communications, gas, electricity (including Ausgrid and Sydney Trains infrastructure), water, sewerage and drainage. The Strategy only considers major (trunk) utility services as defined in **section 2.3**. Other minor utility works which do not meet the definition of construction are not considered as part of this Strategy.

The information contained in this Utilities Management Strategy regarding existing utility services and proposed utility works is based on:

- Utility investigations conducted to date
- Preliminary discussions with utility service providers
- The proposed concept design for the project as set out in the EIS.

The information contained in this Strategy is likely to change over time as further investigations are carried out, discussions with utility service providers progress, and as the design of the project and the construction methodology are refined once a contractor has been appointed.

This Utilities Management Strategy establishes a process for managing utility works associated with the project, including arrangements for ongoing stakeholder and community consultation, environmental constraints analysis and environmental risk assessment during the detailed design phase.

This Utilities Management Strategy should be read in conjunction with the M4-M5 Link EIS, in particular the following chapters:

- **Chapter 6** (Construction work)
- **Chapter 12** (Land use and property)
- **Chapter 29** (Summary of environmental management measures).

An overview of the scope of the Utilities Management Strategy is provided in **Figure 1-4**.

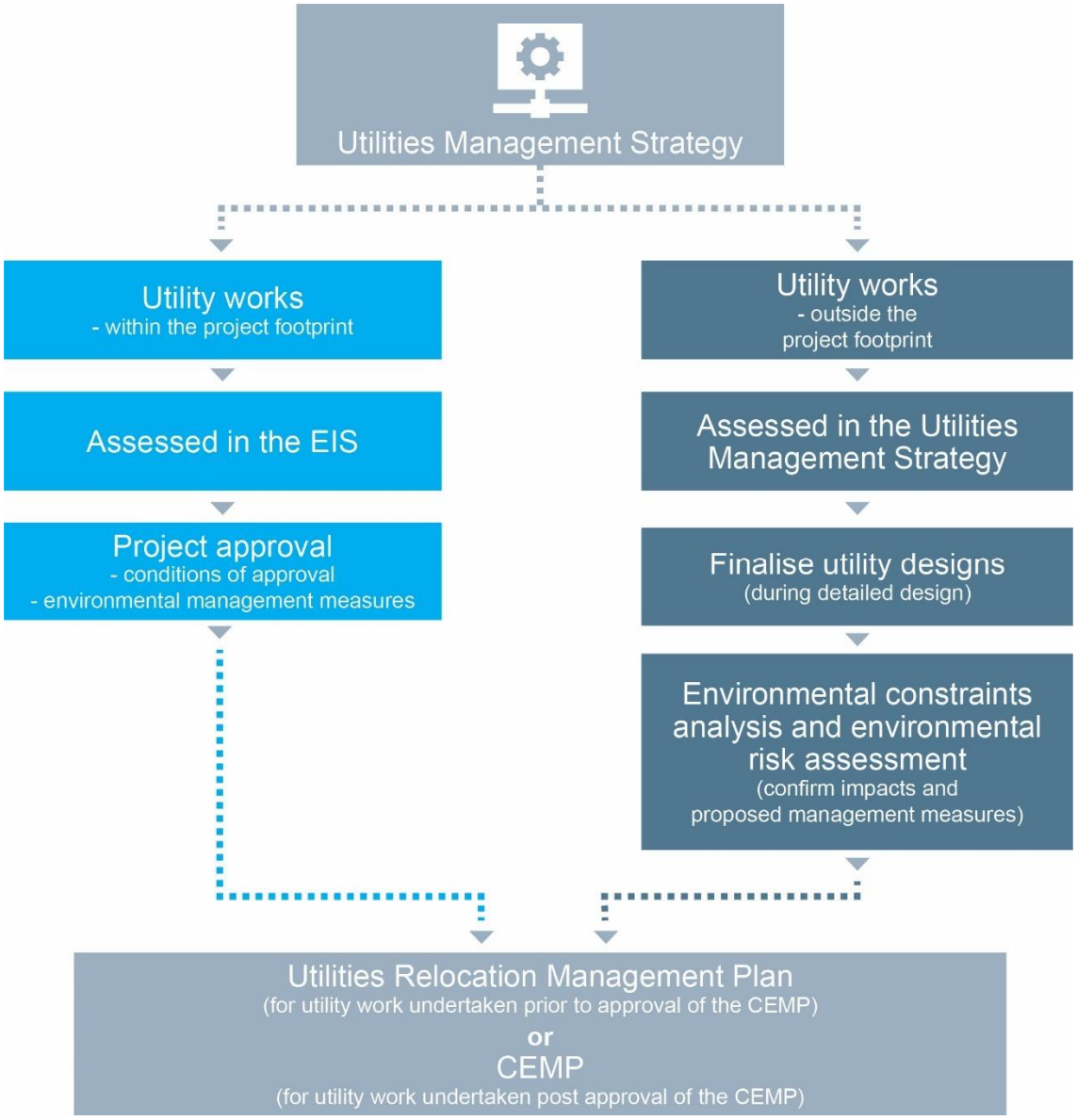


Figure 1-4 Scope of Utilities Management Strategy

1.6 Consultation

Utilities investigations relating to the M4-M5 Link project and preparation of the Utilities Management Strategy has been undertaken in consultation with the following utility service providers:

- Ausgrid
- Sydney Water
- Sydney Trains
- Jemena
- Telstra.

Consultation with utility service providers would continue during the EIS process and during the detailed design and construction phases of the project.

1.7 Relevant legislation

1.7.1 NSW Legislation

Environmental Planning and Assessment Act 1979 (NSW)

Approval is being sought for the M4-M5 Link project under Part 5.1 of the EP&A Act. Clause 4(6) of Schedule 5 to the State Environmental Planning Policy (State and Regional Development) 2011 (NSW) provides that development that is ancillary to the WestConnex program of works, including utilities infrastructure and adjustments to, or relocation of, existing utilities infrastructure is also SSI and CSSI. A request has been made for the NSW Minister for Planning to specifically declare the project to be SSI and also CSSI.

The SEARs for the M4-M5 Link project include requirements relating to assessment of potential impacts of the project on utilities and undertaking a utilities management strategy to address these impacts. The specific SEARs are detailed in **section 1.3** of this Utilities Management Strategy.

State Environmental Planning Policy (Infrastructure) 2007

The aim of State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) (NSW) is to facilitate the effective delivery of infrastructure across NSW.

The Infrastructure SEPP provides that certain development carried out by or on behalf of a public authority can be carried out without consent or as exempt development as detailed in the following clauses:

- Clauses 41–43 – Electricity transmission or distribution network
- Clauses 53–54 – Gas pipelines
- Clauses 105–107 – Sewage reticulation systems
- Clauses 110–112 – Stormwater management systems
- Clauses 113–116 – Telecommunications and other communication facilities
- Clauses 124–127 – Water supply systems.

The Infrastructure SEPP also outlines requirements for consultation with local councils in relation to development that may impact on:

- Council related infrastructure and services (Clause 13)
- Local heritage (Clause 14)
- Flood liable land (Clause 15).

It also provides for consultation with public authorities in respect to certain types of specified development (Clause 16).

Notwithstanding the above, environmental planning instruments do not apply to SSI or CSSI except that they apply to the declaration of infrastructure as SSI or CSSI (section 115ZF(2) of the EP&A Act). In that regard, the Infrastructure SEPP will not apply to utilities infrastructure that are ancillary to, and carried out as part of, the project.

Other relevant NSW legislation

The following NSW legislation may also be relevant:

- *Protection of the Environment Operations Act 1997* (NSW)
- *Threatened Species Conservation Act 1995* (NSW)
- *National Parks and Wildlife Act 1974* (NSW)
- *Heritage Act 1977* (NSW)
- *Contaminated Land Management Act 1997* (NSW)
- *Fisheries Management Act 1994* (NSW)
- *Water Act 1912* (NSW)
- *Water Management Act 2000* (NSW)
- *Roads Act 1993* (NSW).

1.7.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) activities that are likely to have a significant impact on matters of national environmental significance (MNES), actions taken on Commonwealth land or by the Commonwealth must be assessed and approved. The EPBC Act identifies MNES as:

- World heritage properties
- National heritage places
- Ramsar wetlands
- Nationally threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine environment
- Great Barrier Reef Marine Park
- Nuclear actions
- Protection of water resources from coal seam gas and large coal mining development.

The preliminary assessment of potential environmental constraints in **Chapter 7** indicates that the proposed utility works including power supply connections and drainage infrastructure associated with the M4-M5 Link project are not:

- Likely to have a significant impact on MNES as listed under the EPBC Act
- To be undertaken on Commonwealth land
- To be undertaken by the Commonwealth.

At this stage, based on the currently available information and the assessment undertaken during the EIS development, it seems unlikely that the project would significantly impact on MNES. Therefore it is unlikely that the project would trigger the need to refer the works to the Australian Government Department of the Environment and Energy.

2 Approach to proposed utility works

2.1 Areas of interest

The areas of interest for the proposed utility works are both within and outside the project footprint where services are likely to be directly impacted by the project and where utility works would be required. The majority of the areas of interest are located in the vicinity of the surface works required as part of the project.

Most sections of the tunnels have sufficient depth of cover not to affect existing utility services. However, potential settlement and vibration impacts during construction of the project have been considered in the vicinity of major (trunk) utility services such as the Sydney Water Pressure Tunnel and Sydney Water City Tunnel.

Areas outside of the project footprint may be impacted by utility works, such as the installation of construction power or permanent operational power which are required to support the project. These have also been included in the areas of interest.

2.2 Identifying utility services

2.2.1 Utility investigations to date

Existing utility services (underground and overhead services) have been identified by:

- Dial-Before-You-Dig (DBYD) data searches
- Review of plans and drawings provided by utility service providers
- Site walkovers
- Use of electronic tracing and ground penetrating radar and
- Surface level survey.

Investigations are continuing in consultation with utility service providers to identify the utility services likely to be impacted by the project.

2.2.2 Site management works at Rozelle Rail Yards

Site management works would occur within the Rozelle Rail Yards at Rozelle before the start of project construction works. These works have commenced, with completion planned for 2018. They will be carried out in accordance with a separate assessment process under Part 5 of the EP&A Act.

The site management works would remove rail and rail related infrastructure from the Rozelle Rail Yards site and allow existing issues such as waste and noxious weeds to be appropriately managed. These works would also improve access to surface conditions which would allow for further investigations into the location of utilities and the presence of contamination and waste.

2.3 Major utility services

The Utilities Management Strategy details the major (trunk) utility works proposed as part of the project based on the concept design which is being considered by the EIS. Existing major (trunk) utility services within the areas of interest, identified in consultation with utility service providers include:

- Power (Ausgrid) – high voltage transmission (33kV or greater) and substations
- Sydney Trains – feeders (11kV or greater) and switching stations
- Gas (Jemena) – secondary gas mains (1050 kilopascals (kPa))
- Potable water (Sydney Water) – mains of 300 millimetre diameter or greater
- Sewer (Sydney Water) – rising mains or gravity mains of 300 millimetre or greater
- Telecommunications – multiple fibre optics cables.

During detailed design other major (trunk) utility services that may be impacted by the project may be identified in consultation with utility service providers and these would also be subject to this Strategy.

Major (trunk) utility services have been considered because:

- The investigation, approval and delivery phases potentially require long lead times
- The environmental and community impacts associated with these works are potentially more significant
- The approach is consistent with the requirements of the SEARs.

Other minor utility works which do not meet the definition of construction are not considered as part of this Strategy.

2.4 Treatment approach to utility services

The approach for treating utility services would adopt the following hierarchy:

- Avoid or minimise impacts on utility services where practicable such as by adjusting the project design and construction methodology
- Retain and protect utility services if and where required
- Relocate utilities, including removing utility services and re-laying those services in a designated utility service corridor in a different location within or immediately adjacent to the project footprint where practicable. If a service needs to be relocated outside the project footprint, locations within an existing road reserve or infrastructure corridor would be preferred
- Remove or suitably isolate any redundant utility services as agreed with the appropriate utility service provider.

The approach does not allow for the upgrading of utility services apart from any upgrades required to manage potential impacts arising from the project such as upgrades to drainage infrastructure or power supply connections.

As part of the process, where feasible options exist for relocating utility services these would be identified and evaluated before a preferred option is selected and management measures would be adopted to minimise the potential environmental impacts associated with the works.

All utility works would be carried out in consultation with the relevant utility service provider.

2.5 Utility service corridors

Indicative utility service corridors have been developed for the areas of interest, which are primarily located within the project footprint, but also include areas outside the project footprint. These indicative utility service corridors are shown in **Annexure A**. The corridors are primarily focused on the Rozelle and Iron Cove areas of interest. They have been developed to accommodate multiple utility services in a common corridor where feasible.

During detailed design these indicative corridors could be refined to reflect:

- Ongoing utility investigations and the specific requirements of the utility service providers
- Ongoing refinements to the M4-M5 Link project design
- Outcomes of stakeholder and community consultation
- The requirements of the design and construction contractor (the contractor).

3 Proposed utility works

3.1 Areas of interest

The areas of interest within the project footprint include:

- Wattle Street interchange at Haberfield (M4 East project interface) including the optional construction sites:
  - Option A - the Wattle Street civil and tunnel site (C1a), the Haberfield civil and tunnel site (C2a) and the Northcote Street civil site (C3a)
  - Option B - the Parramatta Road West civil and tunnel site (C1b), the Haberfield civil site (C2b) and the Parramatta Road East civil site (C3b)
- Darley Road civil and tunnel site in Leichhardt (C4)
- Rozelle interchange portals and ramps including the Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and the Victoria Road civil site (C7)
- Iron Cove Link portals and ramps including the Iron Cove Link civil site (C8)
- Pyrmont Bridge Road tunnel site at Annandale (C9)
- St Peters interchange at St Peters (New M5 project interface) including the Campbell Road civil and tunnel site (C10)
- Sections of the mainline tunnels which have the potential to interface with existing major (trunk) utility services.

The proposed utility works in each area of interest within the project footprint are discussed in **sections 3.2** to **3.8**. Proposed utility works in areas of interest outside of the project footprint are discussed in **sections 4.1**, **4.2** and **5.4**.

For some utility works, multiple management options have been identified. Further development of the project design, ongoing investigations, technical requirements and outcomes of consultation with utility service providers would be considered to determine a preferred option. New or revised management options may also be identified in the future during the detailed design phase of the project.

3.2 Wattle Street interchange at Haberfield/Ashfield

Utility works in the area of the Wattle Street interchange area are being undertaken as part of the M4 East project. There are no works proposed as part of the M4-M5 Link project in this area of Haberfield which would impact on existing or M4 East relocated utility services. The vertical alignment of the M4-M5 Link tunnels has been adjusted so that the tunnels are at sufficient depth to avoid existing utility services in this area, including Sydney Water sewer and water mains, council stormwater pipes and Ausgrid transmission cables.

Given the vertical and horizontal separation distances proposed there is unlikely to be settlement or vibration impacts on these utility services. During detailed design, an assessment would be carried out to demonstrate that construction of the M4-M5 Link tunnels would have no adverse settlement or vibration impacts on these services.

The existing utility services in this area are listed in **Table 3-1** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-1 Utilities at Wattle Street interchange, Haberfield

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Sydney Water sewer main	300 mm sewer main	Running southeast from the Sydney Water pumping station in Reg Coady Reserve across Dobroyd Parade and along Martin Street.	Within the project footprint.	Retain and protect (if required).
Sydney Water sewer main	225 mm sewer main	Running southeast from Reg Coady Reserve across Dobroyd Parade and along an existing easement to the north of Martin Street.	Within the project footprint.	Retain and protect (if required).
Sydney Water sewer main	225 mm sewer main	Running southeast across Dobroyd Parade and along an existing easement between Martin Street and Ramsay Street.	Within the project footprint.	Retain and protect (if required).
Sydney Water sewer main	225 mm sewer main	Running along Waratah Street and then south in easement.	Within the project footprint.	Retain and protect (if required).
Sydney Water water main	900 mm water main	From Waratah Street running south along Alt Street.	Within the project footprint.	Retain and protect (if required).
Council major stormwater pipe	1,050 mm diameter	From Dobroyd Canal (Iron Cove Creek) running south across Dobroyd Parade and along an existing easement.	Within the project footprint.	Retain and protect (if required).
Ausgrid transmission cable	132 kV underground transmission cable	Running southeast along Martin Street, across Dobroyd Parade and continuing along Martin Street.	Within the project footprint.	Retain and protect (if required).

All Option A construction sites fall within the construction footprint for the M4 East project and all utility works will be completed as part of that project. No further utility works are required in relation to these sites.

For the two Option B construction sites located on Parramatta Road (C1b and C3b) the existing utility services in this area include Sydney Water sewer and water mains, Telstra communications cables and Ausgrid transmission cables in Parramatta Road, Bland Street and Alt Street. None of these utility services would be directly impacted by the project. These utility services are listed in **Table 3-2** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-2 Utilities at Parramatta Road, Haberfield and Ashfield

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Sydney Water water main	450 mm water main	Running along the western side of Parramatta Road.	Within the project footprint.	Retain and protect (if required).

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Sydney Water sewer main	330 mm and 405 mm sewer main	Running along the northern side of Bland Street to the west and east of Parramatta Road.	Within the footprint.	Retain and protect (if required).
Telstra communications	Underground cables	Running along the eastern side of Parramatta Road.	Within the footprint.	Retain and protect (if required).
Telstra communications	Underground cables	Running along Bland Street to the west and east of Parramatta Road.	Within the footprint.	Retain and protect (if required).
Ausgrid transmission	33 kV underground cable	Running along Parramatta Road, Bland Street and Alt Street.	Within the project footprint.	Retain and protect (if required).

3.3 Leichhardt

3.3.1 Darley Road civil and tunnel site, Leichhardt

Two Sydney Water sewer mains run north/south through the site. One of these sewer mains (225 millimetre diameter) would be relocated to a new utility service corridor along part of the northern boundary of the site, while the other main (150 millimetre diameter) would be retained and protected. There is also a sewer main (150 millimetre diameter) that enters the southeast corner of the site. A small section of this asset would either be retained and protected or relocated to the south along Darley Road outside the construction site boundary.

Along a section of Darley Road and James Street there is a sewer main (450 millimetre diameter) which would potentially be impacted by the proposed construction access tunnel. The sewer main is located seven to nine metres clear of the tunnel roof and therefore the risk of settlement impacts is considered to be negligible. Further discussions would occur with Sydney Water about protection of this asset.

An overhead 33kV Feeder to the 760 Sydney Trains transmission line runs along the northern verge of Darley Road adjacent to the site. This overhead line would be protected during construction. Vehicle access points along Darley Road would be located to avoid pits, manholes and pillars so that asset maintenance is not compromised.

The existing utility services in this area are listed in **Table 3-3** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-3 Utilities at Darley Road, Leichhardt

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Sydney Water sewer main	225 mm diameter sewer main	Running north–south through the central part of the site.	Within the project footprint.	Relocation – sewer main to be relayed within shared utility corridor along part of the northern boundary of the site.
Sydney Water sewer main	150 mm diameter sewer main	Running north–south through the western part of the site.	Within the project footprint.	Retain and protect (if required).
Sydney Water sewer main	150 mm diameter sewer main	Running across the south east corner of the site.	Within the project footprint.	Option 1 Retain and protect (if required). Option 2 Relocation – sewer main to be relayed to the south along the northern verge of Darley Road.
Sydney Water sewer main	450 mm diameter sewer main	Running north–south along Darley Road and James Street.	Within the project footprint.	Retain and protect (if required).
Ausgrid 33 kV Feeder	Overhead 33 kV Feeder to the 760 Sydney Trains transmission line	Running east/west along Darley Road adjacent to the southern boundary of the site.	Within the project footprint.	Retain and protect (if required).

3.4 Rozelle interchange

The Rozelle interchange (including the civil and tunnel sites (C5 to C7)) covers a broad geographic area and includes some of the most significant project infrastructure and construction activity. This includes surface road works, tunnel ramps and dive structures, cut and cover tunnels, permanent operational infrastructure, drainage channels and wetland. As a result there would be significant impacts on existing utility services in this area which would need to be managed.

Existing utilities in the area of Rozelle interchange include:

- Ausgrid 132 kV and 33 kV transmission feeders
- Sydney Trains electrical feeders and a switching station
- Telstra multi-fibre optic cable trench
- Sydney Water sewer and water mains.

The existing utility services in this area are listed in **Table 3-4** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-4 Utilities at Rozelle interchange

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Electrical – Ausgrid				
90 V and 90 W	132 kV transmission feeders	Feeders run along Lilyfield Road and Burt Street then both run south along Gordon Street and across the Rozelle Rail Yards in an existing easement, then across City West Link and east along James Craig Road.	Part within and part outside the project footprint.	Option 1 Retain and protect (if required) across the Rozelle Rail Yards and under City West Link. Option 2 Relocation – feeders to be relayed by diverting east along Lilyfield Road, across Victoria Road and along northern side of Anzac Bridge then south under Anzac Bridge to reconnect with James Craig Road[1].
Multiple 33 kV feeders	Multiple feeders from White Bay Power Station (currently disused)	Tunnel running south west from White Bay Power Station under Victoria Road and into the Rozelle Rail Yards.	Part within and part outside the project footprint.	Retain and protect (if required) tunnel section running beneath Victoria Road to maintain Ausgrid access. Relocation – provide new feeder conduits as required by Ausgrid within a new utility service corridor running south through Rozelle Rail Yards and under City West Link, then turning west along the southern side of City West Link and south along the eastern side of The Crescent[1].
Multiple 33 kV feeders	From Easton Park into the Rozelle Rail Yards	Multiple feeders running south under Easton Park and Lilyfield Road into the Rozelle Rail Yards.	Within the project footprint.	Option 1 Relocation – feeders to be relayed to run east along the northern boundary of site adjacent to Lilyfield Road and then turn south to run through the Rozelle Rail Yards in new utility service corridors. Option 2 Relocation – feeders to be relayed to run west along the north boundary of the site adjacent to Lilyfield Road and then turn south to run across the Rozelle Rail Yards adjacent to the western boundary of the site[1]. Then runs south under City West Link and the light rail corridor before turning east along Railway Parade to reconnect at Bayview Crescent.

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Electrical – Sydney Trains				
Rozelle 33 kV switching station	Inside Rozelle Rail Yards	Within Rozelle Rail Yards immediately to the north of City West Link and near its intersection with The Crescent.	Outside of the project footprint.	<u>Option 1</u> Reconfiguring of the Sydney Trains network – remove the switching station and construct new feeders outside of the M4-M5 Link project footprint in the Surry Hills area (see **Figure 3-1**). <u>Option 2</u> Relocation – like for like replacement to a new location either some 450 metres to the south west adjacent to Railway Parade and the light rail corridor or some 200 metres to the north east adjacent to the corner of James Craig Road and City West Link (see **Figure 3-2**).
Feeder 759	33 kV underground bulk supply to Rozelle switching station	Runs south under Easton Park and Lilyfield Road and through the Rozelle Rail Yards to the switching station.	Part within and part outside the project footprint.	Treatment for Feeders 759 and 760. Relocation – feeders relayed to run east along the northern boundary of site adjacent to Lilyfield Road and then turn south to run through the Rozelle Rail Yards and under City West Link in a shared utility service corridor. Then continues south along the eastern side of The Crescent before turning west to run across The Crescent and follows the light rail corridor in a shared galvanised steel trough to tie in with existing overhead connection further to the west.
Feeder 760	33 kV overhead, joint use with Feeder 639	From Rozelle Rail Yards switching station running south to cross City West Link and turning west to the south of City West Link and parallel to the light rail corridor.	Part within and part outside the project footprint.	See Feeder 759 above.

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Feeder 639	11 kV underground and overhead, joint use with Feeder 760	Runs west along James Craig Road then turns north and crosses under Anzac Bridge and then west under Victoria Road and through Rozelle Rail Yard to the switching station. Then south crossing under City West Link and west to the southern side of City West Link and parallel to the light rail corridor.	Part within and part outside the project footprint.	Relocation – feeder relayed to run west along James Craig Road and along the southern side of City West Link then turns to run south along the eastern side of The Crescent. Then turns west across The Crescent and follows the light rail corridor in a galvanised steel trough to tie in with the existing overhead connection further to the west (similar to Feeder 760).
Feeders circuit 766	33 kV underground	Runs north along The Crescent and across City West Link to the switching station within the Rozelle Rail Yards.	Outside the project footprint.	New connection – redirect Feeders 766 and 797 to work in isolation of switching station and remove from the Rozelle Rail Yards completely. Provide new joint in the vicinity of The Crescent and Bayview Crescent or in a location further to the south east to connect the two feeders
Feeder 797	33 kV underground	Runs north along Bayview Crescent, under the light rail corridor and across City West Link then turns east to the switching station within the Rozelle Rail Yards.	Outside the project footprint.	See Feeder 766 above.
Telecommunications				
Major multiple optic fibre trench	A combined communications utility trench (principally Telstra) including 2000 plus fibres in 24 ducts. One of four major links in Sydney. Network connects Melbourne and Brisbane.	Runs south along the eastern verge of Victoria Road to cross under Anzac Bridge. Then turns east to run along the southern side of James Craig Road. Also turns west to run along the southern side of James Craig Road and City West Link before turning south to run along The Crescent.	Part within and part outside of the project footprint.	Relocation – cables to be relayed in new utility service corridor running east adjacent to the White Bay Power Station, then turning south under Anzac Bridge to join existing trench along James Craig Road. Existing trench which runs west to the south of James Craig Road is to be retained. Also relay a short section of trench to the east of James Craig Road.

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Water – Sydney Water				
Water main	300 mm diameter	Runs east crossing under Victoria Road and then south along the eastern verge of Victoria Road and crossing under Anzac Bridge to James Craig Road.	Within the project footprint.	Relocation – main to be relayed with new crossing under Victoria Road and new utility service corridor running east adjacent to White Bay Power Station then turning south across Anzac Bridge to join existing main in James Craig Road. Then relay to the west along the southern side of James Craig Road and City West Link before turning south along the eastern side of The Crescent.
Water main	600 mm diameter	Western verge of Victoria Road at Rozelle.	Within the project footprint.	Relocation – main to be relayed to new utility service corridor in western verge of Victoria Road.
Water mains	450 mm and 500 mm diameter water mains	Run east–west along the southern verge of Lilyfield Road.	Within the project footprint.	Relocation – mains to be relayed in two locations along Lilyfield Road where impacted by proposed cut and cover tunnel construction works.
Wastewater – Sydney Water				
Gravity sewer	150 mm diameter	Running south east from Lilyfield Road through the adjacent Light Rail maintenance depot across the Rozelle Rail Yards and across City West Link.	Within the project footprint.	Retain and protect (if required).
Gravity sewer	150 mm diameter	Running east from Lilyfield Road near Easton Park through part of the Rozelle Rail Yards.	Within the project footprint.	Relocation – sewer to be relayed in new utility service corridor to run east along the northern boundary of site adjacent to Lilyfield Road.
Gravity sewer	150 mm diameter	Running north along the Crescent and then turning west through open space area near Whites Creek to connect with Railway Parade.	Part within and part outside the project footprint.	Relocation – sewer to be relayed from The Crescent in bore under light rail corridor to connect with Bayview Crescent.
Gravity sewer	150 mm diameter	Under Victoria Road and east towards White Bay Power Station.	Within project footprint.	New connection – remove existing sewer main which discharges through the White Bay precinct and install new main running west along Lilyfield Road to reconnect existing properties to sewerage system to the west.

Note:

1 Ausgrid to determine final alignment

Figure 3-1 Sydney Trains - Surry Hills (Option 1)

Figure 3-2 Sydney Trains - Railway Parade, Annandale (Option 2)

3.5 Victoria Road, Iron Cove

Existing utilities in the area of Iron Cove (including the civil site (C8)) include a Jemena secondary gas main, various Ausgrid distribution feeders, Telstra multi-fibre optic cables and Sydney Water sewer and water mains.

A secondary gas main which crosses underneath Victoria Road would be impacted by the project. This main would be relayed along the northern side of Victoria Road and then cross Victoria Road before being relayed west along the southern side of the road to reconnect at Toelle Street.

The Balmain Slopes sewer main crosses under Victoria Road to the west of Terry Street and would be impacted by the project works. The sewer main would be relayed to the east along Victoria Road and then cross Victoria Road and turn east to run under private properties between Springside and Moodie Streets. It then would turn south west along Moodie Street to rejoin the existing sewer.

A separate 225 millimetre diameter sewer main which runs along the south side of Victoria Road between Clubb and Toelle streets would be impacted by the project and would be relayed along the southern boundary of the project footprint.

A major multiple optic fibre trench which runs along the north side of Victoria Road and then crosses under Victoria Road near Byrnes Street would not be impacted by the project. A Sydney Water water-main which runs along the north side of Victoria Road would also not be impacted by the project.

As part of the project, it may also be necessary to relay local electricity, gas and communications services through some of the local streets (Byrnes, Clubb, Toelle, Callan, Manning, McCleer and Springside streets) on the southern side of Victoria Road. This option would be investigated further during detailed design in consultation with relevant utility service providers. This area of interest is shown on **Figure 4-5** and the existing environmental conditions in this area are described in **section 7.6.1**.

The existing utility services in this area are listed in **Table 3-5** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-5 Utilities at Victoria Road, Iron Cove

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Gas – Jemena				
Secondary main	150 mm diameter steel main, 1050 kPa	Crossing under Victoria Road from Terry Street to Toelle Street.	Within the project footprint.	Relocation – main to be relayed from Terry Street to the east along the northern side of Victoria Road then turns south to cross Victoria Road and then west along the southern side of Victoria Road to reconnect at Toelle Street.
Telecommunications				
Major multiple optic fibre trench	A combined communications utility trench including 2000 plus fibres in 24 ducts. One of four major links Sydney. Network connects Melbourne and Brisbane.	Follows northern verge of Victoria Road and runs south to cross the road at Byrnes Street and then travels north west under Iron	Within the project footprint.	Retain and protect (if required).

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
		Cove Bridge.		
Water – Sydney Water				
Water main	250 mm diameter	Northern verge of Victoria Road at Iron Cove.	Within the project footprint.	Retain and protect (if required).
Wastewater – Sydney Water				
Balmain Slopes sub-main trunk sewer	1300 x 1750 mm gravity fed tunnel	Crossing under Victoria Road to the west of Terry Street and Toelle Street.	Within the project footprint.	Relocation – trunk sewer to be relayed to the east along the northern side of Victoria Road and then turns south to cross Victoria Road. Then turns east to run under private properties between Springside and Moodie Streets before turning south west along Moodie Street to rejoin the existing sewer.
Gravity sewer	225 mm diameter	On the southern side of Victoria Road between Clubb and Toelle Streets.	Within the project footprint.	Relocation – sewer main to be relayed a short distance along part of the southern boundary of the site.

3.6 Pyrmont Bridge Road, Annandale

Two Sydney Water sewer mains and one water main are located within the boundary of the proposed Pyrmont Bridge Road tunnel site (C9) including beneath Bignell Lane. These mains would be partly protected and partly relocated to a new service corridor which is to be located to the perimeter of the site.

Underground Telstra optic fibre cables run along the northern verge of Parramatta Road at the frontage of the site. These services would be protected during construction and vehicle access points would be located to avoid pits, manholes and pillars so that maintenance of the cables is not compromised.

The existing utility services in this area are listed in **Table 3-6** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-6 Utilities at Pyrmont Bridge Road, Annandale

Utility service	Description	Existing location	Within or outside the project footprint	Proposed management measures
Sydney Water sewer main	300 and 400 mm diameter sewer main	Running north from Parramatta Road to Bignell Lane through the eastern part of the site, then turns to run west and north along Bignell Lane to connect with Pyrmont Bridge Road.	Within the project footprint.	Option 1 Retain and protect (if required) in utility service corridor along east boundary and along part of Bignell Lane. Then relay in new utility service corridor along part of the eastern, northern and western perimeter of the site. Option 2 Retain and protect existing alignment (if required).
Sydney Water water main	100 mm diameter water main	Running west from Mallet Street along Bignell Lane and then turns north along Bignell Lane to Pyrmont Bridge Road.	Within the project footprint.	Option 1 Retain and protect (if required) in utility service corridor along part of Bignell Lane and then relay in new utility service corridor along the eastern and northern perimeter of the site. Option 2 Retain and protect existing alignment (if required).
Telstra multi-fibre optic cables	Underground multi-fibre cables	Running along the northern verge of Parramatta Road adjacent to the southern boundary of the site.	Within the project footprint.	Retain and protect (if required).

3.7 St Peters interchange

Utility works in the St Peters area (including the civil and tunnel site (C10) are being facilitated by the contractor for the New M5 project.

There are no works proposed as part of the M4-M5 Link project at St Peters which would impact on existing utility services. The vertical alignment of the M4-M5 Link tunnels in the St Peters area would be at sufficient depth to avoid existing utility assets including a Jemena secondary gas main along the northern verge of Campbell Road. This utility service would be protected as part of the New M5 project works and would continue to be protected during construction of the project.

An Ausgrid high voltage (HV) transmission cable along Crown Street would not be impacted given the proposed depth of the M4-M5 Link tunnels below. During detailed design an assessment would be carried out to demonstrate that construction of the M4-M5 Link tunnels would have no adverse settlement or vibration impacts on these services.

The existing utility services in this area are listed in **Table 3-7** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-7 Utilities at St Peters interchange

Utility Service	Description	Existing Location	Within or Outside the Project Footprint	Proposed Management Measures
Jemena secondary gas main	250 mm diameter gas main, 1,050 kPa pressure	Running east–west along northern verge of Campbell Road.	Within the project footprint.	Retain and protect (if required) as part of New M5 project.
Ausgrid 132 kV transmission cable	Underground 132kV HV transmission cable	Running north–south along Crown Street.	Within the project footprint.	Retain and protect (if required).

3.8 Mainline tunnels

3.8.1 Sydney Water utility services

The mainline tunnel alignment crosses key Sydney Water utility services, principally the Pressure Tunnel and the City Tunnel. These deep tunnels supply water to residents of Sydney's eastern and southern suburbs and run from Potts Hill to Waterloo. The Pressure Tunnel is listed on the State Heritage Register and on Sydney Water's Heritage and Conservation Register under section 170 of the *Heritage Act 1977* (NSW) and is of State heritage significance. The City Tunnel is listed on Sydney Water's Heritage and Conservation Register and is of local heritage significance.

The Pressure Tunnel was constructed circa 1930 and is described as having an excavated diameter of 3,800 millimetre and an internal steel lining of 2,480 millimetre diameter and is located at an approximate invert level of Reduced Level (RL)-35 metres Australian Height Datum (AHD). It passes below the proposed alignment of the M4-M5 Link mainline tunnels in the vicinity of Enmore Road and King Street in Newtown. In this location, the base of the M4-M5 Link tunnels is located about 12 metres above the top of the Pressure Tunnel (see **Annexure A**). The closest construction/access shaft for the Pressure Tunnel (shaft 14) is approximately 45 metres from the M4-M5 Link mainline tunnels.

The City Tunnel was constructed circa 1960 and is described as having an excavated diameter of 3,000 millimetre with cement lined steel pipe of 2,100 millimetre diameter and is located at an approximate invert level of RL-15 metres AHD. It passes above the proposed alignment of the M4-M5 Link mainline tunnels in the vicinity of Princes Highway and Alice Street, Newtown. In this location the top of M4-M5 Link tunnels is located about 11 metres below the base of the City Tunnel (refer **Annexure A**).

The existing utility services in this area are listed in **Table 3-8** together with proposed management measures. They are also shown in **Annexure A**.

Table 3-8 Utilities for mainline tunnel

Utility Service	Description	Existing Location	Within or Outside the Project Footprint	Proposed Management Measures
Sydney Water Pressure Tunnel	Excavated diameter of 3,800 mm and an internal steel lining of 2,480 mm diameter. Approximate invert level of RL-35	Running east–west in the vicinity of Enmore Road and King Street, Newtown.	Within the project footprint.	Retain and protect (if required).
Sydney Water City Tunnel	Excavated diameter of 3,000 mm with a cement lined steel pipe of 2,100 mm diameter. Approximate invert level of RL-15	Running east–west in the vicinity of Princes Highway and Alice Street, Newtown.	Within the project footprint.	Retain and protect (if required).

Due to the clearance achieved by the M4-M5 Link alignment relative to the Sydney Water tunnels, and the geological conditions in the areas where these cross over points occur, it is expected the Sydney Water assets would not be adversely impacted. Preliminary settlement assessments have predicted that both of the Sydney Water tunnels would experience minimal movement (see **Chapter 12** (Property and land use) of the EIS). It is expected that the potential vibration and settlement impacts on these utility services would be negligible and can be managed.

Surveys should be undertaken to verify the levels and condition of these Sydney Water assets. A detailed assessment would be carried out in consultation with Sydney Water during the detailed design phase to demonstrate that construction of the M4-M5 Link tunnels would have negligible adverse settlement or vibration impacts on these water tunnels. A settlement monitoring program would also be implemented during construction. An interface agreement would be required with Sydney Water to ensure these utility services are protected during construction including requirements for monitoring of potential vibration and settlement impacts.

3.8.2 Ausgrid electrical infrastructure

Investigations have been undertaken to confirm the location of any existing electrical zone substations adjacent to the tunnel alignment. These substations could potentially have earthing rods infrastructure, possibly up to 30 metres deep.

The tunnel alignment comes within around 20 metres of the Ausgrid substation located in Balmain Road at Leichhardt. The tunnel alignment does not cross directly beneath the substation and at this point the tunnels are located at a depth of about 50 metres below ground level.

Ausgrid has confirmed that the tunnel alignment and depths would not have any adverse impacts on earthing rods associated with existing substations.

4 Proposed power supply

4.1 Construction power supply

4.1.1 Overview

A number of construction sites are proposed along the mainline tunnel alignment and for the Rozelle interchange and Iron Cove Link for construction of the project as detailed in **section 1.1.3**. Major construction power would be required at sites where tunnelling is to be undertaken by roadheaders.

Construction power supply to other construction sites will be arranged by the contractor and are likely to be provided either by local supplies or by generators.

4.1.2 Estimated power demand

The projected estimate of maximum power demands is shown in **Table 4-1**. The maximum power demand has been conservatively calculated to allow contingency for larger or additional roadheaders that may be required to accelerate the construction program. Target power connection dates are indicative only and would be reviewed during detailed design in consultation with Ausgrid.

Table 4-1 Estimate of construction power supply demand

Construction site	Maximum demand (MVA)	Target power connect date
Option A – Wattle Street and Haberfield civil and tunnel sites (C1a and C2a)	10	Q3 2019
Option B – Parramatta Road West civil and tunnel site (C3b)	10	Q4 2018
Darley Road civil and tunnel site (C4)	8	Q3 2018
Rozelle civil and tunnel site (C5)	13	Q4 2018
Pyrmont Bridge Road tunnel site (C9)	10	Q3 2018
Campbell Road civil and tunnel site (C10)	10	Q4 2018

4.1.3 Haberfield/Ashfield

The contractor for the M4 East project has provided a 10 Mega Volt Amp (MVA) construction power supply on the Northcote Street tunnelling site. The connection is provided via two 11 Kilovolt (kV) High Voltage Connections (HVCs) supplied by two cabled connections to the Ausgrid network. It is currently located in an ideal position to service the proposed construction sites at Haberfield.

However, it may not be possible for the M4-M5 Link project to use this supply for construction purposes, as:

- There is uncertainty that the connection would be released by the M4 East contractor by the required date
- The connection capacity has already been reallocated by Ausgrid.

Consequently, an alternative power supply connection is required. The alternative power supply connection is likely to be from the Ausgrid substation located on Croydon Road some distance to the west. The maximum demand of 10 MVA would require two HVCs connected by cables to the Ausgrid 11 kV network.

For both the Option A and Option B construction sites the connection would run from the substation on Croydon Road generally in an easterly and south easterly direction following existing road reserves toward the Parramatta Road West civil and tunnel site with a tee connection to the Wattle Street and Haberfield civil and tunnel sites. The proposed connection would be located outside of the project footprint and therefore would be subject to the environmental constraints analysis and environmental risk assessment process as detailed in **section 9.2**.

An indicative alignment for the connection to serve both sites is shown in **Figure 4-1**. The final alignment would be determined in consultation with Ausgrid during detailed design.

4.1.4 Darley Road, Leichhardt

The location of the proposed supply point for the Darley Road civil and tunnel site (C4) is the Leichhardt substation on Balmain Road opposite the corner of Derbyshire Road some 850 metres to the south east of the construction site.

The maximum demand of 8 MVA would require two HVCs connected by cables to the Ausgrid 11 kV network. The connection would run from the substation on Balmain Road in a north-westerly direction toward the construction site following existing road reserves. The proposed connection would be located outside of the project footprint and therefore would be subject to the environmental constraints analysis and environmental risk assessment process as detailed in **section 9.2**.

An indicative alignment is shown in **Figure 4-2**. The final alignment would be determined in consultation with Ausgrid during detailed design.

4.1.5 Rozelle

The location of the proposed supply point for the Rozelle civil and tunnel site (C5) is the Leichhardt substation on Balmain Road some 1,500 metres to the southwest of the construction site.

The maximum demand of 13 MVA would require two HVCs connected by cables to the Ausgrid 11 kV network. The connection would run from the substation on Balmain Road generally in a north-easterly direction toward the construction site at Rozelle (C5) following existing road reserves. The connection is located outside of the project footprint and therefore would be subject to the environmental constraints analysis and environmental risk assessment process as detailed in **section 9.2**.

An indicative alignment is shown in **Figure 4-3**. The final alignment would be determined in consultation with Ausgrid during detailed design.

4.1.6 Pyrmont Bridge Road, Annandale

The location of the proposed supply point for the Pyrmont Bridge Road tunnel site (C9) is in Layton Street, Annandale some 100 metres to the east of the construction site.

The maximum demand of 10 MVA would require two HVCs connected by cables to the Ausgrid 11 kV network. The connection would run from the substation on Layton Street generally in a westerly direction toward the construction site following existing road reserves. The connection is located outside of the project footprint and therefore would be subject to the environmental constraints analysis and environmental risk assessment process as detailed in **section 9.2**.

An indicative alignment is shown in **Figure 4-4**. The final alignment would be determined in consultation with Ausgrid during detailed design.

4.1.7 Campbell Road, St Peters

The contractor for the New M5 project is required to provide a 10 MVA supply for construction of the M4-M5 Link project. The location of the supply point is on the south side of Albert Street within the M4-M5 Link construction site at Campbell Road (C9). These works do not form part of the M4-M5 Link project.

Figure 4-1 Construction power - Haberfield and Ashfield (Options A and B)

Figure 4-2 Construction power - Darley Road, Leichhardt

Figure 4-3 Construction power - Rozelle

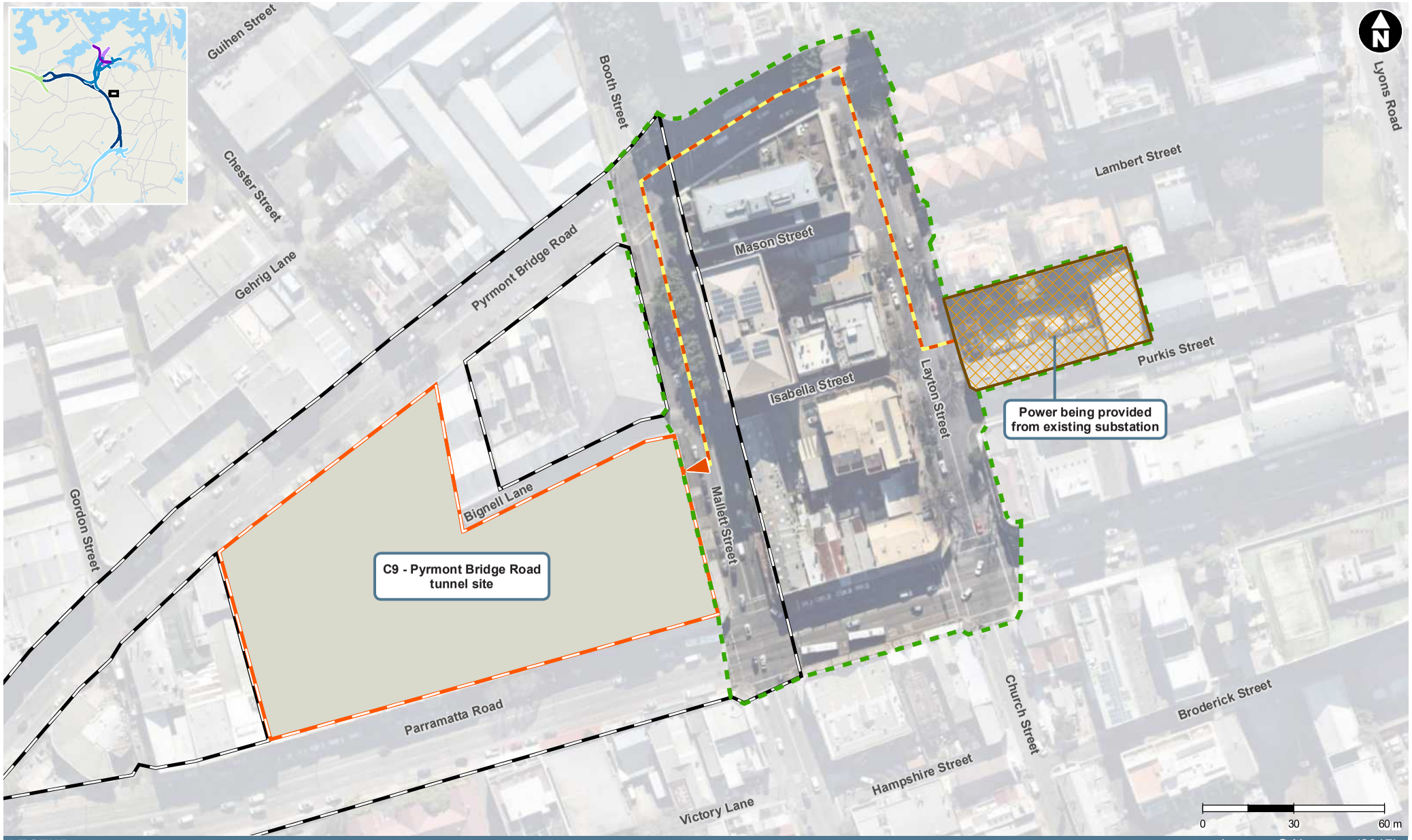


Figure 4-4 Construction power - Pyrmont Bridge Road, Annandale

4.1.8 Summary

Table 4-2 provides a summary of the estimated maximum power demand and supply connection points for each of the proposed tunnel construction sites for the project.

Table 4-2 Construction sites – power demand and supply connections

Construction site	Maximum demand required (MVA)	Ausgrid supply connection point	Approximate distance (metres)[1] to construction site	Within or outside project footprint
Option A - Wattle Street and Haberfield civil and tunnel sites (C1a and C2a)	10	Croydon Road, Croydon	850	Outside the project footprint.
Option B – Parramatta Road West civil and tunnel site (C1b)	10	Croydon Road, Croydon	850	Outside the project footprint.
Darley Road civil and tunnel site (C4)	8	Balmain Road, Leichhardt	850	Outside the project footprint.
Rozelle civil and tunnel site (C5)	13	Balmain Road, Leichhardt	1,500	Outside the project footprint.
Pyrmont Bridge Road tunnel site (C9)	10	Layton Street, Annandale	100	Outside the project footprint.
Campbell Road civil and tunnel site (C10)	10	Connection to be provided within site by New M5 contractor	N/A	N/A

Note:

1 Distance is measured in a straight line between the supply connection point and the construction site.

4.2 Operational power supply

4.2.1 Overview of strategy

The strategy for permanent, operational power supply has considered the following issues:

- The power connection must allow for commissioning of the mainline tunnel independently of, and prior to, the Rozelle interchange and Iron Cove Link
- Mainline tunnel is to be operational in 2022 and commissioned prior to this date
- Rozelle interchange and Iron Cove Link is to be operational in 2023 and commissioned prior to this date
- Power supply must provide full redundancy (effectively two supply units, each capable of powering the operation) and there is to be no inter-dependency between the two redundant supplies, so that power supply would not be interrupted if one unit fails
- The ideal (but not mandatory) location for power supply connection to a long tunnel is as close as possible to the load centre or separate supplies from either end. For the M4-M5 Link project, the main load centres are the ventilation outlets at St Peters, Rozelle and Iron Cove and the evenly spaced jet fans throughout the various tunnel sections.

4.2.2 Estimated power demand

The preliminary estimate of maximum power demands for the M4-M5 Link project is shown in **Table 4-3**.

It has been assumed that operational power for the proposed future Western Harbour Tunnel and Beaches Link project would be supplied separately and as a result no allowance has been included for this project in the estimate of power demand.

Table 4-3 Preliminary estimate of maximum power demand

Project element	MVA
Mainline tunnels	35
Rozelle interchange and Iron Cove Link	30

The maximum power demand for the tunnels is driven predominantly by the ventilation system and particularly for scenarios involving congested traffic conditions or a fire within the tunnels. During normal, free-flowing traffic conditions the power demand for ventilation is significantly reduced by comparison. Therefore much of the power supply capacity remains unused for most of the time.

4.2.3 Power supply connection locations

A bulk power supply can be provided in a single location or two locations and then distributed to the ventilation outlets and jet fans within the tunnels. The Ausgrid transmission voltage is 33 kV and this is the nominated preference for the bulk power supply.

There are two substations best located to provide the bulk power supply connection for the project:

- Alexandria zone substation, at Bourke Road, Alexandria. This substation is currently under construction and is expected to be completed in late 2017
- Rozelle zone substation at Manning Street, Rozelle.

The locations of each zone substation are shown in **Figure 4-5**, **Figure 4-6** and **Figure 4-7**. Upgrade of the zone substations would be required to accommodate the bulk power supply connection for the M4-M5 Link project and these works would be undertaken by Ausgrid.

4.2.4 Options for power supply network connections

Bulk power supply network connection

At this stage, there are three preferred options for the bulk power supply network connection for the project and these options are currently being investigated with Ausgrid:

- Option 1 – connection from Rozelle zone substation only
- Option 2 – connection from Alexandria zone substation only
- Option 3 – connection from Rozelle zone substation (for Rozelle interchange and Iron Cove Link) and Alexandria zone substation (for the mainline tunnels).

Each option is explained in more detail in **Table 4-4**.

Table 4-4 Options for bulk power supply network connection

Option Number	Ausgrid zone substation	Connection to mainline tunnel	Connection to Rozelle interchange and Iron Cove Link	Within or outside the project footprint
1	Manning Street, Rozelle	Dual 33 kV feeders to substation at Darley Road, Leichhardt	Dual 33 kV feeders to substation at Rozelle Rail Yards.	Outside the project footprint.
2	Bourke Road, Alexandria	Dual 33 kV feeders to substation at Campbell Road, St Peters	Additional pair of dual 33 kV feeders to substation at Campbell Road, St Peters and then via the mainline tunnel to Rozelle interchange and Iron Cove Link.	Outside the project footprint.
3	Manning Street, Rozelle	N/A	Sub-option A Dual 33 kV feeders to the tunnel portals at Victoria Road Iron Cove and then via the Iron Cove Link tunnel to a substation at the Rozelle Rail Yards. Sub-option B Dual 33 kV feeders to substation at Rozelle Rail Yards following local roads.	Outside the project footprint.
	Bourke Road, Alexandria	Dual 33 kV feeders to substation at Campbell Road, St Peters	N/A	N/A

At this stage Option 3 is preferred as it provides greater system reliability and accommodates the staged opening of the mainline tunnels and Rozelle interchange/Iron Cove Link.

Feeder connections

For Option 3 there are two sub-options for how 33 kV feeders would connect from the Ausgrid zone substation in Manning Street, Rozelle to the Rozelle Rail Yards. These options are shown in **Figure 4-5** and **Figure 4-6** and include:

- Sub-option A – would be to run the feeders a short distance (about 200 metres) to the north east to the proposed ventilation facility at Victoria Road Iron Cove and then via the Iron Cove Link tunnel to a ventilation facility at the Rozelle Rail Yards
- Sub-option B – would be to run the feeders a longer distance (about 900 metres) to the south east to the ventilation facility at the Rozelle Rail Yards following local roads.

At this stage Sub-option A is preferred given the shorter distance involved and the likely reduced level of environmental and community impact associated with the works.

For Option 3 at Alexandria, the 33 kV feeders would run southwest from the Alexandria zone substation in Bourke Road and then west crossing Alexandria Canal and travelling along Campbell Road to the site (distance of about 1,100 metres). This connection is shown in **Figure 4-7** and would be constructed to supply power to the New M5 project. Additional conduits would be installed by the New M5 project for use by the M4-M5 Link project thereby removing the need for further disturbance.

The dual 33 kV feeders from the Alexandria and Rozelle Zone substations would provide power to high voltage intake substations at Rozelle, Iron Cove and St Peters ventilation facilities and other operational facilities. There would also be underground substations located along the length of the tunnels at spacings of no more than 1,200 metres to supply the ventilation and lighting systems.

Figure 4-5 Permanent power - Iron Cove (Option A)

Figure 4-6 Permanent power - Rozelle (Option B)

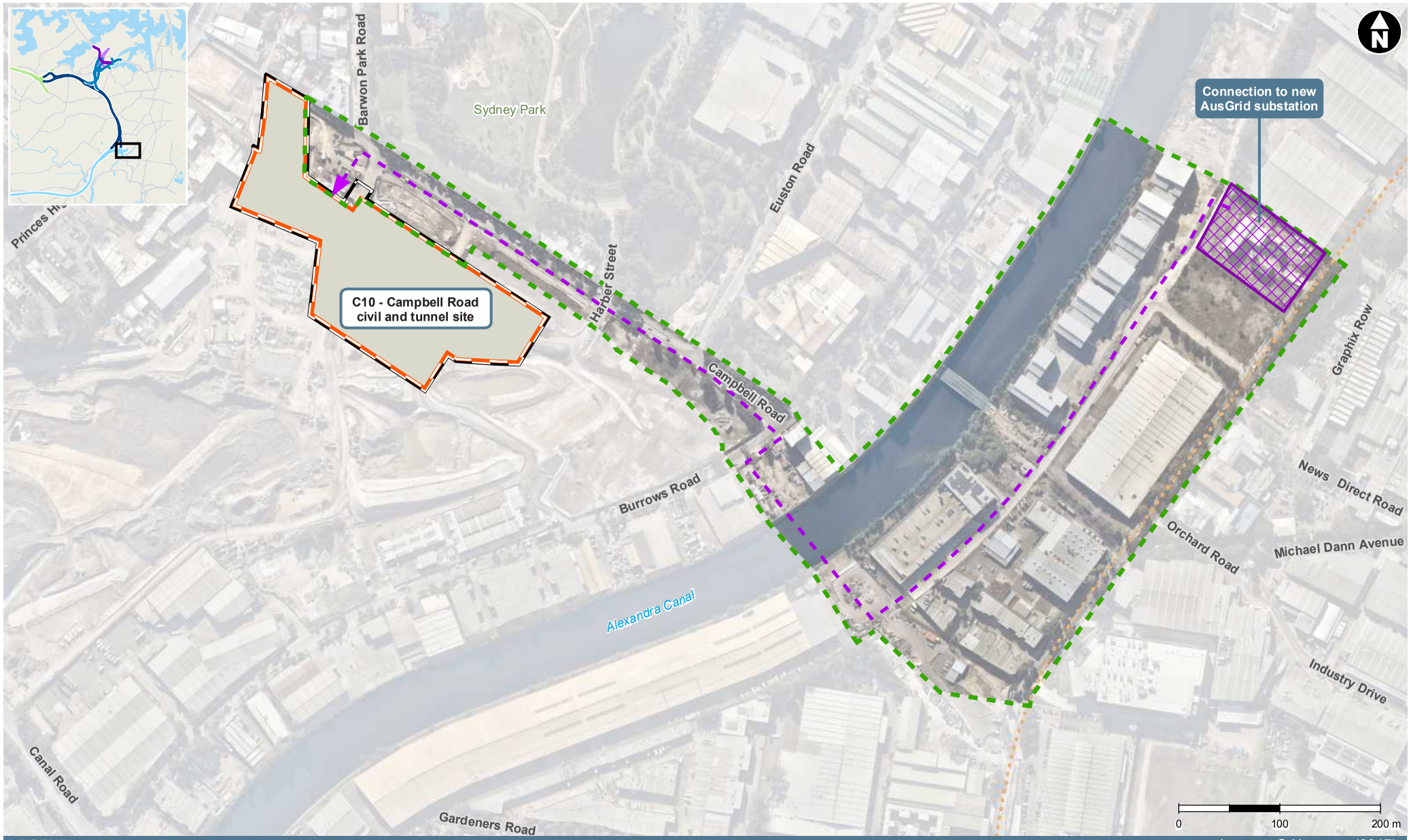


Figure 4-7 Permanent power - St Peters

4.2.5 Relevant considerations

A final decision on the preferred power supply option and feeder route options would be made by the contractor during detailed design in consultation with Ausgrid. A number of issues would be considered in determining the preferred options including:

- Required timeframe for connection and the sequencing of project works
- Capacity of connection
- Redundancy provisions
- Reliability of supply
- Proximity of connection location
- Surface cable route
- Potential for environmental and local community impacts
- Location of existing utility services
- Overall cost.

5 Proposed drainage infrastructure

5.1 Overview

This chapter describes the main permanent drainage infrastructure proposed as part of the M4-M5 Link project. The infrastructure is described under the following work categories:

- Drainage infrastructure proposed within the project footprint, within and adjacent to the Rozelle Rail Yards
- Upgrade of existing road drainage infrastructure within the project footprint
- Drainage works proposed outside of the project footprint.

At this concept design stage of the project, limited information is available about the capacity of the existing drainage infrastructure. This will be investigated further during the detailed design phase and adjustments made to the proposed drainage infrastructure if required.

5.2 Drainage infrastructure within the project footprint

5.2.1 Rozelle Rail Yards

Major drainage works are proposed within and adjacent to the Rozelle Rail Yards including the following elements:

- A new drainage channel (the northern channel) which would run from Lilyfield Road in a southerly direction through the central area of the site and then drains under City West Link via a new drainage box culvert and headwall to Rozelle Bay. This would effectively replace the existing Easton Park drain
- A new drainage channel (the western channel) which would run from the western boundary of the site in an easterly direction parallel to City West Link. In the central part of the site the channel would connect with the northern channel and then drain under City West Link to Rozelle Bay. This would include an adjustment of the northern outlet headwall to be constructed at the CBD and South East Light Rail Rozelle maintenance depot adjacent to the common (western) boundary
- A new drainage channel and bio-retention swale (the eastern channel) which would run from near the eastern boundary in a westerly direction to the northern channel in the central portion of the site and then drain under City West Link to Rozelle Bay
- A water treatment plant which would treat groundwater and surface water that enters the tunnels and then discharge the treated water into the constructed wetland
- A new constructed wetland located in the central portion of the site, which would connect to the northern channel and then drain under City West Link to Rozelle Bay
- Upgrade and widening of the Whites Creek concrete-lined drain along its southern bank in the vicinity of The Crescent to allow for improved conveyance of peak flows to Rozelle Bay. The work would include reshaping the southern bank, naturalisation of the creek and a new outlet to Rozelle Bay.

These works are described and shown in **Chapter 5** (Project description) of the EIS and are all located within the project footprint.

5.2.2 Other drainage infrastructure

Other drainage works are proposed within the project footprint including:

- A new stormwater bioretention facility located within an informal grassed carpark area within King George Park adjacent to Manning Street, Rozelle. This facility would capture and treat surface water run-off from Victoria Road before discharging via an existing outlet to Iron Cove. The carpark area in Manning Street would be redeveloped and the existing capacity (number of spaces) would be maintained
- Upgrade of existing drain in Byrnes Street to capture run-off from Victoria Road and direct it to the new bioretention facility adjacent to Manning Street.

These works are described and shown in **Chapter 5** (Project description) of the EIS and are all located within the project footprint.

5.3 Upgrade of existing road drainage infrastructure

Drainage infrastructure along some existing roads within the M4-M5 Link project footprint would also need to be adjusted or upgraded, including:

- Wattle Street at Haberfield to connect the drainage for the M4-M5 Link tunnel portals to the M4 East drainage system
- Victoria Road at Rozelle to the southeast of Iron Cove Bridge, including the drainage connection between Victoria Road and Warayama Place
- Victoria Road at Rozelle to the north of The Crescent
- Victoria Road at the western approach to Anzac Bridge
- The Crescent to the south of City West Link
- Lilyfield Road generally between Victoria Road and Grove Street to the north of the Rozelle Rail Yards including at the corner of Lilyfield Road and Gordon Street
- James Craig Road near its intersection with The Crescent and further east along James Craig Road on the south side Victoria Road and Anzac Bridge.

5.4 Drainage works outside project footprint

Drainage works proposed outside of the M4-M5 Link project footprint include a number of options that are being considered for managing treated water from the Darley Road water treatment plant. These include:

- Direct discharge to Hawthorne Canal, which would require a pipe to be installed along Canal Road and the construction of a new outlet in the wall of the Hawthorne Canal
- Direct discharge to the existing stormwater pipework in an adjoining road (ie Canal Road), which would require a pipe to be installed to connect to the existing piped drainage and potentially other augmentation of the stormwater drainage network
- Direct discharge into the sewer system located on the site, which would require a Trade Waste Agreement with Sydney Water.

The first two of these options are shown in **Figure 5-1** and would involve work being undertaken in areas outside of the project footprint and therefore would be subject to the environmental constraints analysis and environmental risk assessment process as detailed in **section 9.2**.

Figure 5-1 Water treatment plant discharge - Canal Road, Leichhardt

6 Construction works

6.1 Construction methodology

The construction methodology would vary according to the type of utility service, the scale of the work and the location. However, typically the methodology for constructing an underground utility service may include:

- Establishing temporary construction facilities including storage, laydown and stockpile areas, site offices and amenities
- Securing work areas such as with fencing and hoarding
- Installing pre-construction environmental management controls
- Investigations to confirm location of existing utility services such as potholing and works to protect or relocate services as required
- Removing and managing/protecting vegetation as required
- Saw cutting to remove asphalt or concrete pavement
- Undertaking initial trench excavations and shoring. Note that in some circumstances tunnelling or boring techniques can be used. Launching and receiving sites are required for these techniques
- Stockpiling excavated materials for reuse or removal for off-site disposal
- Preparing sub-grade surface (eg crushed rock) to accommodate utility services
- Laying utility services either as pipes or conduits
- Constructing joint bays and pits
- Pulling feeders through conduits
- Connecting utility services to existing systems
- Testing and commissioning of utility services
- Backfilling trenches and re-instating surface to an appropriate condition
- Removing excess stockpiles, materials and equipment
- Removing or suitably isolating redundant services where practical
- Rehabilitating areas disturbed by works, such as with new topsoil and vegetation
- Site clean-up and decommissioning temporary construction facilities, work areas and environmental management controls.

The work would be carried out in stages and would proceed in a linear manner along the route. The depth and width of excavation would depend on a number of factors such as the type of utility service, local topography, the location of existing services and sub-surface conditions.

6.2 Typical equipment used

The type of equipment that can be used varies according to the type of utility service, the scale of the project and the location. However, typically equipment may include items such as:

- Chainsaws and mulcher/chipper
- Asphalt/concrete cutting saws and rock breaking equipment
- Excavators, bobcats and backhoes
- Boring machine
- Vacuum excavation trucks, super suckers, water tankers and road sweepers
- Horizontal directional drilling and thrust boring rigs

- Piling rig, pole bores and mobile crane
- Power generators and assorted power tools
- Graders, compactors and vibratory rollers
- Concrete agitators and asphalt/concrete pavement laying machine
- Trucks to transport spoil and materials.

6.3 Standard working hours

Construction associated with utility works would typically be undertaken between the following standard hours:

- 7.00 am and 6.00 pm Monday to Friday
- 8.00 am and 1.00 pm on Saturday
- No work on Sunday or public holidays.

6.4 Work required outside of standard working hours

In some instances, works may be required outside of these standard hours. Examples include, but are not limited to, the following:

- Works that are emergency works
- Works that are being carried out on or adjacent to heavily trafficked roads such as Victoria Road, City West Link, The Crescent and Parramatta Road
- Works that affect essential public infrastructure and which could potentially disrupt services to the local community
- Works that involve the delivery of oversize plant or equipment that cannot occur during standard hours
- Works that may shorten the length of the construction phase and thereby benefit the local community
- Works that would not result in exceedances of relevant noise management levels identified in accordance with *Interim Construction Noise Guideline* (NSW EPA, 1999) (ICNG).

In these circumstances works would be undertaken in accordance with an out of hours work (OOHW) protocol and prior notification of the works would be provided to affected residential and business properties. A road occupancy licence (ROL) may be required to support the OOHW, particularly for works that are being carried out on or adjacent to heavily trafficked roads.

6.5 Timing and duration of utility works

Table 6-1 shows the indicative timing and duration of the utility works.

In most areas the utility works would occur over an estimated duration of up to nine months. At Rozelle and Iron Cove where more significant utility works are required, the works would occur over an estimated duration of around 15 months and 24 months respectively.

The duration refers to the overall period during which the utility works would be undertaken. In reality the utility works are likely to be undertaken intermittently during this overall period (not continuously). The overall duration of utility works would be confirmed during detailed design.

Table 6-1 Indicative timing and duration of utility works

Area of interest	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	2018				2019				2020			
Haberfield area (Option A) – Wattle Street civil and tunnel site (C1a) and Haberfield civil and tunnel site (C2a)												
Haberfield area (Option B) – Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b)												
Leichhardt area – Darley Road civil and tunnel site (C4)												
Rozelle area – Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and Victoria Road civil site (C7)												
Iron Cove area – Iron Cove civil site (C8)												
Annandale area – Pyrmont Bridge Road tunnel site (C9)												
St Peters area – Campbell Road civil and tunnel site (C10)												

7 Existing environment

7.1 Overview

The information in the following sections (**sections 7.2** to **7.9**) provides a general description of the existing environmental conditions and key constraints in the areas of interest and in particular in the areas that fall outside of the project footprint based primarily on desktop assessment. The descriptions are provided in the context of the utility works including power supply connections and drainage infrastructure that are proposed.

Once further consultation with relevant utility service providers has occurred and a detailed design for the proposed works are confirmed by the contractor then an updated environmental constraints analysis and risk assessment would be undertaken to confirm that the environmental impacts assessed and management measures recommended in this Strategy are appropriate.

7.2 Construction power – Haberfield and Ashfield

As detailed in **section 3.2** there are two options for proposed construction sites at Haberfield and Ashfield – Option A and Option B.

As detailed in **section 4.1.3**, the construction power connection will run from the Ausgrid substation on Croydon Road generally in an easterly and south easterly direction following existing road reserves to service the Parramatta Road West civil and tunnel site with a tee connection to the Wattle Street and Haberfield civil and tunnel sites. The existing environmental conditions in this area of interest are shown in **Figure 7-1** and **Figure 7-2** and described in **Table 7-1**.

Table 7-1 Construction power - Haberfield and Ashfield (Options A and B)

Environmental aspect	Existing conditions
Land use	This area is dominated by commercial development along the Parramatta Road corridor, established residential areas located on either side of the corridor and various open spaces. The area is relatively flat although there is a gentle fall from Parramatta Road in an easterly direction toward Iron Cove. Along this section of Parramatta Road, commercial development lines both sides of the road. To the south-east of Parramatta Road are established residential areas, including local streets such as Church Street, Henry Street, Lucy Street, Knocklayde Street, Page Avenue and Earl Avenue, Alt street and Bland Street. In this area there is an Ausgrid substation on Croydon Road. Key open spaces include Hammond Park at Frederick Street and areas along Dobroyd Canal (Iron Cove Creek) to the east of Parramatta Road. Works associated with the M4 East project are continuing in the area around Parramatta Road and Wattle Street until 2019.
Traffic and transport	Major roads within the investigation area include: · Parramatta Road, which has three lanes of traffic in each direction, operational clearways and is generally congested during peak hours · Wattle Street, which has two lanes of traffic in each direction · Frederick Street and Croydon Road, which both have one lane of traffic in each direction and limited on-street car parking. Other roads within the area of investigation are primarily residential streets with one lane of traffic in each direction, on street parking and footpaths on either side of the road. Bus services operate along Parramatta Road, Frederick Street and John Street.

Environmental aspect	Existing conditions
Non-Aboriginal Heritage	A number of listed non-Aboriginal heritage items are located within the investigation area. The items are listed under the Ashfield LEP or Roads and Maritime's Heritage and the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW) and include: · Roads and Maritime heritage items at 19, 21 and 23 Wattle Street, Haberfield (Roads and Maritime section 170 register) · House at 9 Wattle Street, Haberfield (local significance) · House at 30 Page Avenue, Ashfield (local significance) · Public reserve (Hammond Park) at Frederick Street, Ashfield (local significance) · Houses at 11–11a, 27–29, 31–33, 30–38 Lucy Street, Ashfield (local significance) · Houses at 1 and 43 John Street, Ashfield (local significance) · Houses at 82 and 86 Charlotte Street, Ashfield (local significance) · Houses at 18, 22 and 26 Julia Street, Ashfield (local significance) · Dobroyd Canal (Iron Cove Creek) (local significance) · Commercial building (Bunnings Warehouse) at 476 Parramatta Road (local significance) · Infants Home at 17 Henry Street (local significance). The investigation area also includes the following heritage conservation areas under the Ashfield LEP: · The Ranch Conservation Area to the west of Parramatta Road and north of Frederick Street · Hammond Park Estate Conservation Area to the north of Frederick Street in the vicinity of Hammond Park · Lucy Street Conservation Area to the north of Frederick Street and west of Church Street · Haberfield Heritage Conservation Area east of Parramatta Road and extending both north and south of Wattle Street/Dobroyd Parade.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, sensitive receivers within and adjacent to the investigation area include: · Bupa Aged Care Ashfield at 126–128 Frederick Street, Ashfield · Mini-Skool Early Learning Centre at 195 Croydon Road, Croydon · Robyn Taylor Child Development Centre at 65 Church Street, Croydon · Little VIPs Child Care at 113 Dobroyd Parade, Haberfield · St John's Anglican Church at 81 Alt Street, Ashfield · St John's Pre-School at 64 Bland Street, Ashfield · The Infants Home at 17 Henry Street, Ashfield · Haberfield Public School at Bland Street, Haberfield.

Environmental aspect	Existing conditions
Waterways and biodiversity	Dobroyd Canal (Iron Cove Creek) is a concrete lined channel that runs under Parramatta Road and to the east where it drains into Iron Cove. Areas bordering Dobroyd Canal (Iron Cove Creek) are landscaped. Dobroyd Canal (Iron Cove Creek) is located along the northern extent of the investigation area. Vegetation within the investigation area is primarily limited to mature trees of various sizes contained within residential property boundaries. There are a number of mature trees, including significant trees and landscaped vegetation within Hammond Park at Frederick Street.
Geology, soils and contamination	The investigation area includes land classified as Class 5 acid sulphate soils and there are no adjacent Class 1, 2, 3 or 4 lands. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area. Soils landscapes within the investigation area include: · Disturbed terrain soil landscape surrounding Dobroyd Canal (Iron Cove Creek) · Gymea – erosional soil landscape for the majority of the investigation area between Dobroyd Canal (Iron Cove Creek) and Frederick Street/Wattle Street · Blacktown – soil residual landscape for the area beginning at Frederick Street/Wattle Street and extending south. The investigation area consists of the Ashfield Shale (black to dark grey shale and laminate) geological formation. The investigation area does not include any sites identified on the NSW Environment Protection Authority (NSW EPA) Contaminated Lands Register or on the list of NSW Contaminated Sites notified to NSW EPA.
Noise environment	Background noise in this area is dominated by traffic on the major roads in particular Parramatta Road, Wattle Street/Dobroyd Parade and Frederick Street, and construction noise from the M4 East project. The investigation area falls with Noise Catchment Area (NCA) 01 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

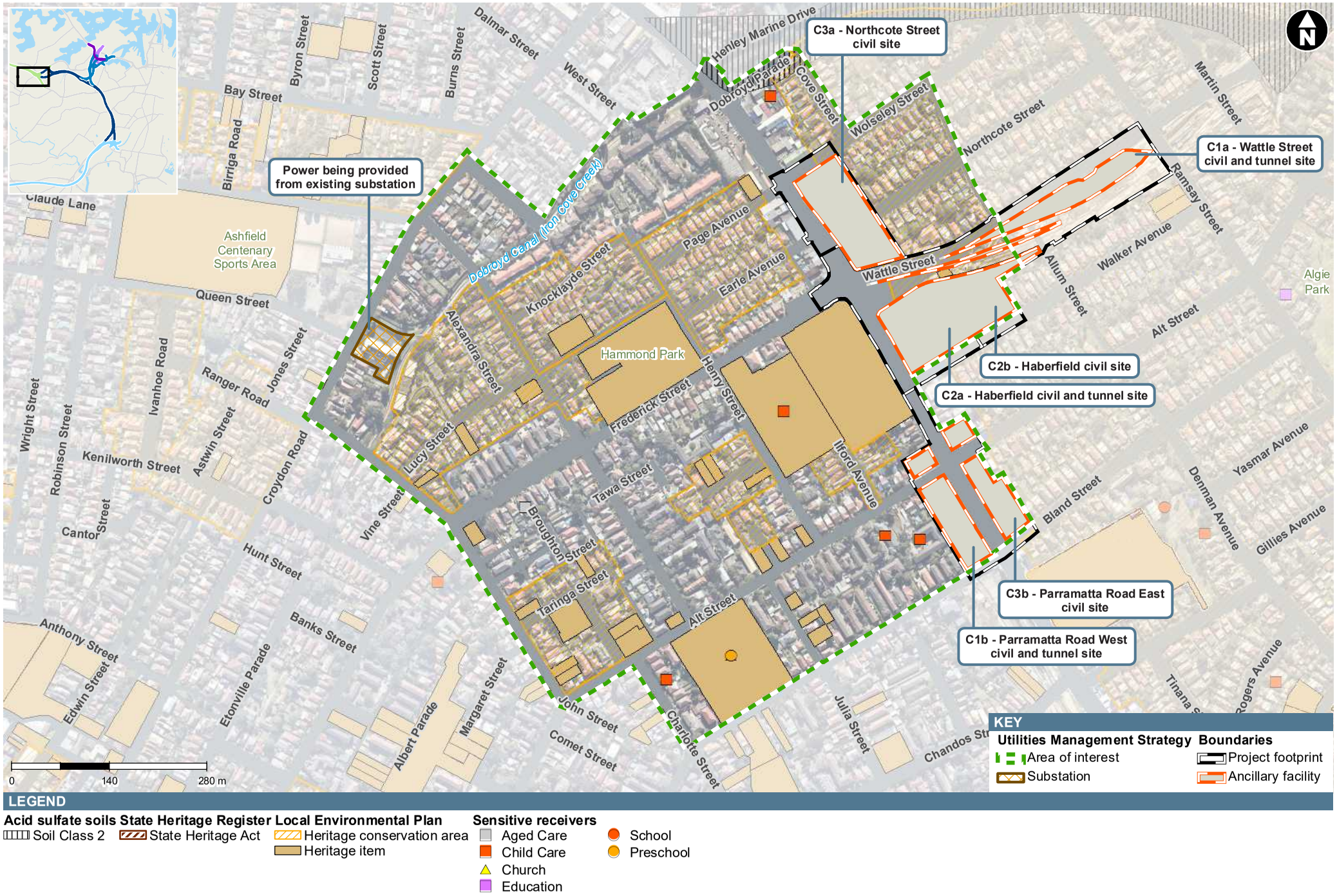


Figure 7-1 Construction power - Haberfield and Ashfield (Options A and B) environmental constraints 1 of 2

Figure 7-2 Construction power - Haberfield and Ashfield (Options A and B) environmental constraints 2 of 2

7.3 Construction power - Darley Road Leichhardt

As detailed in **section 4.1.4**, the construction power connection will run from the Ausgrid substation on Balmain Road at Leichhardt in a north-westerly direction to the Darley Road civil and tunnel site (C4) following existing road reserves. The existing environmental conditions in this area of interest are shown on **Figure 7-3** and **Figure 7-4** and are described in **Table 7-2**.

Table 7-2 Construction power – Darley Road, Leichhardt

Environmental aspect	Existing conditions
Land use	The Darley Road site is occupied by a commercial building. To the north, the site adjoins the Inner West Light Rail line and the Leichhardt North Light Rail stop and further to the north is City West Link. To the south of the site across Darley Road is an established residential area. Commercial and mixed-use development is located along sections of Norton Street. There is also a small area of industrial/commercial development located on William Street between North Street and Francis Street. Other notable land uses within and adjacent to this area include the Sydney Secondary College Leichhardt and State Transit Authority (STA) bus depot on Balmain Road, Pioneers Memorial Park in Norton Street and Blackmore Park to the north west of Darley Road and the light rail corridor.
Traffic and transport	Major roads within the investigation area include: · City West Link at the north of the investigation area, which is major road with between two to three lanes of traffic in each direction · Darley Road is a collector road with one lane of traffic in each direction and on-street car parking. The signalised intersection of City West Link and Darley Road is quite busy and traffic queues back from this intersection during the morning and afternoon peak periods · Derbyshire Road is a narrow road with one lane of traffic and some provision for on-street parking. Bollards are located along Derbyshire Road adjacent to the Sydney Secondary College Leichhardt and restrict through traffic movements · Norton Street has one lane of traffic in each direction, restricted on-street parking and runs through the Leichardt town centre. Other roads within the area of investigation are primarily residential streets with one lane of traffic in each direction, on-street parking and footpaths on either side of the road. The Leichhardt North Light Rail stop is located to the south of City West Link near the corner of Darley Road. Bus services operate along Norton Street, Derbyshire Road, Balmain Road, Allen Street and Carlisle Street.

Environmental aspect	Existing conditions
Non-Aboriginal Heritage	A number of listed non-Aboriginal heritage items are located within and adjacent to the investigation area. The items are listed under the Leichhardt LEP and the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW) and include: · RailCorp heritage area (Charles Street Rail Bridge) at Charles Street, Leichhardt · Street trees – at Henry Street, Leichhardt (local significance) · Pioneers Memorial Park at Norton Street Leichhardt (local significance) · Former general store, including interiors at 20–22 Forster Street, Leichhardt (local significance) · Leichhardt hotel, including interiors at 1 Short Street, Leichhardt (local significance) · Royal Hotel, including interiors at 156 Norton Street, Leichhardt (local significance) · Charles Street rail bridge which is on the Railcorp section 170 Heritage and Conservation Register (local significance) · The former SRA cable store and traffic office (local significance). The investigation also includes the following heritage conservation areas under the Leichhardt LEP: · Whaleyborough Estate Heritage Conservation Area located between Cromwell Street and Norton Street · Wetherill Estate Heritage Conservation Area located between North Street and Derbyshire Road south of Allen Street · Leichhardt Street/Stanley Street Heritage Conservation Area.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, sensitive receivers within and adjacent to the investigation area include: · Only About Children Leichardt, 215 Elswick Street, Leichhardt · St Columba's Primary School Leichhardt North · Sydney Secondary College Leichhardt on Balmain Road, Leichhardt.
Waterways and biodiversity	There are no waterways within the investigation area. The closest watercourses are located at Hawthorne Canal to the west and Whites Creek to the east. Vegetation within the investigation area is primarily limited to mature street trees of various sizes and vegetation within private properties. There are a number of mature trees located within Pioneers Memorial Park, Blackmore Park, within parts of the Sydney Secondary College Leichhardt and along sections of the light rail corridor. There are heritage listed street trees located within the road reserve at Henry Street, Leichhardt which are identified under the Leichhardt LEP as having local significance.

Environmental aspect	Existing conditions
Geology, soils and contamination	The investigation area includes land classified as Class 5 acid sulphate soils and there are no adjacent Class 1, 2, 3 or 4 lands. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area. Soils landscapes within the investigation area include: · Gymea – erosional soil landscape generally west of Norton Street · Blacktown – residual soil landscape generally east of Norton Street. The investigation area consists of the Ashfield Shale (black to dark grey shale and laminate) geological formation for the area generally east of Francis Street and the geological formation consisting of a lithology of medium to coarse grained quartz sandstone generally west of Francis Street. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register. The State Transit – Leichhardt Depot is located immediately to the east of the investigation area at the corner of Balmain Road and City West Link and is currently listed as 'under assessment' on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	Background noise in the north of the investigation area is dominated by traffic on City West Link. In other areas, background noise is associated with traffic on streets such as Darley Road, Norton Street, Balmain Road and Derbyshire Road. There is also occasional noise associated with the operation of flight paths from Sydney Airport. The investigation area primarily falls with NCAs 12, 13 and 14 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

Figure 7-3 Construction power - Darley Road, Leichhardt environmental constraints 1 of 2

Figure 7-4 Construction power - Darley Road, Leichhardt environmental constraints 2 of 2

7.4 Drainage infrastructure - Canal Road, Leichhardt

As detailed in **section 5.4**, the drainage infrastructure from the Darley Road water treatment plant to Hawthorne Canal will generally follow the existing road reserve along Canal Road. The existing environmental conditions in this area of interest are shown on **Figure 7-5** and **Figure 7-6** and are described in **Table 7-3**.

Table 7-3 Drainage infrastructure – Canal Road, Leichhardt

Environmental aspect	Existing conditions
Land use	Land use within the investigation area generally consists of Blackmore Oval and its amenities, the Inner West Light Rail Corridor and vegetated areas surrounding Blackmore Oval. Land uses surrounding the investigation area include City West Link to the north and the Canal Road arts precinct to the south. Areas of open space within the investigation area include Blackmore Oval and also areas along either side of Hawthorne Canal. Residential areas are located to the south east across the light rail corridor and Darley Road and to the north across City West Link.
Traffic and transport	Roads within and adjacent to the investigation area include: · City West Link at the north of the investigation area, which is major road with two lanes from the west merging into three lanes at James Street to the east · Darley Road, which has one lane of traffic in each direction and on street parking on both sides of the road · Charles Street and Canal Road which run parallel to City West Link and Hawthorne Canal respectively. Both roads have one lane of traffic in each direction and Canal Road has parking areas facing the Hawthorne Canal. The Leichhardt North Light Rail stop is located to the east of the investigation area between City West Link and Darley Road. The Inner West Light Rail line runs east-west in this location within the investigation area.
Non-Aboriginal Heritage	The Hawthorne Canal Stormwater Channel No. 62 located to the west of the investigation area is listed on the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW) The Charles Street Rail Bridge near the intersection of Charles Street and Darley Road is also listed on the RailCorp section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW).
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Based on the desktop assessment, sensitive receivers within and adjacent to the investigation area include recreational users of Blackmore Oval and Billy Kids Kindergarten located to the north of the investigation area at 64 Charles Street, Lilyfield.
Waterways and biodiversity	The Hawthorne Canal is located immediately adjacent to the west of the investigation area. Hawthorne Canal is an artificial stormwater canal that joins the Parramatta River (Iron Cove) to the north. There is also a small wetland area to the north of Blackmore Oval. The area immediately surrounding Blackmore Park is vegetated consisting primarily of grasses and mature trees. This area is most densely vegetated directly to the east of Blackmore Park and around the wetland area. There are groups of mature trees located along Canal Road and Hawthorne Canal.

Environmental aspect	Existing conditions
Geology, soils and contamination	The investigation area includes land primarily classified as Class 2 acid sulphate soils. Acid sulphate soils are likely to be encountered for works below the natural ground surface. Soils landscapes within the investigation generally include the Gymea – erosional soil landscape. The investigation area generally is comprised of the geological formation consisting of a lithology of medium to coarse grained quartz sandstone. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register or the List of NSW contaminated sites notified to NSW EPA.
Noise environment	The background noise environment would be primary influenced by traffic on City West Link and to a lesser extent on Darley Road and by the operation of the light rail line. The investigation area falls with NCA 08 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

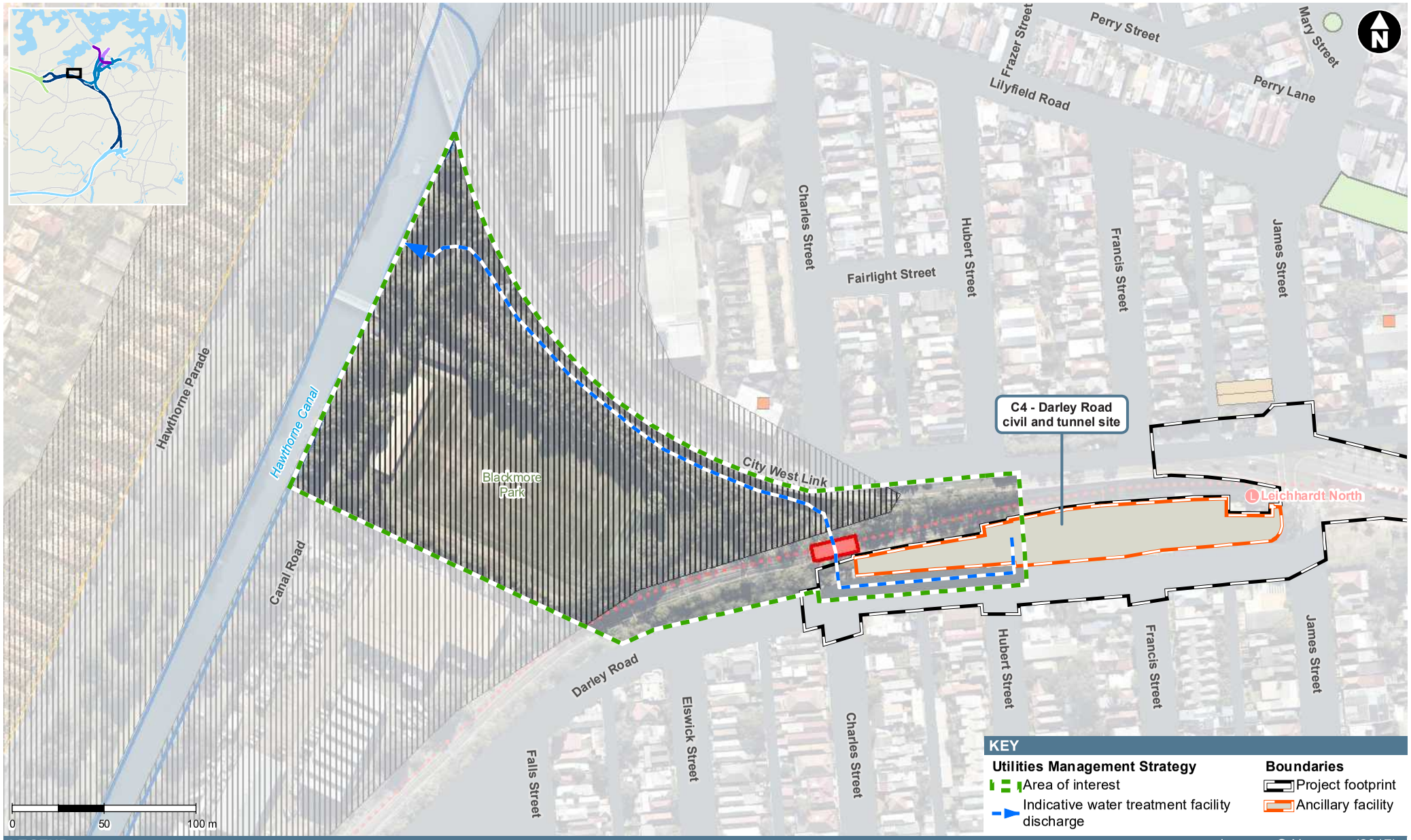


Figure 7-5 Water treatment plant discharge - Canal Road, Leichhardt environmental constraints 1 of 2

Figure 7-6 Water treatment plant discharge - Canal Road, Leichhardt environmental constraints 2 of 2

7.5 Construction power - Rozelle

As detailed in **section 4.1.5**, the construction power connection will run from the Ausgrid substation on Balmain Road at Leichhardt in a north-easterly direction through Lilyfield to the Rozelle civil and tunnel site (C5) following existing road reserves. The existing environmental conditions in this area of interest are shown on **Figure 7-7** and **Figure 7-8** and are described in **Table 7-4**.

Table 7-4 Construction power - Rozelle

Environmental aspect	Existing conditions
Land use	Land uses located between City West Link and Leichardt Road are primarily residential. The STA – Leichhardt Depot and Sydney Secondary College Leichhardt Campus are located west of Balmain Road and south of City West Link and there is a small commercial precinct on Moore Street west of Mackenzie Street. In the north of the investigation area land uses consists of City West Link, the Inner West Light Rail corridor, the Rozelle Rail Yards and residential properties to the north of Lilyfield Road. Areas of open space within the investigation area include: · War Memorial Park at 39–73 Moore Street, Leichhardt · 36th Battalion Park at Mackenzie Street and Hill Street, Leichhardt and · Active recreation area on Balmain Road adjacent to the Sydney Secondary College, Leichhardt.
Traffic and transport	Major roads within the investigation area include: · City West Link at the north of the investigation area, which is a major road with two lanes from the west merging into three lanes at James Street to the east · Balmain Road which has one to two lanes of traffic in each direction, limited on-street parking and is subject to school zone speed limits during school hours · Lilyfield Road has one lane of traffic in each direction, on-street parking and cycle ways · Catherine Street, which has one lane of traffic in each direction, on-street parking and cycle ways. Other roads within the area of investigation are primarily residential streets with one lane of traffic in each direction, on-street parking and footpaths on either side of the road. The STA – Leichhardt Depot is located east of Balmain Road, south of City West Link. Bus services operate along Catherine Street, Balmain Road, Piper Street and Moore Street.

Environmental aspect	Existing conditions
Non-Aboriginal Heritage	A number of listed non-Aboriginal heritage items are located within the investigation area. The items are listed under the Leichhardt LEP, Sydney Regional Environmental Plan No 26 – City West (SREP 26) or the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW)) and include: · Catherine Street Railways Bridge (listed under SREP 26) · Street trees – Brush Box plantation at Leys Avenue, Leichhardt (local significance) · Former factory, including interiors at 111 Moore Street, Leichhardt (local significance) · Street trees – row of Port Jackson Figs at Catherine Street (south of Moore Street), Leichhardt (local significance) · Child care centre 'Rose Cottage' including interiors at 1 Coleridge Street, Leichhardt (local significance) · Former State Rail Authority (SRA) Tram shed, including interiors at 25 Derbyshire Road, Leichhardt (local significance) · Former SRA cable store and traffic office, including interiors 29 Derbyshire Road, Leichhardt (local significance) · Department of Education (Sydney Secondary College) at 210 Balmain Road, Leichhardt (local significance). The investigation also includes the following heritage conservation areas under the Leichhardt LEP: · Wetherill Estate Heritage Conservation Area located between North Street and Derbyshire Road south of Allen Street.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, sensitive receivers in the investigation area include: · Annandale Veterinary Hospital at 62 Moore Street, Annandale · My Stepping Stones (Child Care Centre), at 75 Moore Street, Leichhardt.
Waterways and biodiversity	There are no waterways within the investigation area. Vegetation within the investigation area is primarily limited to mature street trees of various sizes located between local roads and property boundaries. There are a number of mature trees, including significant trees and landscaped vegetation on the boundary of War Memorial Park, 36th Battalion Park and Sydney Secondary College Leichhardt. There are heritage listed street trees on Leys Avenue (Brush Box plantation) and Catherine Street south of Moore Street (row of Port Jackson Figs) which are identified under the Leichhardt LEP as having local significance. There is a significant area of vegetation located between the light rail corridor and Lilyfield Road east of Balmain Road in the north western extent of the investigation area.

Environmental aspect	Existing conditions
Geology, soils and contamination	The investigation area includes land classified as Class 3 acid sulfate soils in the north of the investigation area extending from the Rozelle Rail Yards to Balmain Road to the north west of Brenan Street. The remaining land is classified as Class 5 acid sulfate soils and there are no adjacent Class 1, 2, 3 or 4 lands other than the Class 3 land identified in the north. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area south of Brenan Street. Soils landscapes within the investigation area include: · Disturbed terrain soil landscape generally within the Rozelle Rail Yards · Gymea – erosional soil landscape generally east of Catherine Street · Blacktown – residual soil landscape generally west of Catherine Street. The investigation area consists of the Ashfield Shale (black to dark grey shale and laminate) geological formation for the area generally west of Catherine Street and the geological formation consisting of a lithology of medium to coarse grained quartz sandstone generally east of Catherine Street. The area around the Rozelle Rail Yards is defined as man-made fill overlying silty to peaty quartz sand. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register. The State Transit – Leichhardt Depot is located immediately to the east of the investigation area at the corner of Balmain Road and City West Link and is currently listed as 'under assessment' on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	Background noise in the north of the investigation area is dominated by traffic on City West Link. Background noise would also be influenced by bus movements to and from the State Transit – Leichhardt Depot. There is also occasional noise associated with the operation of flight paths from Sydney Airport. The investigation area falls primarily within NCAs 15, 16 and 17 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

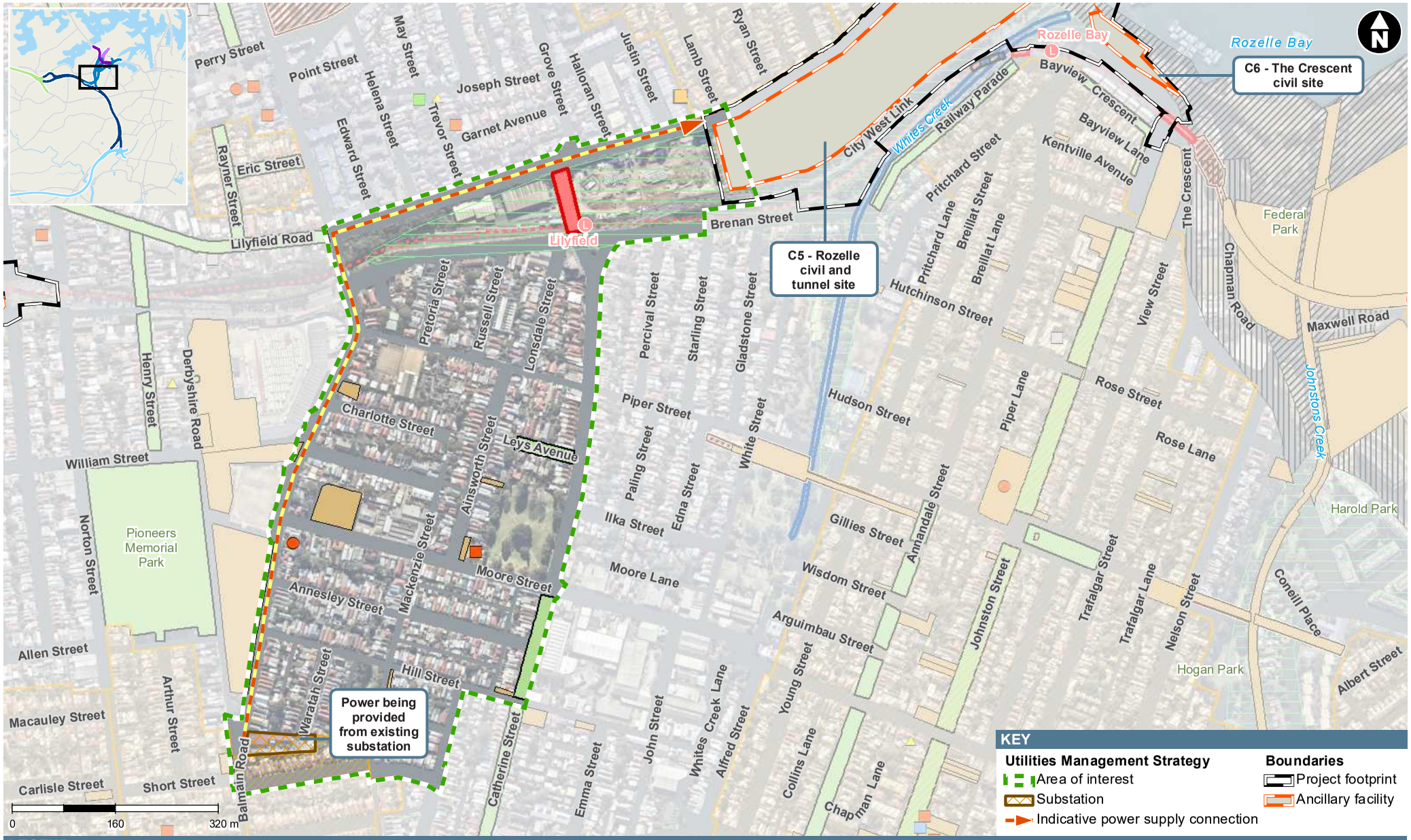


Figure 7-7 Construction power - Rozelle environmental constraints 1 of 2

LEGEND

Existing features
- Light rail
- Light rail stop

Utilities Management Strategy
- Area of interest
- Substation
- Indicative power supply connection

Boundaries
- Project footprint
- Ancillary facility

Standard Instrument LEP
- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- B7 Business Park
- IN2 Light Industrial
- R1 General Residential
- RE1 Public Recreation
- SP2 Infrastructure
- CP — Callan Park (Special Provisions) Act 2002 No 139

SREP 26 - City West
- Port & Employment
- Waterfront

Figure 7-8 Construction power - Rozelle environmental constraints 2 of 2

7.6 Operational power – Rozelle interchange

As detailed in **section 4.2.4** there are two options for provision of a permanent operational power to the Rozelle interchange – Options A and B.

7.6.1 Option A – Iron Cove

One of the options for the permanent power connection (Option A) will run from the Ausgrid substation on Manning Street, Rozelle in an easterly direction to the Iron Cove substation near Victoria Road following existing road reserves. It is also possible that this area could be used for utility works as outlined in **section 3.5**.

The existing environmental conditions in this area of interest are shown on **Figure 7-9** and **Figure 7-10** and are described in **Table 7-5.**

Table 7-5 Operational power – Iron Cove (Option A)

Environmental aspect	Existing conditions
Land use	The investigation area includes primarily an established residential area of Rozelle with some limited commercial development including a car dealership and liquor store fronting Victoria Road and an area of open space (King George Park) adjacent to Iron Cove Bridge. The topography of this area falls toward Iron Cove to the north-west and toward Manning Street and King George Park in the south-west. The residential area includes a number of local streets that run between Victoria Road and Manning Street, a number of which are relatively narrow and quite steep. King George Park forms part of a network of open space along this eastern shoreline of Iron Cove. The Bay Run is a regional pedestrian and cycling link which runs around Iron Cove and joins Iron Cove Bridge near Byrnes Street. A car parking area is available along Manning Street to serve King George Park. There is also an existing substation located in Manning Street adjacent to King George Park.
Traffic and transport	Victoria Road is a major road on the eastern extent of the investigation area with three to four lanes of traffic in each direction. It has limited on-street parking and clearways and bus lanes operating during peak hours. Bus services operate along both sides of Victoria Road. Local streets within the investigation area include Byrnes Street, Clubb Street, Toelle Street, Callan Street, Springside Street, Moodie Street, Manning Street and McCleer Street. For the most part, these are residential streets with on-street parking and footpaths on either side of the road. A number of these streets are narrow, with only one effective trafficable lane due to on-street parking.
Non-Aboriginal Heritage	There are no listed non-Aboriginal sites within the investigation area. The closest site is Iron Cove Bridge which is identified as being of local significance under the SREP 26. There are no Heritage Conservation Areas within the investigation area. The closest is the Iron Cove Heritage Conservation Area on the north east side of Victoria Road.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area. The King George Park Draft Plan of Management referred to "incomplete" land claims lodged by Metropolitan Local Aboriginal Land Council.
Sensitive receivers	Other than the residential land uses described above, there is a children's playground located within King George Park to the north of Byrnes Street. There are no other sensitive receivers within the investigation area.
Waterways and	Iron Cove is located immediately to the north of the investigation area.

Environmental aspect	Existing conditions
biodiversity	A number of mature trees are located within King George Park and along the foreshore area of Iron Cove. Small to medium size street trees are located within a number of the local streets and within the boundary of some residential properties.
Geology, soils and contamination	The investigation area primarily includes land classified as Class 5 acid sulfate soils. There is a discrete area of Class 2 acid sulfate soils extending east from Iron Cove adjacent to Manning Street towards the existing substation. There is the possibility of encountering acid sulfate soils for activities which are likely to lower the water table below one metre within 500 metres of the Class 2 acid sulfate soils land. Soils landscapes within the investigation area consist of the Gymea – erosional soil landscape east of Manning Street and the Hawkesbury – colluvial soil landscape west of Manning Street. The investigation area consists of a lithology of medium to coarse grained quartz sandstone east of Manning Street and man-made fill overlying silty to peaty quartz sand west of Manning Street. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register. The service station located to the south east at 178–180 Victoria Road is currently identified on the List of NSW contaminated sites notified to NSW EPA, however, it is identified as 'Regulation under the *Contaminated Land Management Act 1997* not required'.
Noise environment	Background noise in the investigation area is dominated by traffic on Victoria Road and also occasional noise associated with the operation of flight paths from Sydney Airport. The investigation area falls primarily within NCAs 33 and 36 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

Figure 7-9 Operational power - Iron Cove environmental constraints 1 of 2

LEGEND

Utilities Management Strategy
- Area of interest
- Substation
- Indicative power supply connection

Boundaries
- Project footprint
- Ancillary facility

Standard Instrument LEP
- B1 Neighbourhood Centre
- B2 Local Centre
- IN2 Light Industrial
- R1 General Residential
- RE1 Public Recreation
- SP2 Infrastructure
- Callan Park (Special Provisions) Act 2002 No 139
- DM Deferred Matter

Note: There may be other utility works undertaken in this area (see **section 3.5**)

Figure 7-10 Operational power - Iron Cove environmental constraints 2 of 2

7.6.2 Option B - Rozelle

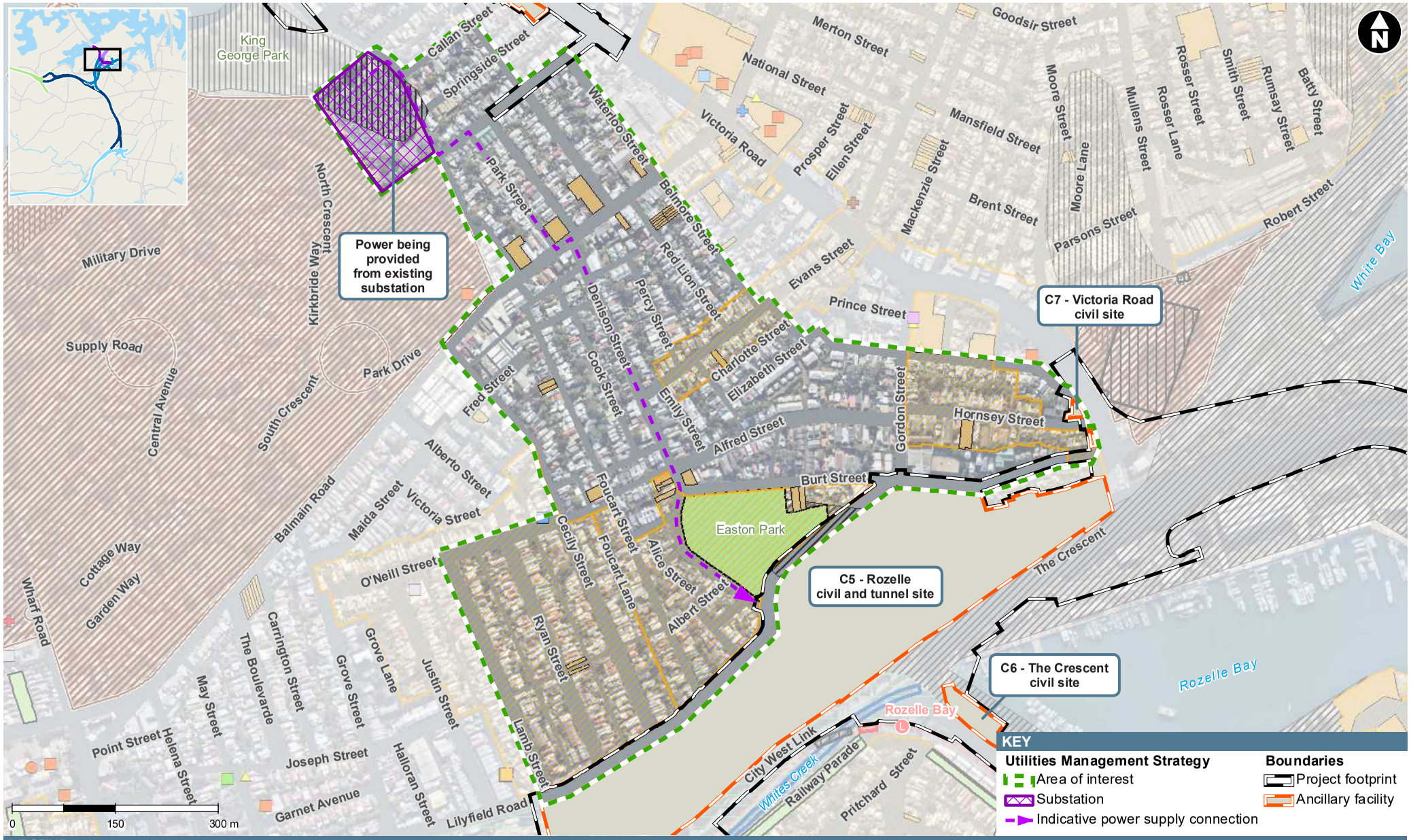
As detailed in **section 4.2.4**, one of the options for permanent power connection (Option B) will run from the Ausgrid substation on Manning Street, Rozelle in a southerly direction through to a substation in the Rozelle Rail Yards following existing road reserves.

The existing environmental conditions in this area of interest are shown on **Figure 7-11** and **Figure 7-12** and are described in **Table 7-6**.

Table 7-6 Operational power – Rozelle (Option B)

Environmental aspect	Existing conditions
Land use	Land uses within the investigation area are primarily residential although there is some commercial land use along sections of Darling Street/Balmain Road and Lilyfield Road. There are a number of open space areas within and adjacent to the investigation area such as Easton Park, Rozelle Commons and King George Park.
Traffic and transport	Roads within the investigation area primarily consist of local residential streets with one lane of traffic in each direction, footpaths and on street parking and laneways. Many of the local streets are quite narrow. Major roads in the vicinity of the investigation area include Victoria Road and Darling Street/Balmain Road. Bus services run along both of these roads.
Non-Aboriginal Heritage	Non-Aboriginal heritage items listed under the State Heritage Register and the Leichhardt LEP include: · Callan Park Conservation Area & Buildings at Balmain Road and Manning Street (state significance) · Maxwell House, including interiors at 757 Darling Street (local significance) · Former Fire Brigade/Ambulance Training Centre, including interiors at 747 Darling Street (local significance) · Single storey shops, including interiors at 735 Darling Street (local significance) · Former Police Station, including interiors at 707 Darling Street (local significance) · Single storey commercial building, including interiors at 736 Darling Street (local significance) · A number of listed terrace housing items between Red Lion Street and Belmore Street near Darling Street (local significance) · House, 'Hornsey' including interiors at 42 Hornsey Street (local significance) · House, including interiors at 206 Evans Street · Easton Park (local significance) · Sydney Water sewage pumping station No.6 listed on the section170 NSW State agency heritage register · Semi-detached house, including interiors at 15 and 17 Burt Street (local significance) · Former shop and residence, including interiors at 60 and 62 Ryan Street (local significance) · Cottage and former broom factory, including interiors at 84 Foucart Street (local significance)

Environmental aspect	Existing conditions
	· Semi-detached house, including interiors at 120A and 122 Foucart Street (local significance) · Smith's Hall, including interiors at 56 Burt Street (local significance) · Corner shop and residence, including interiors at 67 Denison Street (local significance) · Shop and residence, including interiors at 69 Denison Street (local significance) · House, 'Rotherhithe Cottage' including interiors at 73 Denison Street (local significance). The investigation also includes the following heritage conservation areas listed under the Leichhardt LEP: · Brennan's Estate Heritage Conservation Area · Easton Park Heritage Conservation Area · Hornsey Street Heritage Conservation Area · The Valley Heritage Conservation Area.
Aboriginal Heritage	Lilyfield Cave (site card 45-6-2278), located at Lamb Street near Lilyfield Road is a closed site listed on the Aboriginal Heritage Information Management System (AHIMS).
Sensitive receivers	Other than the residential land uses described above, sensitive receivers within the investigation area include: · Rosebud Cottage Child Care, located at 5 Quirk Street, Rozelle · Lilyfield Community Centre located at 19 Cecily Street, Lilyfield.
Waterways and biodiversity	There are no waterways within the investigation area. Mature trees are concentrated around areas of open space including Easton Park and Rozelle Commons Park at Cook Street. There are a number of significant trees located on or near the residential streets south of Balmain Road, including but not limited to Cook Street, Denison Street and the streets running parallel between Justin Street and Cecily Street.
Geology, soils and contamination	The investigation area includes land primarily classified as Class 5 acid sulfate soils. There is an area of land classified as Class 2 acid sulfate soils near King George Park and an area of land classified as Class 1 acid sulfate soils at Easton Park. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area, other than in proximity to King George Park and Easton Park. The investigation area consists primarily of the Gymea – erosional soil landscape. There is an area of disturbed terrain at the southern extent of the investigation area south of Lilyfield Road. The investigation area consists primarily of a lithology of medium to coarse grained sandstone. There is an area of man-made fill at the southern extent of the investigation area south of Lilyfield Road. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register or on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	The background noise environment would be primarily influenced by traffic on major roads such as Victoria Road, Darling Street/Balmain Road, Lilyfield Road and City West Link and also occasional noise associated with the operation of flight paths from Sydney Airport. The investigation area falls primarily within NCAs 19, 24, 25, 32 and 33 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.



KEY

Utilities Management Strategy
- Area of interest
- Substation
- Indicative power supply connection

Boundaries
- Project footprint
- Ancillary facility

LEGEND

Existing features
- Light rail
- Light rail stop

Acid sulfate soils
- Soil Class 1
- Soil Class 2
- Soil Class 3

State Heritage Register
- State Heritage Act

SREP Heritage Register
- SREP 26- City West

Aboriginal Heritage
- AHIMS site

Local Environmental Plan
- Heritage conservation area
- Landscape heritage item
- Heritage item

S170 RailCorp item
- S170 Agency register

S170 Sydney Water
- S170 Agency register

Sensitive receivers
- Aged Care
- Child Care
- Church
- Community Centre
- Education
- Health
- School
- Vet
- Hospital
- Park or Reserve

Figure 7-11 Permanent power - Rozelle (Option B) environmental constraints 1 of 2

Figure 7-12 Permanent power - Rozelle (Option B) environmental constraints 2 of 2

7.7 Sydney Trains infrastructure

As detailed in **section 3.4** there are two options for removal and replacement of the Sydney Trains infrastructure from the Rozelle Rail Yards – Options 1 and 2.

7.7.1 Option 1 – Surry Hills

One of the options for relocation of the Sydney Trains switching station in the Rozelle Rail Yards (Option 1) involves reconfiguring the Sydney Trains electricity network to remove the switching station and construct additional feeders outside of the M4-M5 Link project footprint in the Surry Hills area.

This will involve a new electrical feeder connecting between the existing Ausgrid transmission substation at Surry Hills and a Sydney Trains substation in Chalmers Street in the vicinity of Central Station. The existing environmental conditions in this area of interest are shown on **Figure 7-13** and **Figure 7-14** and are described in **Table 7-7**.

Table 7-7 Sydney Trains infrastructure – Surry Hills (Option 1)

Environmental aspect	Existing conditions
Land use	Land use within the investigation area consists primarily of multi-storey mixed use development with ground floor commercial premises below residential apartments. There are pockets of residential land use (terrace housing) on Riley Street, Albion Way and Devonshire Street. There are small pockets of open space located at the western extent of Cooper Street. There are also areas of open space on the north side of Albion Street (Frog Hollow Reserve) and west of Chalmers Street (Prince Alfred Park) within and adjacent to the investigation area respectively. Central Station and the associated rail corridor is located within the western extent of the investigation area.
Traffic and transport	Roads within the investigation area east of Central Station primarily include streets with one lane of traffic in each direction, on street parking and footpaths as well as narrow laneways. Elizabeth Street and Chalmers Street are main roads with multiple traffic lanes in each direction. Riley Street in the eastern extent of the investigation area includes one lane of traffic in each direction and on street parking and cycle lanes on both sides of the road. Foveaux Street includes up to two lanes of traffic in each direction and on street parking.
Non-Aboriginal Heritage	A large number of listed non-Aboriginal heritage items are located within the investigation area. The items are listed under the Sydney LEP, State Heritage Register or the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW). The listed items include (but are not limited to): · Sydney Terminal and Central Railway Stations Group (State significance) · Railway Institute Building at Chalmers Street, Surry Hills (State significance) · Crown Street reservoir, Crown Street, Surry Hills (Sydney Water's section 170 Heritage and Conservation Register) · Crown Street pumping station, Riley Street, Surry Hills (Sydney Water's section 170 heritage register) · Electricity substation No. 63, 112–114 Cooper Street, Surry Hills (section 170 NSW State agency heritage register) · Numerous listed terrace houses primarily concentrated on Riley Street, Surry Hills (local significance) · Royal Exhibition Hotel including interior, 86–92 Chalmers Street, Surry Hills (local significance)

Environmental aspect	Existing conditions
	· Forrester's Hotel including interiors, 332–338 Riley Street, Surry Hills · Former Ford Sherington Trunk Factory including interior, 119–127 Kippax Street, Surry Hills (local significance) · Former 'News Limited' including interior, 61–81 Kippax Street, Surry Hills (local significance) · 1487 Former Prince of Wales Hotel including interior, 33–35 Cooper Street, Surry Hills (local significance) · Evening Star Hotel façade, 8 Cooper Street and 360–370 Elizabeth Street, Surry Hills (local significance) · Former RC Henderson Ltd factory including interiors, 11–13 Randle Street, Surry Hills (local significance) · "Hibernian House" including interior, 328–344 Elizabeth Street, Surry Hills (local significance) · Former 'Metro Goldwyn Mayer' including interior, 20–28 Chalmers Street, Surry Hills (local significance) · Dental Hospital including interior, 2–18 Chalmers Street, Surry Hills (local significance) · Former Farleigh Nettheim & Co Ltd warehouse including interiors, 1–15 Foveaux Street, Surry Hills (local significance) · Former 'Schweppes Building' including interior, 63, 65–67 Foveaux Street, Surry Hills (local significance). The investigation also includes the following heritage conservation areas under the Sydney LEP: · Bourke Street North · Bourke Street South · Reservoir Street and Fosterville · Little Riley Street Conservation Area · Albion Estate Conservation Area · Brumby Street Conservation Area · Cleveland Gardens Conservation Area.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, sensitive receivers within the investigation area include: · SDN Surry Hills Children's Education and Care Centre at 443 Riley Street, Surry Hills · Surry Hills Children's Program Childcare Centre at 402 Riley Street, Surry Hills · SHNC Long Day Care at 405 Crown Street, Surry Hills · Twinkle Twinkle Child Care at 132 Devonshire Street, Surry Hills · Presbyterian Aged Care at 168 Chalmers Street, Surry Hills.

Environmental aspect	Existing conditions
Waterways and biodiversity	There are no waterways within the investigation area. Vegetation within the study area primarily consists of street trees and other landscaped vegetation lining most residential streets. There are also significant mature trees located at the open space areas within or immediately adjacent to the investigation area.
Geology, soils and contamination	The investigation area includes land classified as Class 5 acid sulphate soils and there are no adjacent Class 1, 2, 3 or 4 lands. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area. Soils landscapes within the investigation area consist primarily of the Deep Creek – alluvial and Lucas Heights – residual soil landscape. The investigation area consists of the Ashfield Shale (black to dark grey shale and laminate) geological formation in the western and eastern extent of the investigation area. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register. Legion Cabs (Trading) Cooperative at 69–81 Foveaux Street is listed as 'under assessment' on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	The background noise environment would be primary influenced by the operation of the rail line in proximity to Central Station and by traffic travelling on the road network through the area. The investigation area is in Surry Hills and does not fall within any of NCAs described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

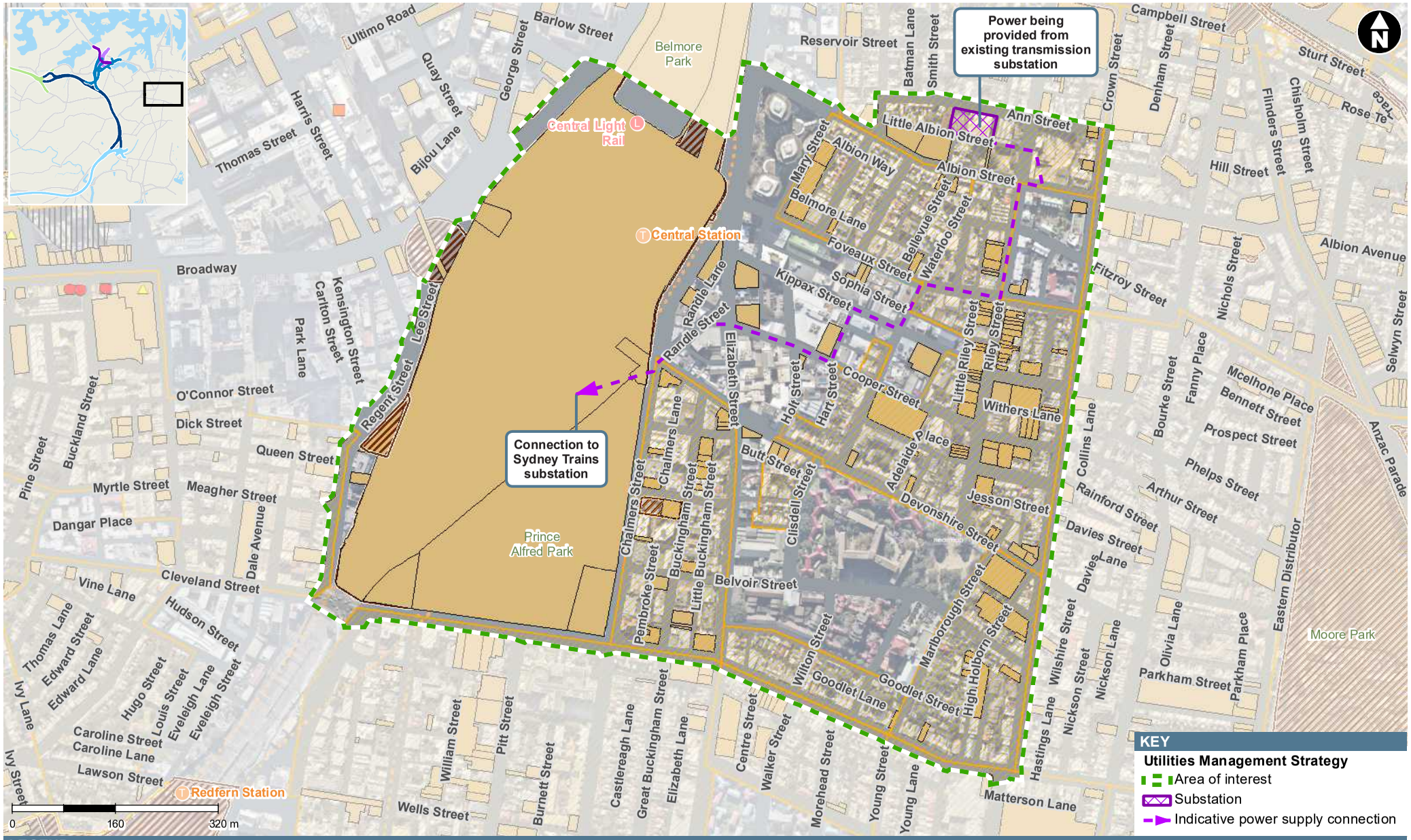


Figure 7-13 Sydney Trains - Surry Hills (Option 1) environmental constraints assessment 1 of 2

LEGEND

Existing features
- Railway
- Light rail
- Light rail stop
- Railway station

Utilities Management Strategy
- Area of interest
- Substation
- Indicative power supply connection

Standard Instrument LEP
- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- B8 Metropolitan Centre
- R1 General Residential
- R2 Low Density Residential
- RE1 Public Recreation
- SP2 Infrastructure

Figure 7-14 Sydney Trains - Surry Hills (Option 1) environmental constraints assessment 2 of 2

7.7.2 Option 2 – Railway Parade, Annandale

As detailed in **section 3.4**, one of the options for relocation of the Sydney Trains switching station in the Rozelle Rail Yards (Option 2) involves either:

- A new site in Railway Parade near the corner of Brenan Street in Annandale which is outside the project footprint; or
- A new site near the corner of James Craig Road and City West Link which is within the project footprint.

A new feeder would also be required to connect with the switching station using existing infrastructure corridors or road reserves. The existing environmental conditions in the Railway Parade, Annandale area of interest which is outside the project footprint are shown on **Figure 7-15** and **Figure 7-16** and are described in **Table 7-8**.

Table 7-8 Sydney Trains infrastructure – Railway Parade, Annandale (Option 2)

Environmental aspect	Existing conditions
Land use	Land use within the investigation area consists primarily of residential properties. There is open space located along the Whites Creek corridor. Major infrastructure within or close to the investigation area includes the Inner West Light Rail corridor and City West Link further to the north.
Traffic and transport	Roads within the investigation area include Brenan Street, Railway Parade, Pritchard Street, Bayview Crescent, Buruwan Lane, Bayview Lane, Kentville Avenue, Kentville Lane, Weynton Street, Johnston Street and The Crescent. Roads within the investigation primarily consist of residential streets with one lane of traffic in each direction, footpaths and on street parking. Johnston Street and parts of The Crescent have two lanes of traffic in each direction and footpaths, while Johnston Street also has areas of on street parking. The Rozelle Bay Light Rail stop is located near the corner of Railway Parade and Bayview Crescent.
Non-Aboriginal Heritage	A number of listed non-Aboriginal heritage items are located within the investigation area. The items are listed under the Leichhardt LEP, SREP 26 or the State Agency section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW) and include: · Sydney Water Whites Creek stormwater channel No.95 listed on Sydney Water's section 170 Heritage and Conservation Register · Arched Bridge, Whites Creek (listed under SREP 26) · Railway Bridge, Railway Parade (listed under SREP 26) · Avenue of Phoenix Canariensis at Railway Parade (local significance) · Street trees, row of palms at Railway Parade (local significance) · Street trees, row of brush box at Bayview Crescent and Johnston Street (local significance) · Iron/sandstone palisade fence at Bayview Crescent (local significance) · Shop and residence, including interiors at 349 Annandale Street. The investigation also includes the Annandale Heritage Conservation Area listed under the Leichhardt LEP.
Aboriginal Heritage	An area of land within the riparian zone of Whites Creek south of Brenan Street has been accepted for registration on the Native Title Register.

Environmental aspect	Existing conditions
Sensitive receivers	Other than the residential land uses described above, there are no sensitive receivers within the investigation area.
Waterways and biodiversity	Whites Creek flows north and east under Brenan Street towards Rozelle Bay. The creek is a concrete lined channel. Vegetation within the investigation area primarily consist of matures street trees within and adjacent to the road corridor. This includes significant mature trees and heritage listed street trees on Railway Parade, Bayview Crescent and Johnston Street. The investigation area also includes the riparian zone along the Whites Creek corridor which consists primarily of mature trees and open space areas.
Geology, soils and contamination	The investigation area includes land classified as Class 1 acid sulfate soils around Brenan Street, Railway Parade and Whites Creek. acid sulfate soils would be encountered for any works one metre below ground surface in this area. The investigation area consists of disturbed terrain soil landscapes generally around Whites Creek and towards the Rozelle Rail Yards and the Gymea – erosion soil landscape in the south western and south eastern extent of the investigation area. The investigation area consists of man-made fill lithology generally around Whites Creek and towards the Rozelle Rail Yards and a lithology of medium to coarse grained quartz sandstone in the south western and south eastern extent of the investigation area. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register or on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	The background noise environment would be primary influenced by traffic on City West Link, The Crescent and Johnston Street and also occasional noise associated with the operation of flight paths from Sydney Airport. The investigation area falls primarily within NCAs 20 and 21 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

Figure 7-15 Sydney Trains - Railway Parade, Annandale (Option 2) environmental constraints 1 of 2

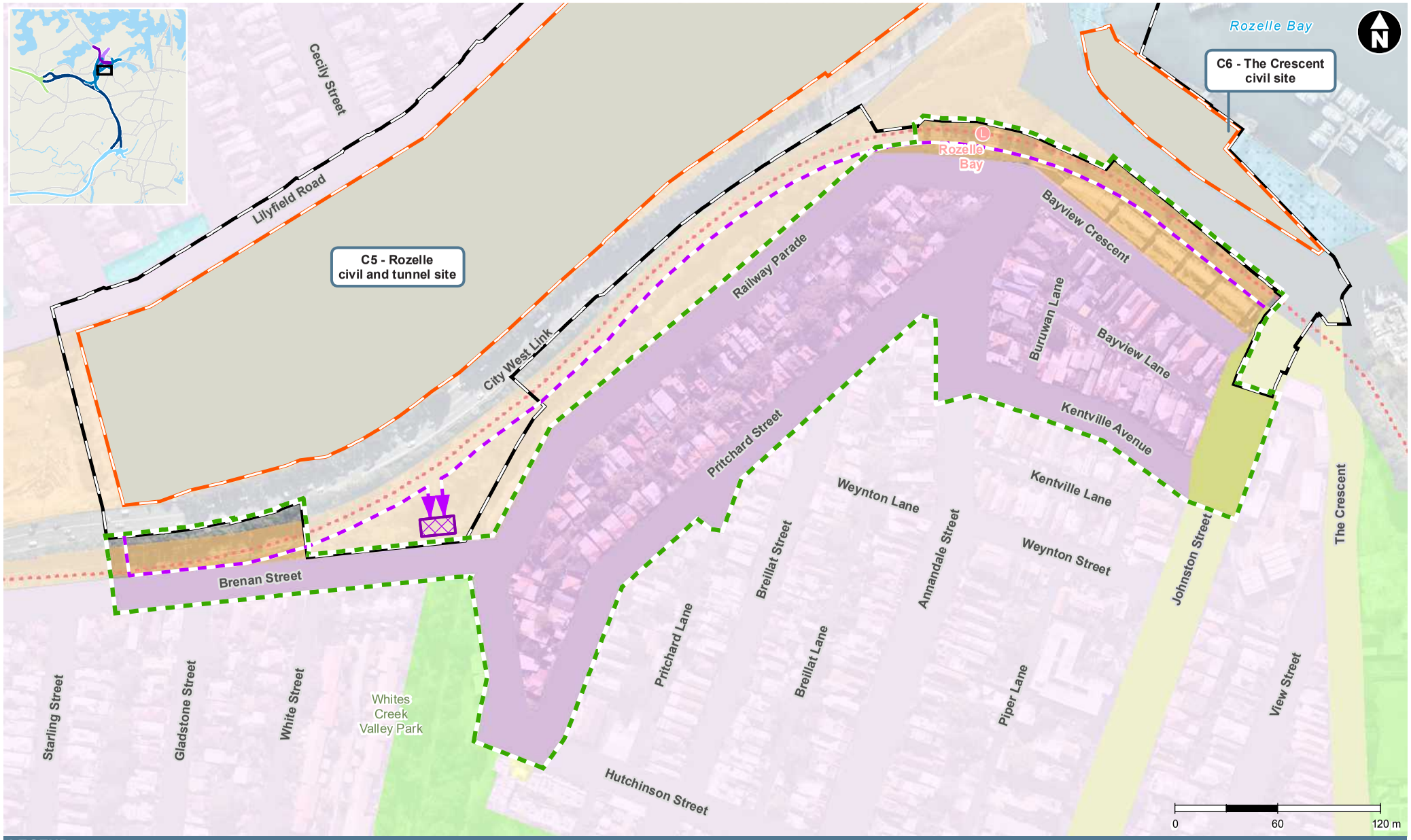


Figure 7-16 Sydney Trains - Railway Parade, Annandale (Option 2) environmental constraints 2 of 2

7.8 Construction power – Pyrmont Bridge Road, Annandale

As detailed in **section 4.1.6**, the construction power connection will run from the Ausgrid substation on Layton Street, Annandale in a westerly direction to the Pyrmont Bridge Road tunnel site (C9) following existing road reserves. The existing environmental conditions in this area of interest are shown on **Figure 7-17** and **Figure 7-18** and are described in **Table 7-9**.

Table 7-9 Construction power – Pyrmont Bridge Road, Annandale

Environmental aspect	Existing conditions
Land use	The area is relatively flat and occupied by various commercial properties fronting Parramatta Road, industrial/warehouse buildings fronting Pyrmont Bridge Road and isolated residential, commercial and mixed-use developments along Mallett and Layton Streets. There is a substation located on the east side of Layton Street. To the south, across Parramatta Road, are a number of commercial properties, residential apartment developments and the Bridge Road School. There are no areas of open space within the investigation area although Camperdown Park is located nearby to the south of Parramatta Road. The *Parramatta Road Corridor Urban Transformation Strategy*, developed by Urban Growth NSW and released in November 2016, identified a number of precincts along the Parramatta Road corridor for future urban renewal including the Camperdown precinct. The Strategy proposes to leverage the precinct's proximity to Sydney University and Royal Prince Alfred Hospital to generate jobs in specialised education and medical industries and to provide student housing and affordable housing. The Strategy has the target to create new homes for 1,400 people and 2,300 new jobs in the precinct by 2050.
Traffic and transport	Major roads within the investigation area include: · Parramatta Road, which is an arterial road with three lanes of traffic in each direction, operational clearways and is generally congested during peak hours · Pyrmont Bridge Road, which is an arterial road with two lanes of traffic in each direction and operational clearways. Other roads within the area include Mallet Street, Layton Street, Mason Street, Isabella Street and Bignell Lane. Mallet Street and Layton Street have one to two lanes of traffic in each direction with on-street parking and footpaths on either side of the road. Isabella Street and Bignell Lane are both one-way streets with no on-street parking, while Mason Street is a narrow two-way street with on-street parking. Bus services operate along Parramatta Road, Pyrmont Bridge Road and Booth Street.
Non-Aboriginal Heritage	Non-Aboriginal heritage items listed under the Sydney LEP include: · Warehouse including interior at 9–11 Layton Street, Camperdown (local significance) · Flats 'Alexandra Dwellings' at 27–45 Pyrmont Bridge Road, Camperdown (local significance) · Warehouse on the north west corner of Pyrmont Bridge Road and Booth Street (local significance) · Bridge Road School and Camperdown Park on south side of Parramatta Road (both of local significance) · Kerb and gutter in Chester and Guihen Streets (both of local significance)

Environmental aspect	Existing conditions
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, there are no sensitive receivers within the investigation area. The Bridge Road School is located nearby on the south side of Parramatta Road.
Waterways and biodiversity	There are no waterways within the investigation area. The closest watercourse is Johnstons Creek located some 200 metres to the northwest. There are significant mature trees located on the eastern side of Mallet Street and on both sides of Layton Street. There are also mature trees located along the Johnstons Creek corridor the north west and in the Bridge Road School and Camperdown Park to the south.
Geology, soils and contamination	The investigation area includes land classified as Class 5 acid sulfate soils and there are no adjacent Class 1, 2, 3 or 4 lands. It is therefore unlikely that acid sulfate soils would be encountered within the investigation area. Soils landscapes within the investigation area consist of the Blacktown – residual soil landscape. The investigation area consists of the Ashfield Shale (black to dark grey shale and laminate) geological formation. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register. The 7-Eleven service station at 198 Parramatta Road, Annandale is listed as 'under assessment' on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	Background noise in investigation area is dominated by traffic on Parramatta Road and Pyrmont Bridge Road. The investigation area falls primarily within NCAs 41 and 44 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

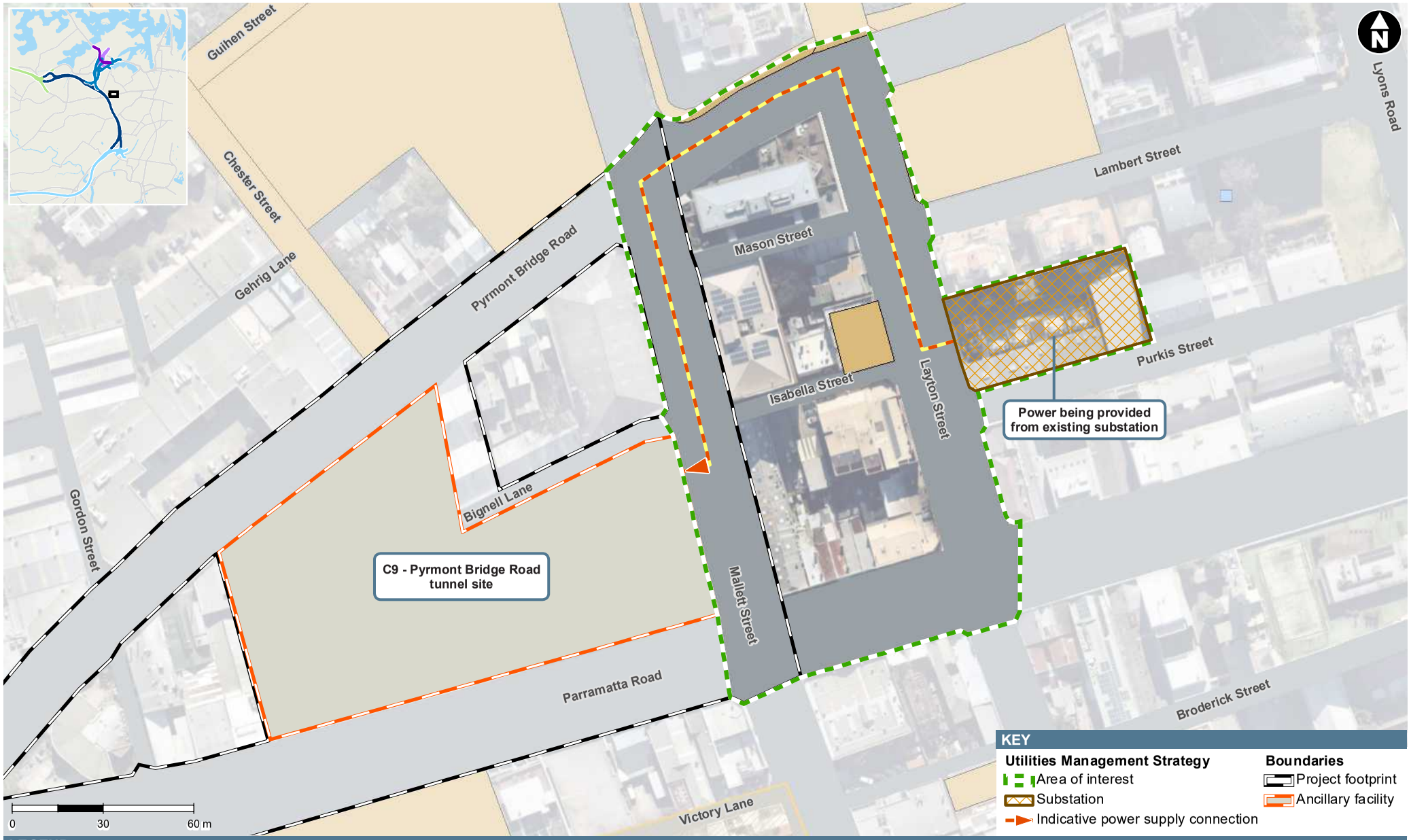


Figure 7-17 Construction power - Pyrmont Bridge Road environmental constraints 1 of 2

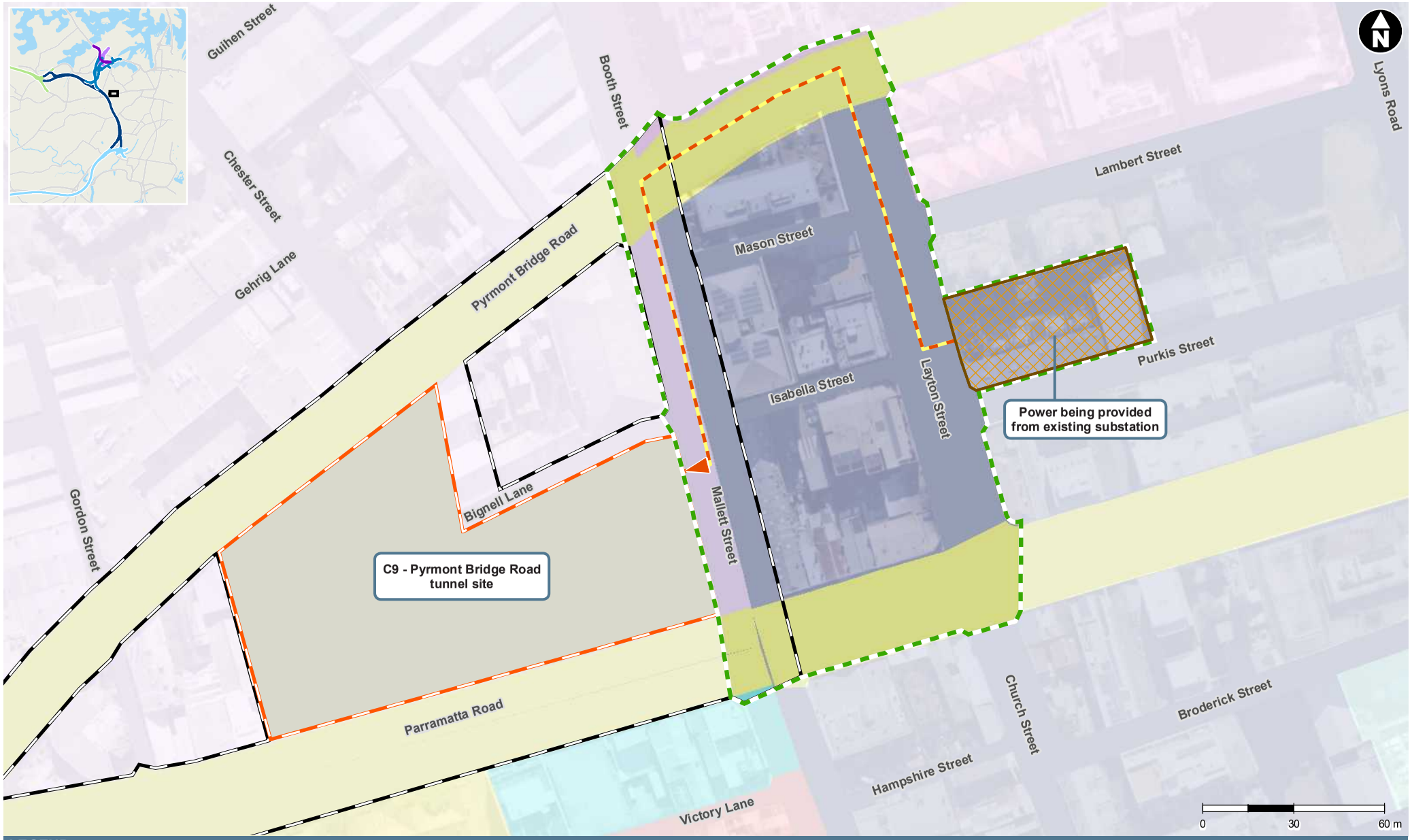


Figure 7-18 Construction power - Pyrmont Bridge Road environmental constraints 2 of 2

7.9 Operational power – St Peters interchange

As detailed in **section 4.2.4**, the permanent power supply connection will run from the Ausgrid substation on Bourke Road which is currently under construction in a south-westerly direction to the Campbell Road substation and ventilation facility following existing road reserves. The existing environmental conditions in this area of interest are shown on **Figure 7-19** and **Figure 7-20** and are described in **Table 7-10**.

Table 7-10 Operational power – St Peters

Environmental aspect	Existing conditions
Land use	Land use in the investigation area is a mix of industrial development along Burrows Road and Alexandra Canal, commercial and industrial development along Princes Highway and some established and infill residential development. Sydney Park is a major area of open space. The area to the south of Campbell Road is being used as a major construction site for the New M5 project and works are continuing in this area until 2020. This includes the site of the former Alexandria Landfill. A substation is currently being constructed by Ausgrid along the west side of Bourke Road and is scheduled for completion in late 2017.
Traffic and transport	Roads within the investigation area include Campbell Road, Burrows Road and Bourke Road. The roads generally have one lane of traffic in each direction and footpaths on either side of the roads. Campbell Road and Burrows Road have on-street parking on both sides of the road. Bourke Road has on-street parking on the eastern side of the road and a cycle lane on its western side. Some of the road network is being upgraded as part of the New M5 project. Bus services in this area operate along Princes Highway, Canal Road and Bourke Road.
Non-Aboriginal Heritage	Non-Aboriginal heritage items within the investigation area include Alexandra Canal, which is listed under Sydney Water's section 170 Heritage and Conservation Register of the *Heritage Act 1977* (NSW) and is of state heritage significance. There are no other listed heritage items in this area.
Aboriginal Heritage	There are no registered Aboriginal sites or sensitive areas in the investigation area.
Sensitive receivers	Other than the residential land uses described above, sensitive receivers within the investigation area include: · Sydney Park at Sydney Park Road, St Peters · Building Blocks Early Childhood Learning Centre at 140 Bourke Road, Alexandria.
Waterways and biodiversity	The Alexandra Canal flows through the investigation area towards Botany Bay. The canal is concrete lined and about 70 metres wide. Vegetation within the investigation area includes mature trees within Sydney Park and along the banks of Alexandra Canal and along road corridors such as Campbell Road, Burrows Road and Bourke Road. A number of trees are being removed along sections of Sydney Park, Campbell Road and Euston Road as part of the New M5 project.

Environmental aspect	Existing conditions
Geology, soils and contamination	The investigation area primarily includes land classified as Class 3 acid sulfate soils. The Alexandra Canal is classified as Class 1 acid sulfate soils. Works would not be undertaken within the Canal. Any works beyond one metre below ground surface in Class 3 acid sulfate soils would be likely to encounter acid sulfate soils. Soils landscapes within the investigation area consist of disturbed terrain soil landscape. The investigation area consists of a lithology quaternary peat, sandy peat and mud to the north of Alexandra Canal and quaternary medium to fine-grained marine sand with podsols to the south of Alexandra Canal. The investigation area does not include any sites identified on the NSW EPA Contaminated Lands Register or on the List of NSW contaminated sites notified to NSW EPA. The former Alexandria Landfill site is listed as 'under assessment' on the List of NSW contaminated sites notified to NSW EPA.
Noise environment	The background noise environment would be primary influenced by traffic movements along Campbell Road and Bourke Road as well as by noise from industrial activity given the nature of the land use within the investigation area. There is also occasional noise associated with the operation of flight paths from Sydney Airport and noise from on-going construction activity associated with the New M5 project. The investigation area falls primarily within NCAs 47, 48, 49, 50 and 55 as described in **Appendix J** (Technical working paper: Noise and vibration) of the EIS.

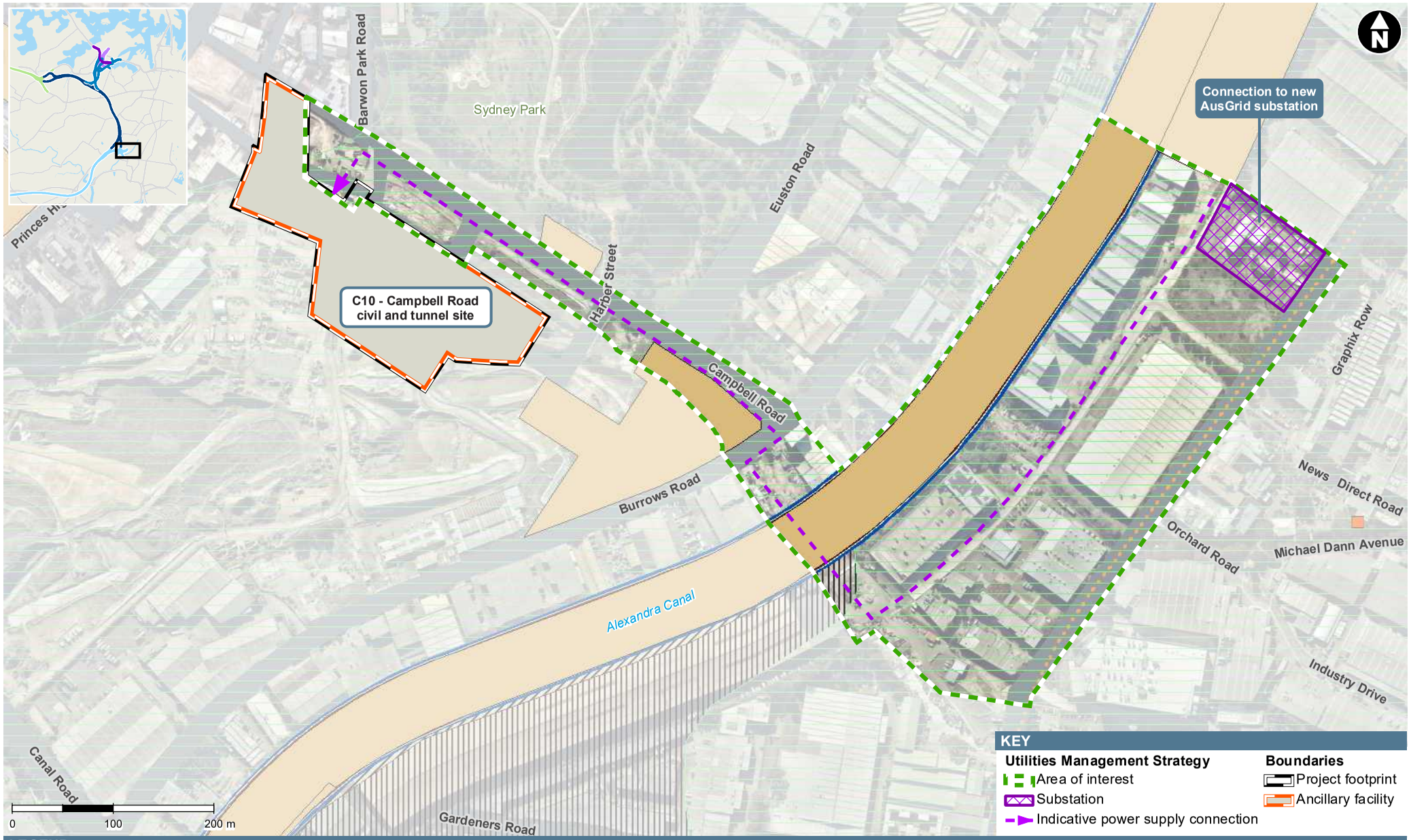


Figure 7-19 Permanent power - Campbell Road, St Peters environmental constraints 1 of 2

Figure 7-20 Permanent power - Campbell Road, St Peters environmental constraints 2 of 2

8 Potential environmental impacts

8.1 Overview

This section provides an overview of the typical environmental impacts associated with the utility works, power supply connections, Sydney Trains electrical infrastructure and drainage infrastructure proposed for the M4-M5 Link project.

It is proposed that more detailed investigations would be carried out once further consultation with relevant utility service providers has occurred and once a detailed design for the proposed works is confirmed by the contractor. Utility investigations will also be undertaken at the Rozelle Rail Yards in association with the approved site management works. The process for confirming the detail of the utility works and the measures and plans for managing the environmental impacts of the utility works are outlined in **Chapter 10**.

Potential impacts during construction are likely to be short-term and localised in the immediate vicinity of the work area. Potential impacts of utilities during operation are even more limited than potential impacts during construction. Standard and proven management measures such as those contained in the environmental management measures for the EIS and as outlined in **Chapter 10** would be implemented (as appropriate) to avoid and minimise these impacts.

Potential environmental impacts are discussed by key issue in **sections 8.2** to **8.14**.

8.2 Traffic

Potential traffic related impacts during construction works may include:

- Traffic generated by construction vehicles and personnel impacting on the local road network
- Car parking required by construction staff
- Closure of roads or traffic lanes and associated diversions of traffic and traffic delays
- Temporary restricted access to some areas of on-street car parking
- Temporary closure of sections of footpaths or cycle paths and associated diversions
- Temporary relocation of public transport stops.

Potential impacts on property access (eg driveways) is discussed in **section 8.9**.

These traffic and car parking impacts would be temporary and can be managed by adopting the proposed management measures as detailed in **Chapter 10** including workers using designated off-street car parking areas where available, undertaking works outside of peak traffic periods where possible and consulting with the local council prior to commencing construction.

8.3 Air quality

Potential air quality impacts during construction works may include:

- Generation of dust from excavation areas and/or stockpiles
- Tracking of soil from plant and equipment onto the local road network
- Odour in the event that construction works encounter acid sulfate soils or contaminated soil and groundwater
- Emissions from plant and equipment including heavy vehicles.

These impacts would be temporary and can be managed by the proposed management measures as detailed in **Chapter 10** including use of water sprays to minimise dust from exposed areas, covering of truck loads to minimise tracking of dust and regular maintenance of plant and equipment to minimise exhaust emissions.

8.4 Noise and vibration

Potential noise and vibration related impacts during construction works may include:

- High noise generating activities such as concrete cutting and breaking, trenching, joint pit construction and road paving
- Noise from construction works that in some circumstances may be required out of standard construction hours and that may impact on sensitive receivers, including possible sleep disturbance
- Vibration intensive works that may occur in the vicinity of sensitive receivers and sensitive building structures such as heritage listed items or works which may impact sensitive equipment.

The majority of noise and vibration impacts would be temporary during construction and would transition progressively along the utility service corridor thereby impacting particular receivers for only a limited period of time. These impacts can be managed by adopting the proposed management measures as detailed in **Chapter 10** including scheduling of noise intensive works, use of temporary noise barriers or mobile acoustic enclosures, establishing an OOHW procedure, maintaining minimum separation distances between vibration intensive works and sensitive building structures or sensitive equipment, carrying out vibration monitoring and building condition surveys (where necessary).

8.5 Biodiversity

Potential biodiversity related impacts during construction works may include:

- Impacts on native flora, threatened flora species and/or ecological communities (if present) as a result of removal of trees and vegetation such as from within road reserves or public open space areas
- Impacts on native or threatened fauna species (if present) as a result of removal of potential foraging habitat or shelter
- Impacts on native or threatened fauna species (if present) as a result of construction noise and lighting
- Spread of noxious weeds during construction works.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including undertaking pre-clearing surveys, establishing tree protection zones, unexpected threatened species finds procedure, using sensitive construction techniques to avoid impacts on trees, planting suitable replacement trees for any trees to be removed and managing works to avoid the spread of noxious weeds.

8.6 Non-Aboriginal heritage

Potential non-Aboriginal heritage related impacts during construction works may include:

- Direct impacts on listed heritage items such as buildings, structures, trees or kerbs/gutters and including structural vibration impacts
- Indirect visual and amenity impacts on listed heritage items and streetscapes in Heritage Conservation Areas
- Direct impacts on unexpected archaeological finds in the unlikely event that this would occur.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including archival recording of any listed heritage items to be disturbed, adoption of an unexpected heritage finds protocol, maintaining minimum separation distances between vibration intensive works and sensitive building structures, carrying out vibration monitoring and building condition surveys (where necessary).

8.7 Aboriginal heritage

Potential Aboriginal heritage related impacts during construction works may include:

- Direct impacts on AHIMS registered archaeological sites (if present)
- Direct impacts on areas identified as containing potential archaeological deposits, such as along intact watercourses
- Direct impacts on unexpected archaeological finds in the unlikely event that this would occur.

No potential archaeological deposits have been identified in any of the areas of interest investigated. Given the significant disturbance that has occurred in these urban areas, it is considered unlikely that the utility works would impact on any item of Aboriginal heritage.

Any impacts that may occur can be managed by the proposed management measures as detailed in **Chapter 10** including adoption of an unexpected heritage finds protocol.

8.8 Visual

Potential visual impacts during construction works may include:

- Views from sensitive receivers of trench excavation, stockpiles, laydown areas and plant equipment
- Removal of trees or vegetation from within road reserves or open space areas
- Light spill and glare impacting on residential properties during work at night.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including erection of screen barriers around work areas, careful orientation and shielding of lighting to minimise light spill and glare, avoiding tree removal where possible and planting suitable replacement trees for any trees to be removed.

8.9 Land use and socio-economic

Potential land use and socio-economic impacts during construction works include:

- Impact on property access (eg driveways) noting that existing property access would be maintained other than for short periods during the works as agreed in consultation with the property owner
- Impact on visibility of existing commercial businesses
- Impact on access to areas of public open space
- Impact on sensitive land uses such as schools, child care centres and medical facilities
- Amenity impacts on residential land uses adjacent to the work areas
- Temporary disruption to services such as power and water supply during the works
- Generating employment opportunities for workers during the construction phase
- Providing indirect economic benefits for some business during the construction phase.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including providing prior notification to residential, business and other property owners that may be affected.

8.10 Soil and water

Potential impacts on soil and water during construction works include:

- Earthworks during construction create potential for erosion and sedimentation of waterways in the vicinity of the works
- Dewatering of excavated trenches may be required during and after rainfall
- In some locations groundwater may be intercepted and dewatering may be required during excavation of trenches
- Disturbance of acid sulfate soils and exposure to air
- Spills of hydraulic oils and fuels from vehicles and plant equipment may impact on soil and water quality
- Disturbance of contaminated soils (as referred to in **section 8.11**).

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including implementation of erosion and sediment control measures in accordance with the Blue Book Volume 1 (Landcom, 2004), progressive stabilisation of exposed soil surfaces, and implementing procedures for the storage and handling of oils and fuels.

8.11 Contamination

Potential impacts on soil and groundwater from contamination during construction works include:

- Disturbance of asbestos and other potential contaminants in old cabling, conduits, pipes etc
- Mobilisation of contamination in soils by earthworks and movement of plant and equipment
- Mobilisation of contaminants in exposed soils by rainfall or surface water run-off
- Encountering contaminated groundwater during excavation of trenches
- Spills of hydraulic oils and fuels from vehicles and plant equipment may impact on soil and water quality.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including adopting standard health and safety management practices, spoil management, measures for dewatering of groundwater, progressive stabilisation of exposed soil surfaces and adoption of an unexpected contamination finds protocol.

8.12 Waste

Potential waste impacts during construction works may include:

- Excess spoil generated during trench excavation
- Classification and disposal of waste.

These impacts would be temporary and can be managed by the proposed management measures as detailed in **Chapter 10** including procedures for the classification and management of waste in accordance with the NSW EPA Waste Classification Guidelines.

8.13 Electric and magnetic fields

Equipment which forms part of an electricity network, including overhead or underground powerlines, has current flowing through it and produces electric and magnetic fields (EMF). Electricity produces an electric field and a magnetic field and the strengths of these fields decrease rapidly with distance from their source. The level of magnetic fields from the electricity network depends on the amount of current/electrical load, the way the network is configured and the distance from the equipment. The level is not directly related to the voltage. Everyone who regularly uses electricity or electrical appliances is exposed to EMF on an ongoing basis. The balance of current scientific evidence does not indicate that EMF causes adverse health effects.

Proposed utility works that involve power supply connections or which require existing Ausgrid or Sydney Trains electrical infrastructure to be relayed have the potential to produce EMF. It is likely that these utility works would be located within existing road and transport corridors and/or in designated utility service corridors within the project footprint either below ground or above ground. In these locations there is likely to be reasonable separation distance provided to the closest receivers

Potential EMF impacts can be managed by optimising feeder and feeder/joint bay configurations (if required) and where possible locating feeders to increase separation distances to sensitive receivers.

8.14 Cumulative impacts

There is the potential for cumulative impacts associated with the proposed utility works where these works are concurrent or overlap with other works that may be related to either the M4-M5 Link project or other projects such as:

- Other utility works or maintenance works that may be undertaken by utility service providers independent of the M4-M5 Link project
- Construction of other elements of the M4-M5 Link project
- Construction of other stages of WestConnex in particular the M4 East project in the Haberfield/Ashfield area (due for completion in 2019) and the New M5 project in the St Peters area (due for completion in 2020)
- Construction of other projects that may occur in the immediate vicinity of the project footprint particularly in the Rozelle and St Peters areas such as:
- CBD and South East Light Rail (CSELR) maintenance depot at Lilyfield (due for completion in 2019), and in association with CSELR works at Chalmers Street
- Site management works at the Rozelle Rail Yards (due for completion in 2018)
- Proposed future Western Harbour Tunnel and Beaches Link project in the Rozelle area
- Sydney Metro City and Southwest project in the area near Sydenham Station (due for completion in 2024)
- Proposed future Sydney Gateway project in the St Peters and Mascot areas.

Potential cumulative impacts are likely to relate to a range of issues but most particularly issues such as traffic, car parking, noise and vibration, land use, air quality and visual.

These impacts can be managed by the proposed management measures as detailed in **Chapter 10** including regular communication with proponents of other projects, scheduling of works to minimise potential impacts of overlapping projects and progressively staging work to minimise potential impacts. In addition, as part of this Strategy it is proposed that a Utility Co-ordination Committee would be established to ensure better planning for, and co-ordination of, individual utility works. This is discussed in **section 9.5**. A utilities coordinator would manage the process of coordination with the committee.

9 Process for managing proposed utility works

9.1 Overview

The Utilities Management Strategy details the major (trunk) utility works proposed as part of the project based on the concept design which is being considered by the EIS. Other minor utility works which do not meet the definition of construction are not considered as part of this Strategy.

This Utilities Management Strategy provides information in relation to:

- Utility works which are proposed within the project footprint. These utility works have been assessed as part of the EIS and would be subject to the recommended environmental management measures contained in the EIS. They would also be subject to either:
  - The Utilities Relocation Management Plan (URMP) if the works are to be carried out prior to approval of a CEMP or
  - The CEMP if the works are to be carried out after approval of the CEMP
- Utility works which are proposed outside of the project footprint. This Utilities Management Strategy provides the framework for how these utility works would be managed including requirements for environmental constraints analysis and environmental risk assessment to confirm the potential impacts associated with the works and review of the recommended environmental management measures. These utility works proposed outside of the project footprint would also be subject to the URMP of the CEMP.

The Utilities Management Strategy also provides information in relation to requirements for:

- Options assessment
- Stakeholder and community consultation
- Co-ordination of works.

The information contained in this Strategy is likely to change over time as further investigations are carried out, as discussions with utility service providers progress and as the design of the project is refined during detailed design once a contractor has been appointed. This Utilities Management Strategy establishes a process for managing utility works associated with the project.

9.2 Environmental constraints analysis and environmental risk assessment for areas outside of the project footprint

The assessment undertaken in this Strategy has been carried out based on the concept design for the M4-M5 Link project which is assessed in the EIS. It is also based on the investigations carried out to date and consultation undertaken with relevant utility service providers.

More detailed investigations would be carried out and further consultation would be undertaken during the detailed design phase of the project once a design for the proposed works is confirmed by the contractor. This may result in some changes to the proposed utility works.

In these circumstances an updated environmental constraints analysis and risk assessment would be undertaken for utility works in areas outside of the project footprint to confirm that the environmental management measures that would be applied, either through the URMP or the CEMP and sub-plans, are appropriate. If additional environmental impacts are identified as part of this process then the proposed management measures would be reviewed and, if necessary, modified to minimise these impacts.

9.3 Options assessment

For some of the proposed utility works there may be a number of potential route options which are available. In determining a preferred route option, the following criteria would be considered as relevant:

- The requirements of the relevant utility service provider
- Minimising commercial and schedule risk
- The location of existing utility services in relation to the project infrastructure and surrounding exiting utilities
- Allowing ease of access for both construction and maintenance
- Locating infrastructure in areas of previous disturbance such as road reserves or infrastructure corridors
- Adopting the shortest feasible route (all other considerations allowing)
- Where possible, avoiding or minimising impacts on:
    - Sensitive environmental areas (eg watercourse crossings)
    - Known areas of contamination or acid sulfate soils
    - Heritage Conservation Areas and listed heritage items
    - Areas of public open space
    - Visibility of, and access to, commercial businesses
    - Residential and other sensitive receivers
    - Major roads which are heavily trafficked
- Cumulative impacts with other concurrent or overlapping projects
- Where multiple feasible options exist, the views of stakeholders and the local community.

9.4 Stakeholder and community consultation

9.4.1 Consultation

Where reasonable and feasible route options exist for the utility works and time permits, the local community (residential, business and other property owners) would be consulted about the route options. The views arising from this consultation process would be considered among other issues in determining a preferred route option. Consultation would occur in accordance with the Community Communication Strategy for the project.

9.4.2 Notification

Where no feasible route options exist for the utility service adjustment, then the local community who may be affected would be given prior notification of the works, at least five days prior to the works commencing.

9.5 Co-ordination of utility works

To ensure that the potential cumulative environmental impacts associated with proposed utility works are effectively managed it is essential that various individual utility works are co-ordinated.

It is proposed that a Utility Co-ordination Committee would be established to ensure better planning for, and co-ordination of, individual utility works and also to ensure that these works are co-ordinated with other works being undertaken either as part of the M4-M5 Link project and associated with other projects.

The Utility Co-ordination Committee would be established by the contractor for the M4-M5 Link project and would include representatives from the following organisations:

- Roads and Maritime
- Sydney Motorway Corporation
- Ausgrid
- Sydney Trains
- Jemena
- Sydney Water
- Telstra and other telecommunications providers
- Inner West Council
- City of Sydney
- The contractors for other interfacing projects such as M4 East, New M5, CSELR Rozelle maintenance depot at Lilyfield, site management works at Rozelle Rail Yards, Sydney Metro City and Southwest, proposed future Western Harbour Tunnel and Beaches Link project and proposed future Sydney Gateway project as appropriate
- Other key government agency stakeholders such as Urban Growth NSW and the Port Authority of NSW.

The Utility Co-ordination Committee would meet a minimum of four times per year starting prior to commencement of construction of the project (nominally early 2018) until the completion of the construction period (nominally late 2023). The actions agreed at the meetings would be minuted.

The objectives of the Utility Co-ordination Committee would be developed but may include:

- Coordinating timing of project and non-project utility works to avoid working in established respite periods where possible
- Delivering the works efficiently, safely and cost effectively
- Minimising impacts on the environment
- Minimising amenity impacts on the local community, including residents and businesses
- Minimising local traffic and car parking impacts
- Minimising impacts on the road network and public transport services
- Minimising cumulative environmental impacts associated with multiple overlapping projects and individual utility works including limiting the overall extent and duration of disturbance where possible
- Ensuring regular communication of the works program to key stakeholders and the local community.

10 Management measures

10.1 Environmental management measures

The environmental management measures from **Chapter 29** (Summary of environmental management measures) of the EIS would be included in the CEMP and associated sub-plans. These relevant environmental management measures would also form the basis of the URMP for the project.

Typical management measures that would be implemented during utility works are outlined in **Table 10-1**. As outlined in **section 9.2**, the environmental management measures would be reviewed as part of the environmental constraints analysis and risk assessment and would be amended and added to as required having regard to the detailed design of the proposed utility works, the construction methodology to be employed, and the location of the works.

Table 10-1 Utility works – typical management measures

Environmental issue	Typical management measures
Traffic and access	· Construction workers utilise designated off-street car parking areas where available · Minimise periods of time during which roads and footpaths would be closed · Install signage to advise road users of any closures and alternative arrangements · Where possible undertake works outside peak traffic periods · Notify affected communities about temporary traffic and access disruptions · Consultation with the local Council prior to commencement of proposed works · Where utility works are required within main arterial roads · For any utility works on main arterial roads, a Road Occupancy Licence (ROL) and coordination with the Traffic Management Centre (TMC) would be required
Noise and vibration	· Carry out works during standard construction hours except in specific circumstances where out–of-hours work may be required, such as to avoid traffic impacts on arterial roads during peak periods · Scheduling noise intensive works outside of sensitive periods where possible · Establish an Out-of-Hours Work Protocol to guide how out-of-hours work would be conducted, including community notification procedures for affected neighbours, provisions for respite periods and a complaints handling process · Use of temporary noise barriers or mobile acoustic enclosures where practicable · Maintain minimum separation distances between vibration intensive works and sensitive building structures · Carry out vibration monitoring and complete pre and post-construction condition assessments for sensitive building structures or sensitive equipment likely to be impacted by vibration intensive works
Air quality	· Use of water sprays to minimise dust from exposed areas such as trenches and stockpiles · Avoid and remove deposits of loose materials (eg soils) on impervious surfaces to reduce potential for dust generation · Covering truck loads, use of wheel washes and street sweepers to minimise

Environmental issue	Typical management measures
	tracking of dust · Regular maintenance of plant and equipment to minimise exhaust emissions · Turn off vehicles and equipment when not in use
Biodiversity	· Carry out pre-clearing surveys of any potential habitat trees and vegetation to be removed · Establish tree protection zones around trees to be retained · Where appropriate, utilise sensitive construction techniques such as under boring to minimise impacts on the roots of high retention values trees · Minimise removal of vegetation and where appropriate plant replacement trees and vegetation with suitable local native species at completion of construction works · Manage works to avoid the spread of noxious weeds in accordance with the *Noxious Weeds Act 1993* (NSW)
Non-Aboriginal heritage	· Avoid route options that would involve disturbance of listed heritage items · Undertake archival recording of any listed heritage items disturbed by the works · Minimise the use of vibration-intensive equipment and manage associated activities in the vicinity of listed heritage items to avoid potential cosmetic damage · Establish an unexpected heritage finds protocol
Aboriginal heritage	· Establish an unexpected heritage finds protocol · Check registers to confirm no registered sites · Modify route if necessary · Check for Aboriginal Land claims
Visual	· Sensitive siting and design of above ground utility services to minimise visual impacts · Careful orientation and shielding of lighting to minimise light spill and glare
Land use	· Undertake prior notification of works to residential, business and other property owners who may be affected
Soil and water	· Manage surface water and soils to minimise potential erosion and sedimentation of drains and watercourses in accordance with the requirements of the Blue Book · Minimise areas of exposed soil surfaces to reduce erosion · Install sediment control measures · Stabilisation of exposed soil surfaces progressively during construction · Nominating exclusion zones during construction works to protect environmentally sensitive areas such as watercourses · Storing oils and fuels in a suitably bunded, covered and secure area · Adoption of appropriate storage and refuelling controls including a nominated refuelling area
Contamination	· Adopting standard health and safety management practices

Environmental issue	Typical management measures
	· Stabilisation of exposed soil surfaces progressively during construction · Requirements for dewatering of groundwater · Adopting an unexpected contaminated land finds protocol
Waste	· Characterise and manage waste in accordance with the NSW EPA's Waste Classification Guidelines
Electric magnetic fields	· Optimise feeder and feeder/joint bay configurations (if required) · Where possible locating feeders to increase separation distances to sensitive receivers
Cumulative impacts	· Regular communication with other utility service providers, contractors and proponents of other projects · Scheduling of work with other overlapping projects to minimise potential cumulative impacts · Progressively stage construction works to minimise impacts such as traffic, noise and visual impacts

10.2 Environmental management plans

Utility works associated with the project would be subject to the following management framework:

- The relevant environmental management measures outlined in **Chapter 29** (Summary of environmental management measures) of the EIS
- The URMP for utility works undertaken prior to approval of the CEMP. This may be a staged URMP where required
- The CEMP which would outline the environmental management measures and procedures that would be followed during construction
- The measures outlined in **Chapter 9** and **Chapter 10** of this Strategy.

10.3 Other management measures

As part of the Utilities Management Strategy other management measures are also proposed including:

- Where utility works are proposed that are located outside of the project footprint, then an updated environmental constraints analysis and risk assessment would be undertaken. The purpose of this assessment is to confirm that the environmental management measures that would be applied, either through the Utilities Relocation Management Plan or the CEMP and sub-plans, are appropriate. If additional environmental impacts are identified as part of this process then the proposed management measures would be reviewed and, if necessary, modified to minimise these impacts (see **section 9.2**)
- Where multiple feasible route options for utility works exist, a range of criteria to guide the selection of preferred route option would be considered (see **section 4.2.5**)
- Where reasonable and feasible route options for utility works exist and time permits, the local community likely to be affected by the options would be consulted about the route options and their views considered in deciding on a preferred option (see **section 9.4**)
- Where no feasible route options for utility works exist, appropriate notification will be provided to the local community likely to be affected by the proposed works in advance of the works commencing (see **section 9.4**)

- A Utility Co-ordination Committee would be established to ensure better planning for, and co-ordination of, individual utility works and also to ensure that these works are co-ordinated with other works being undertaken as part of the M4-M5 Link project and other projects (see **section 9.5**).