NSW GOVERNMENT

Parramatta Light Rail (Stage 2) Scoping Report

June 2019

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Purpose of this Scoping Report

This Scoping Report has been prepared to support a State significant infrastructure application for the proposed Stage 2 Parramatta Light Rail (PLR) Project (described below), and to assist the formulation of Secretary's environmental assessment requirements (SEARs) by the Department of Planning, Industry and Environment (formerly the Department of Planning and Environment).

Background

The Greater Parramatta and Olympic Peninsula (GPOP) priority growth area is one of Sydney's fastest growing areas. In the next 23 years, the population of the GPOP priority growth area will undergo substantial growth, with forecasts predicting the GPOP priority growth area will accommodate almost 170,000 new residents and an additional 102,500 jobs by 2041 (SGS, 2017).

The PLR network will deliver an integrated light rail service that supports population and employment growth as well as the additional development expected throughout the GPOP priority growth area. The light rail will also integrate with existing and future modes of transport including buses, trains, ferries and active transport across the area as well as future metro services and the existing road network.

Stage 2 of PLR (the Project) was announced in October 2017 with the preferred route connecting to Stage 1 at Rydalmere and running north of the Parramatta River through the rapidly developing suburbs of Ermington and Melrose Park, before crossing the Parramatta River at Wentworth Point and continuing to Sydney Olympic Park.

An option for extending east through Camellia before crossing the Parramatta River to Rydalmere is also being considered. At Wentworth Point two potential route options are currently being considered; one which passes through the proposed Sekisui House development and one that goes around the development.

PLR Stage 2 follows approval of Stage 1 in May 2018 – a 12 kilometre two-way light rail system connecting Westmead, Parramatta CBD and Carlingford. Major contracts have been awarded to build and operate Stage 1 of the PLR network, which is expected to be operational in 2023.

Key features of the Project

The key features of the Project include:

- a new light rail line extending about 10 kilometres, with at least 10 to 12 stops that forms part of the overall Parramatta Light Rail network
- turn-up-and-go light rail services between Parramatta Square and the Carter Street Precinct at Olympic Park
- up to two Parramatta River bridge crossings (one potentially at Camellia and another at Wentworth Point), a bridge over Silverwater Road and a low-level bridge over a creek at Ken Newman Park in Ermington
- the conversion of the existing disused freight rail corridor to light rail in Camellia
- active transport infrastructure that links into the existing cycling and pedestrian network
- urban design features integrated with the light rail design and stop precincts

- integration with the wider transport network, including improvements to local bus and special event services with selected routes using the proposed bridge between Melrose Park and Wentworth Point
- interchanges with existing rail, bus and ferry facilities and the proposed Sydney Metro West
- alterations to the road network to accommodate the Project
- construction of substations to provide electricity for the Project
- track infrastructure including overhead wiring.

Detailed planning for the Project is ongoing with a government decision expected later in 2019.

Project benefits

PLR Stage 2 will be a transformative transport project that supports future growth and significantly improves the way people connect within the growing GPOP priority growth area. It will encourage new and more diverse housing, support increased population densities, and provide important connections to the existing heavy rail and future Sydney Metro West stations in Parramatta and Sydney Olympic Park.

The Project will be part of an integrated land use and transport solution for the GPOP priority growth area that will deliver the following benefits:

- it will build on Stage 1 by providing a turn up and go light rail service between Parramatta CBD and Sydney Olympic Park
- more customers will be provided with reliable 30-minute access to jobs, education and services, and entertainment attractions
- it will connect Western Sydney University campuses at Parramatta, Rydalmere and Sydney Olympic Park (as well as Westmead via Stage 1)
- it will enable customers in the east of the GPOP priority growth area to benefit from shorter journey times partly enabled by Stage 1 infrastructure
- integrated transport and land use development will be supported, with each proposed development area located within an 800 metre walking distance of the Project
- connectivity will be improved within the GPOP priority growth area, which will promote liveability and jobs growth and improve access to urban renewal areas
- it will complement the existing and proposed transport network by integrating with the proposed Sydney Metro West
- jobs, residents, visitors and investment will be attracted to the GPOP priority growth area, and urban renewal initiatives will be enhanced and accelerated.

Key environmental issues for the Project

The preliminary environmental risk analysis undertaken for the EIS has identified the following ‘Key’ environmental issues:

- traffic, transport and access
- social impacts and community infrastructure
- biodiversity
- Aboriginal heritage

- non-Aboriginal heritage
- land use and property
- hazard and risk
- urban design, landscape and visual amenity
- noise and vibration
- hydrology, flooding and water quality
- business and economic.

A preliminary environmental assessment of the Project's potential impacts has confirmed that the above issues have the potential to result in a significant impact. Detailed assessment of these issues, and the other environmental issues identified, will be undertaken as part of an Environmental Impact Statement (EIS). As part of this assessment process, environmental mitigation measures will be developed to minimise the potential impacts of the Project during construction and operation.

Next steps

Following receipt of the SEARs, Transport for NSW will prepare and publicly exhibit the EIS for the Project, which will be prepared in accordance with the SEARs and technical guidelines and will include:

- a description of the Project including its components and construction activities
- identification and consideration of issues raised by stakeholders and the community
- a description of the existing environment and an assessment of potential direct and indirect impacts on the Key and Other potential environmental issues during construction and operation of the Project
- identification of measures to be implemented to avoid, minimise, manage, offset and/or monitor the potential impacts of the Project.

1. Introduction

This chapter provides an overview of Parramatta Light Rail, the Project and the planning approval approach. The structure of this report is also provided.

1.1 Background

The Greater Parramatta and Olympic Peninsula (GPOP) priority growth area is a 40 square kilometre area extending from Westmead and Parramatta in the west to Sydney Olympic Park to the east. It is one of Sydney's fastest growing areas. In the next 23 years, the population of the GPOP priority growth area will undergo substantial growth, with forecasts predicting the area will accommodate almost 170,000 new residents by 2041. Employment opportunities in the GPOP priority growth area will also grow, with an additional 102,500 jobs predicted by 2041 (SGS, 2017).

The Parramatta Light Rail (PLR) network will deliver an integrated light rail service that supports population and employment growth as well as the additional development expected throughout the GPOP priority growth area. The light rail will also integrate with existing and future modes of transport including buses, trains, ferries and active transport (pedestrian and cycle networks that provide a means of transport) across the area as well as potential future metro services and the existing road network.

The PLR network will be delivered in stages to keep pace with the thousands of new houses and jobs expected in Western Sydney. In February 2017, the NSW Government announced the preferred route for Stage 1 of PLR – a 12 kilometre two-way light rail system connecting Westmead, Parramatta CBD and Carlingford. Major contracts have been awarded to build and operate Stage 1 of the PLR network, which is expected to be operational in 2023.

In October 2017, the NSW Government announced the preferred route for PLR Stage 2. It will connect to Stage 1 via the rapidly developing suburbs of Camellia, Melrose Park and Wentworth Point to Sydney Olympic Park, and provide a new public transport option to this booming sport, entertainment and employment precinct. Stage 2 will connect to Stage 1 to provide an integrated light rail network from Sydney Olympic Park through to Parramatta CBD and on to Westmead.

PLR Stage 2 (the Project) will be a transformative transport project that supports future growth and significantly improves the way people connect within the GPOP priority growth area. It will encourage new and more diverse housing, support increased population densities, and provide important connections to the existing heavy rail and future Sydney Metro West stations at Parramatta and Sydney Olympic Park.

Figure 1.1 provides an overview of the PLR network showing both Stage 1 and the route for Stage 2. Further information regarding the Project is provided in Chapter 5.

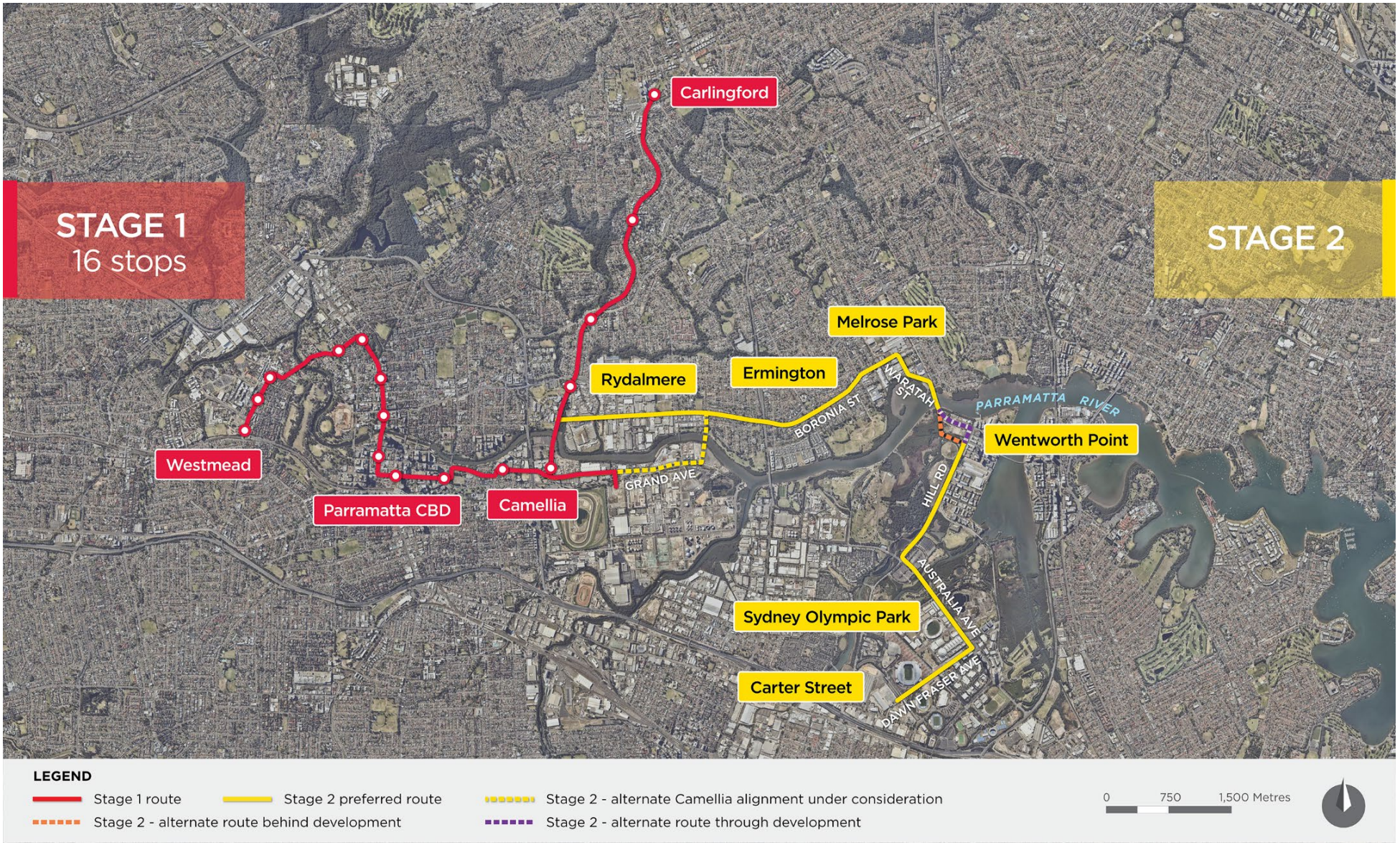

Figure 1.1 Parramatta Light Rail network overview

1.2 PLR objectives

The vision for the whole PLR network is to deliver integrated light rail services that support the NSW government's vision for the GPOP priority growth area.

Five project objectives across the four category areas of city shaping, connectivity, place and choice underpin this vision. These objectives are shown in Figure 1.2.

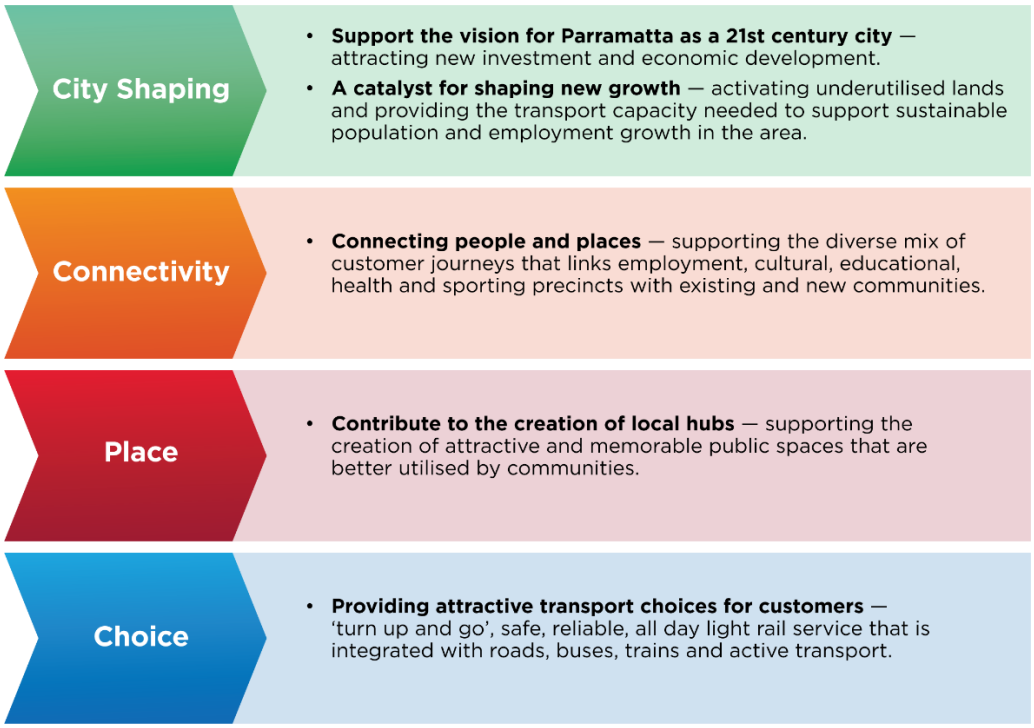

Figure 1.2 PLR objectives

A vision for the Project has been derived from the PLR's network's vision and objectives as follows:

"PLR Stage 2 will deliver comfortable, attractive, convenient, and safe places, maximising transport choice and public amenity or the communities through which it passes.

Fostering environmental and social resilience and celebrating local character; PLR Stage 2 will underpin the future liveability of the Greater Parramatta and Olympic Park precinct."

Development of the Project has been informed by the PLR network's vision and objectives and the project-specific vision, as demonstrated by the Project benefits which are discussed further in Chapter 2.

1.3 Project overview

The key features of the Project will potentially include:

- a new light rail line extending about 10 kilometres, with at least 10 to 12 stops that forms part of the overall Parramatta Light Rail network
- turn-up-and-go light rail services between Parramatta Square and the Carter Street Precinct at Olympic Park
- up to two Parramatta River bridge crossings (one potentially at Camellia, and another at Wentworth Point), a bridge over Silverwater Road and a low-level bridge over a creek at Ken Newman Park in Ermington

- the potential conversion of the existing disused freight rail corridor to light rail in Camellia
- active transport infrastructure that links into the existing cycling and pedestrian network
- urban design features integrated with the light rail design and stop precincts
- integration with the wider transport network, including improvements to local bus and special event services with selected routes using the proposed bridge between Melrose Park and Wentworth Point
- interchanges with existing rail, bus and ferry facilities and the proposed Sydney Metro West
- alterations to the road network to accommodate the Project
- construction of substations to provide electricity for the Project
- track infrastructure including overhead wiring.

These features will be defined and assessed further in the EIS.

Design development of the Project has been urban design led with a focus on integrated land use and transport outcomes.

Further information regarding the Project is provided in Chapter 5.

1.4 Purpose of the Scoping Report

This Scoping Report has been prepared to support a State significant infrastructure application for the proposed Project, and to assist the formulation of Secretary's environmental assessment requirements (SEARs) by the Department of Planning, Industry and Environment (formerly the Department of Planning and Environment) in accordance with sections 5.15 and 5.16 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The assessment and approval process for a State significant infrastructure project is shown in Figure 1.3

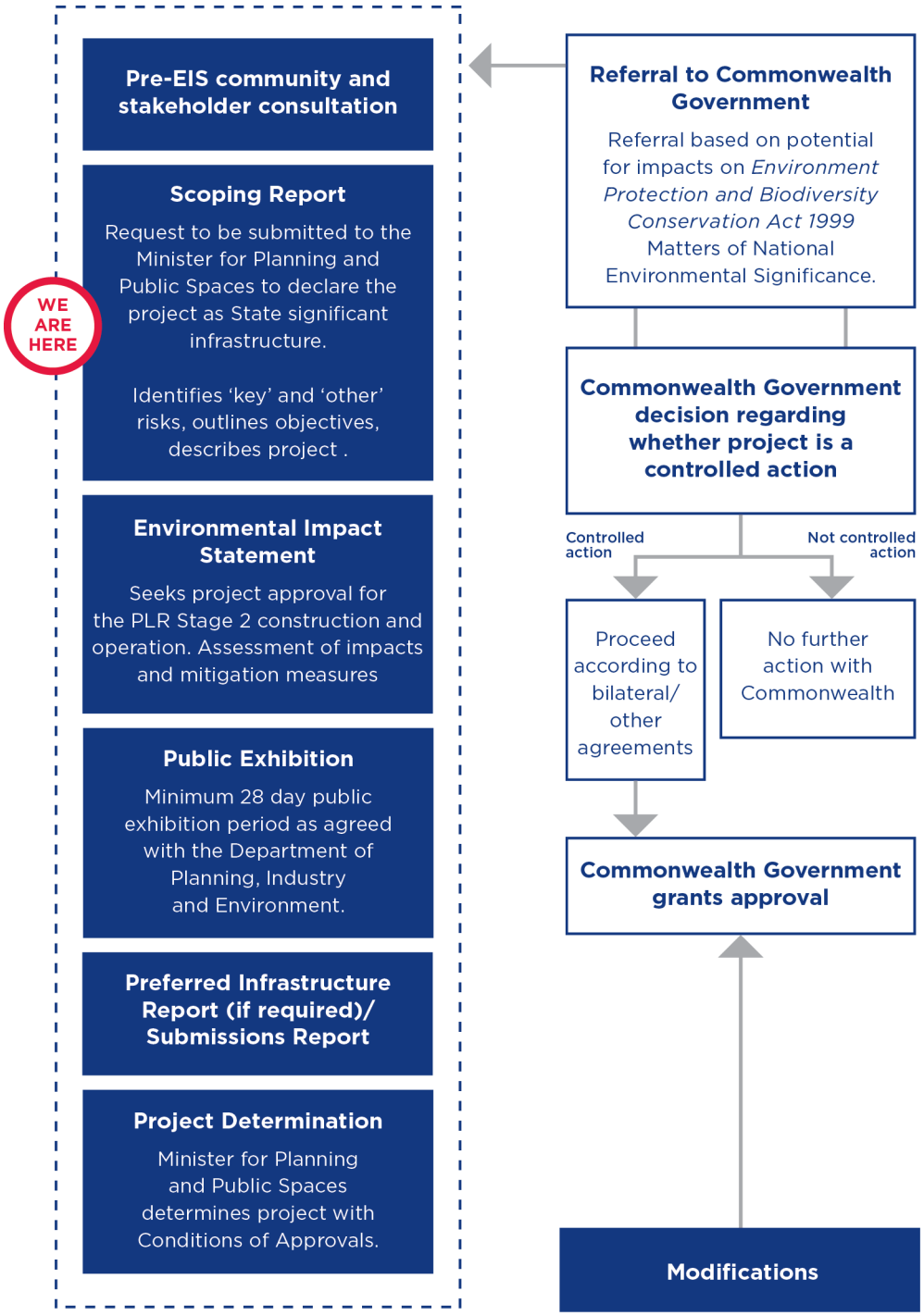

Figure 1.3 Statutory pathway

1.5 Structure of this report

This report is structured as summarised below.

- an introduction to the Project and report (Chapter 1)
- an overview of the Project's benefits and strategic context (Chapter 2)
- a description of the planning and assessment process (Chapter 3)
- an overview of the Project development process and the options considered to date (Chapter 4)

- a description of the Project including indicative milestones (Chapter 5)
- a description of the stakeholder and community consultation undertaken to date and activities planned for the future (Chapter 6)
- a preliminary risk analysis and preliminary assessment of the potential environmental issues associated with construction and operation of the Project (Chapter 7)
- closing comments for consideration (Chapter 8)
- a reference list, acronyms and glossary (Chapter 9).

2. Project benefits and strategic context

This chapter discusses how the Project responds to a number of key transport and land use challenges which are aligned to objectives detailed in key NSW Government strategic plans.

2.1 Project benefits

2.1.1 Contributes to the GPOP priority growth area light rail network

The PLR network underpins the vision for the GPOP priority growth area, as Greater Sydney's true centre – the connected and unified heart, by providing turn-up-and-go light rail services between Westmead and the Sydney Olympic Park precinct. The Project will connect with Stage 1 (which will link Westmead and Carlingford via Parramatta) to form an integrated light rail network. As a result, the Project will provide more customers with reliable 30-minute access to jobs, education and services, and entertainment attractions.

The Project will also complement the existing and proposed transport network, by providing a high-quality connecting service to Sydney Metro West, further enhancing the liveability and connectivity of the GPOP priority growth area. The Project will connect with proposed metro stations at Sydney Olympic Park and Parramatta CBD, improving access to Sydney Metro West for residents in Ermington, Melrose Park, Wentworth Point and Carter Street, and providing a larger catchment area for Sydney Metro West.

2.1.2 Supports population and employment growth

The Project supports planning for population and employment growth in the GPOP priority growth area and will create a more attractive and liveable neighbourhood. Having access to an improved and integrated public transport system offers customers better choice and will help to lower the cost of living for households.

The Project will also help create more attractive communities by delivering high quality streetscapes and urban design. It will also allow for better housing earlier than planned due to the availability of public transport.

2.1.3 Provides transport mode choice

The Project will help to address current car dependency by providing a high quality, rapid and reliable public transport service. Encouraging more journeys by public transport, will assist in easing road congestion and allow for more reliable road journeys.

2.1.4 Improves connectivity between precincts and attracts investment

Transport connections between residential areas and job centres is key to attracting business investment. The Project will provide improved transport connections and more efficient, less crowded trips which will have a positive contribution to businesses and workers.

The Project will help better realise the benefits of investments by providing more people with convenient access to Parramatta and Sydney Olympic Park, attracting more people and events to the area. The Project will connect key investments such as Westmead Innovation and Education Precinct, Museum of Applied Arts and Science, Bankwest Stadium and ANZ Stadium. It will also connect existing locations that host events, including the Parramatta CBD, Parramatta Park, Rosehill Racecourse, Sydney Showground and other event facilities at Sydney Olympic Park.

2.1.5 Provides much needed public transport and active transport connections

The Project will provide much needed public transport and active transport connections across the Parramatta River and physical barriers including Silverwater Road and steep topography. The Project provides an opportunity to improve walking and cycling, through new and enhanced active transport facilities, which can contribute to the wellbeing of the community and urban amenity.

2.2 Strategic context

Several NSW Government strategic plans, including the *Greater Sydney Region Plan* (Greater Sydney Commission (GSC), 2018a)*, GPOP Greater Parramatta and Olympic Peninsula Vision* (Greater Sydney Commission, 2016) (GPOP Vision) *and Future Transport Strategy 2056* (Transport for NSW, 2018b) articulate an integrated land use and transport plan for the GPOP priority growth area to support its development as a liveable, productive and connected area. Refer to Table 2.1 for a discussion of these key strategies and policies and how the Project aligns with their commitments.

Table 2.1 Key NSW Government policies and strategies applicable to the Project

Policy / Strategy	Overview	How the Project aligns
A Metropolis of Three Cities – Greater Sydney Region Plan (Greater Sydney Commission, 2018a)	The *Greater Sydney Region Plan* is the NSW Government's 40-year land use plan for Sydney. It establishes a vision for a metropolis of three cities – the Eastern Harbour City, Central River City and Western Parkland City (refer Figure 2.1). The Central River City is anchored by the GPOP priority growth area – a 40 square kilometre area extending from Westmead and Parramatta in the west to Sydney Olympic Park in the east. The GPOP priority growth area is crucial to the growth of the Central River City, as one of three identified Economic Corridors in Greater Sydney and a designated growth area. The GPOP priority growth area is forecast to accommodate an additional 72,000 dwellings and 110,000 additional jobs by 2036 (Department of Planning and Environment (now known as Department of Planning, Industry and Environment), 2017a).	The Project traverses through seven distinct precincts: Camellia, Rydalmere East, Ermington, Melrose Park, Wentworth Point, Sydney Olympic Park and Carter Street (which is an area designated for urban renewal by Department of Planning, Industry and Environment). The Project will meet the following objectives: • Objective 15: The Eastern, GPOP and Western Economic Corridors are better connected and more competitive • Objective 19: Greater Parramatta is stronger and better connected.
Central City District Plan (Greater Sydney Commission, 2018b)	The *Central City District Plan* is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision of Greater Sydney. It is a guide for implementing the *Greater Sydney Region Plan* at a district level and is a bridge between regional and local planning. All transport initiatives outlined in the District Plan, such as Parramatta Light Rail, are sourced from *Future Transport Strategy 2056* (see below).	The Project will meet the following priorities: • Priority C6: Creating and renewing great places and local centres, and respecting the District's heritage • Priority C7: Growing a stronger and more competitive Greater Parramatta • Priority C8: Delivering a more connected and competitive GPOP Economic Corridor • Action 29: Prioritise public transport investment to deliver the 30-minute city objective for strategic centres along the GPOP Economic Corridor • Action 30: Prioritise transport investments that enhance access to the GPOP Economic Corridor and between centres within the GPOP Economic Corridor.
GPOP Vision (Greater Sydney Commission, 2016)	This document articulates a vision for the GPOP priority growth area which describes the GPOP area as Greater Sydney's true centre – the connected, unifying heart by 2036. The PLR network is considered central to this vision, providing a connected spine through the GPOP priority growth area and enabling liveable communities.	The Project will meet the following Vision directions: • Direction 7: Design Parramatta as our central '30-minute city', with good connectivity within GPOP and beyond to the north, south, east and west • Direction 12: Shape attractive and effective built environments and public spaces that reflect a

Policy / Strategy	Overview	How the Project aligns
		focus on great urban design and environmental excellence.
Greater Parramatta Interim Land Use and Infrastructure Implementation Plan (Department of Planning and Environment, 2017a)	The interim Plan identifies how more jobs, homes and essential services will be accommodated in the priority growth area over the next 20 years. It includes a land use framework to guide future redevelopment of the priority growth area, identifies key actions for the short term and allows government agencies to identify and plan for the infrastructure required to unlock its potential.	The Project will meet the following actions: • Key Action: Planning for future major projects such as the PLR • Key Action: Enhance the priority growth area's open spaces, walkways and cycleways.
Future Transport Strategy 2056 (Transport for NSW, 2018b)	*Future Transport Strategy 2056* is an update of NSW's *Long Term Transport Master Plan*. It is a suite of strategies and plans for transport to provide an integrated vision for the state. *Future Transport Strategy 2056* reinforces the importance of better connectivity and place making in the GPOP priority growth area through its customer outcomes, network vision and investment priorities. It identifies 12 customer outcomes to guide transport investment in Greater Sydney. These outcomes include transport providing convenient access, supporting attractive places and providing 30-minute access for customers to their nearest centre by public transport.	City-serving transport is designed to serve higher density areas around metropolitan centres, like the GPOP growth area, with light rail being a typical mode for such services. Consistent with this, the Project is identified as a committed initiative (subject to completion of a business case) to deliver a 30-minute, city-serving network for Parramatta.
Building Momentum – State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018)	The *State Infrastructure Strategy 2018-2038* makes recommendations for each of NSW's key infrastructure sectors including transport. The Project is nominated as a proposed future transport project with a key recommendation for Transport for NSW to progress a business case. The Strategy also acknowledges that while the Greater Parramatta area and the GPOP Corridor are the geographic centre of Greater Sydney, they are not well connected to areas to their north and south.	The Project will deliver on a proposed future transport project and align with several of the infrastructure responses outlined in the Strategy: • improve transport connections • improve and promote north-south connections through the GPOP priority growth area • improve walking and cycling connections.
Premier's Priorities and State Priorities https://www.nsw.gov.au/improving-nsw/premiers-priorities/	The NSW Government has identified 12 Premier's Priorities and 18 State Priorities that are focused on growing the NSW economy, delivering infrastructure, protecting the vulnerable and improving health, education and public services across the State.	The Project will support and enable the following priorities: • jobs growth • delivering infrastructure • boosting apprenticeships • ensure on-time running for public transport • increasing housing supply • creating sustainable social housing.

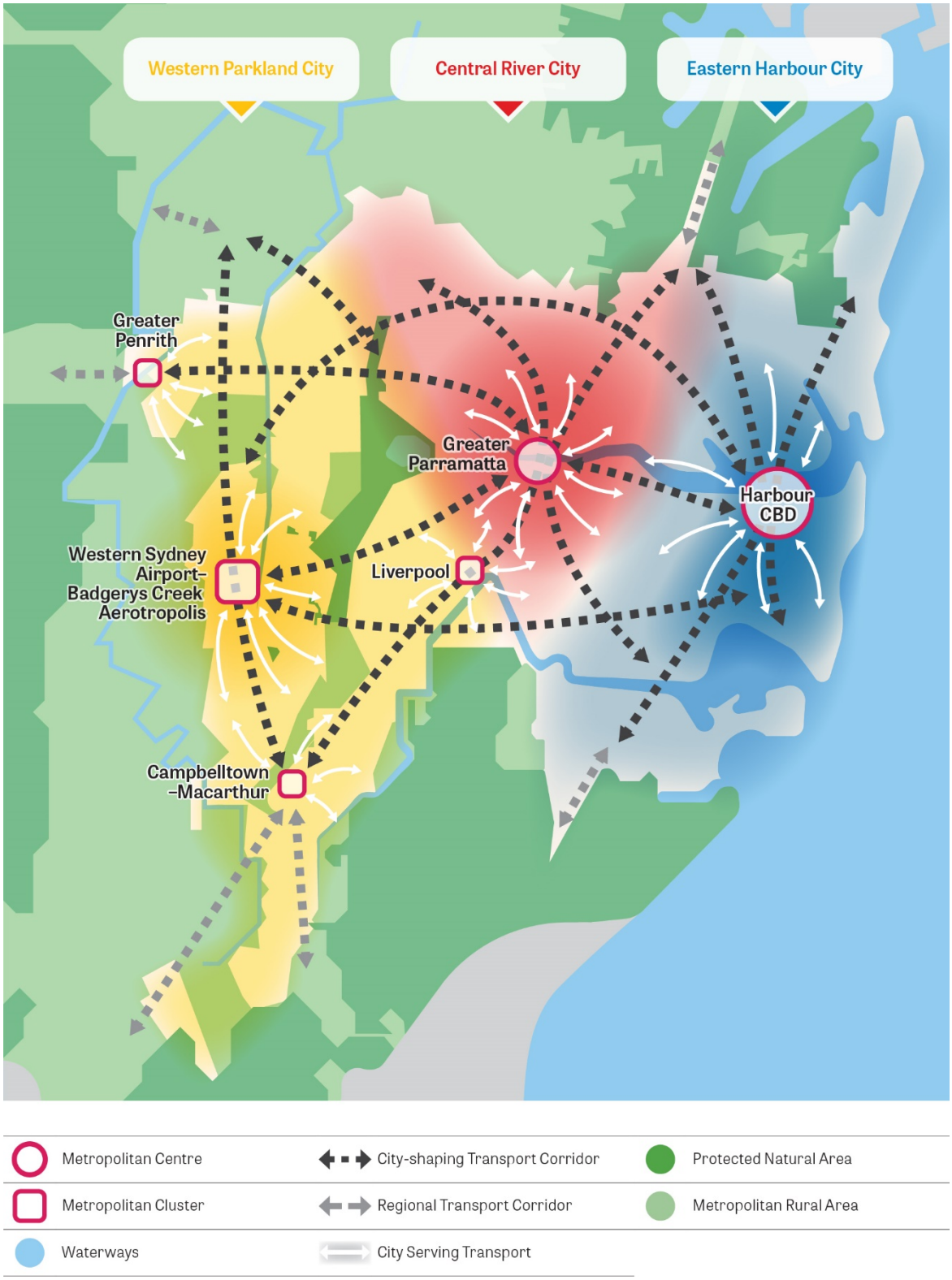

Figure 2.1 A metropolis of three cities

Source: Greater Sydney Regional Plan (Greater Sydney Commission, 2018a)

3. Planning and assessment process

This chapter describes the statutory planning process for the Project and identifies other NSW and Commonwealth legislation and approvals that may apply to the Project.

3.1 Planning pathway under the Environmental Planning and Assessment Act 1979

The EP&A Act is the primary legislation regulating land-use planning and development assessment in NSW. Part 5 of the EP&A Act defines the assessment process for infrastructure which can either be assessed under:

- **Division 5.1:** Assessment of an activity to be carried out by, or on behalf of, a public authority not otherwise requiring development consent (i.e. a public authority such as Transport for NSW can undertake an assessment and 'self-determine' for railway facilities); or
- **Division 5.2:** State significant infrastructure that is approved by the Minister for Planning and Public Spaces and which recognises that while major infrastructure projects deliver significant community and economic benefits, there are also inherent risks and impacts that need to be assessed and managed.

The EP&A Act also has provisions relating to Critical State significant infrastructure, which are major infrastructure projects declared by the Minister for Planning and Public Spaces as being essential to the state for economic, social or environmental reasons.

Assessment under Part 5, Division 5.2 is triggered by certain State environmental planning policies (SEPPs), which are outlined in Table 3.1. In addition, section 5.7(1) of the EP&A Act states that an EIS must be prepared for an activity likely to significantly affect the environment. A determining authority (such as Transport for NSW) shall not carry out an activity or grant an approval in relation to an activity that is likely to significantly affect the environment, prior to the approval of an EIS by the Minister for Planning and Public Spaces.

Section 5.22 of the EP&A Act provides that environmental planning instruments (such as local environmental plans (LEPs) and SEPPs) do not apply to State significant infrastructure projects. Notwithstanding, the environmental planning instruments that have been considered for consistency are discussed in Table 3.1.

Table 3.1 Statutory considerations in determining a State significant infrastructure planning pathway

SEPP	Requirement
State Environment Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)	Clause 79(1) of the Infrastructure SEPP provides that development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority *without consent* on any land. Furthermore Clause 78(2) states: *A reference in this Division to rail infrastructure facilities includes any facilities, buildings, works or infrastructure related to light rail purposes.* The Project is for a light rail network and therefore meets the criteria of clause 79(1).
State Environmental Planning Policy (State and Regional Development) 2011	Clause 14(1) of the State and Regional Development SEPP provides that development is State significant infrastructure, pursuant to section

SEPP	Requirement
(State and Regional Development SEPP)	5.12(2) of the EP&A Act, if it is permissible without development consent under Part 4 of the Act by virtue of the operation of a State environmental planning policy, and it is specified in the categories of development in Schedule 3. Schedule 3 (clause 1) of the State and Regional Development SEPP defines State significant infrastructure as infrastructure that would be an activity for which the proponent is also the determining authority and will, in the opinion of the proponent, require an EIS to be obtained. Transport for NSW, as the proponent, has formed the view that the Project is likely to significantly affect the environment during construction and operation (refer Chapter 7), and therefore requires the preparation of an EIS. Also refer to Section 3.2.3 for the declaration of State significant infrastructure.
State Environmental Planning Policy (State Significant Precincts) 2005	Consistent with the *Sydney Olympic Park Authority Act 2001*, Part 23 of *State Environmental Planning Policy (State Significant Precincts) 2005* establishes Sydney Olympic Park as a State Significant Precinct and provides that development in this precinct may be declared State significant development and assessed under Part 4, Division 4.7 of the EP&A Act. However, it is proposed that a declaration of State significant infrastructure is made enabling assessment and approval for the Project under Part 5, Division 5.2 of the EP&A Act. This is because: • the Project route extends beyond the precinct and also meets the criteria for State significant infrastructure under the State and Regional Development SEPP (see above) • clause 7 of the State and Regional Development SEPP notes in the event of an inconsistency between it and another SEPP (whether made before or after commencement), the SRD SEPP prevails (i.e. prevails over the *State Environmental Planning Policy (State Significant Precincts) 2005*. However, notwithstanding a State significant infrastructure planning pathway, the EIS will have regard for the State significant precinct, its objectives and associated management plans.

3.2 Environmental Planning and Assessment Regulation 2000

Clause 192 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) requires that an application for approval of the Minister for Planning and Public Spaces to carry out State significant infrastructure must include:

- details of any approvals that will, but for section 5.23 of the EP&A Act, be required for the carrying out of the State significant infrastructure
- details of any authorisations that must be given under section 5.24 of the EP&A Act if the application is approved
- a statement as to the basis on which the proposed infrastructure is State significant infrastructure, including, if relevant, the capital investment value of the proposed infrastructure.

These requirements are addressed below.

3.2.1 Approvals that would otherwise apply

State significant infrastructure is exempt from requiring certain authorisations under section 5.23 of the EP&A Act, these include:

- permits under section 201, 205 or 219 of the *Fisheries Management Act 1994*
- approvals under Part 4, or an excavation permit under section 139 of the *Heritage Act 1977*
- Aboriginal heritage impact permits under section 90 of the *National Parks and Wildlife Act 1974*
- various approvals under the *Water Management Act 2000,* including water use approvals under section 89, water management work approvals under section 90 or activity approvals under section 91.

3.2.2 Authorisations if the application is approved

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

- an environmental protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*
- a consent under section 138 of the *Roads Act 1993.*

3.2.3 Statement of State significant infrastructure

As per the statutory considerations outlined in Table 3.1 the Project is considered to be State significant infrastructure as per clause 14(1) of the State and Regional Development SEPP and approval from the Minister for Planning and Public Spaces is required under section 5.14 of the EP&A Act.

3.3 Other NSW legislation

Planning-related legislation and regulations that may be still applicable to an approved State significant infrastructure project and may, based on the current scope of the Project, be relevant, are discussed in Table 3.2.

Table 3.2 NSW legislation of potential relevance

Legislation	Relevant provisions	Approval / action required
Biodiversity Conservation Act 2016 (BC Act)	Under section 2.4 of the BC Act it is an offence to damage the habitat of a threatened species or threatened ecological community, as listed in Schedule 1 and 2 of the Act. Part 7, Division 2, section 7.9 of the BC Act specifies the requirements for biodiversity assessment for approval of State significant infrastructure. Development that is likely to significantly affect threatened species is required to be accompanied by a biodiversity development assessment	A BDAR will be prepared as part of the EIS. The BDAR will quantify the impacts of the Project on biodiversity values and site the number and type of credits required to offset the impacts of the Project.

Legislation	Relevant provisions	Approval / action required
	report (BDAR) or concurrence from the Environment Agency Head, unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values.	
Contaminated Land Management Act 1995 (CLM Act)	The CLM Act regulates significantly contaminated land and includes requirements for persons undertaking activities and landowners to provide notification to the EPA. The CLM Act also sets out requirements for investigation, remediation and recovery of costs from the person responsible.	Transport for NSW is not currently a landowner but will have obligations in relation to the notification of contamination if it becomes an owner of land. Where Transport for NSW is not a landowner but is undertaking construction, it may have an obligation to report contaminating activities/events. Potential for activities to cause contamination will be further considered in the EIS.
Crown Land Management Act 2016	This Act repealed the *Crown Lands Act 1989* on 1 July 2018, and provides for the ownership, use and management of Crown land in NSW. It is possible to obtain a lease or licence over Crown Land. Dedicated or reserved Crown Land may only be used for the specified purpose.	The Project will likely require a lease and/or licence over Crown Land from the Minister of Lands to enable the establishment of the Project (Section 5.16-5.28). Preliminary research has indicated that Crown land is likely to be located in Camellia, Rydalmere and Melrose Park. For the purposes of the EP&A Act, under the Act, the Lands Minister is taken to have given written consent on the behalf of the Crown for the lessee of dedicated Crown land to make a development application, or the carrying out of development, relating to the purpose for which a lease or licence has been granted. Transport for NSW will seek any necessary licence or lease for the Project route from the Minister for Lands.
Electricity Supply Act 1995	Works situated in, on or near electricity works requires notification to the relevant utility provider. Under section 63Z a person must not commence to carry out excavation work, or authorise such excavation work to be commenced unless the person has: *(a) contacted the designated information provider and requested information as to the location and type of any underground electricity power lines in the vicinity of the proposed work, and*	Transport for NSW is in discussions with utility providers regarding the location of existing assets. Further consideration will be undertaken as part of the EIS.

Legislation	Relevant provisions	Approval / action required
	(b) complied with any reasonable procedures of the designated information provider as to the manner of contacting the designated information provider and the information to be provided by the person in connection with the person's request for information, and *(c) allowed a reasonable period for the requested information to be provided.*	
Environmental Planning and Assessment Regulation 2000 (EP&A Regulation)	Clause 193(1) states that landowner's consent is not required if the State significant infrastructure is proposed to be carried out by a proponent that is a public authority. Clause 193(4) states if the consent of the owner of the land is not required for an infrastructure application or modification request under this clause, the proponent is still required to give notice of the application or request which may be: *(a) by written notice to the owner of the land before, or no later than 14 days after, the application or request is made, or* *(b) by advertisement published in a newspaper circulating in the area in which the infrastructure is to be carried out:* *(i) in the case of an infrastructure application – at least 14 days before the environmental impact statement that relates to the infrastructure is placed on public exhibition.*	As the Project is State significant infrastructure to be carried out by Transport for NSW (a public authority) landowner's consent is not required under clause 193(1). However, as per the requirements of clause 193(4) Transport for NSW will provide notice in accordance with the EP&A Regulation.
Fisheries Management Act 1994 (FM Act)	The FM Act aims to conserve, develop and share the fishery resources of the state for the benefit of present and future generations. It provides legal status for aquatic and marine biota of conservation significance in NSW (including fish species and ecological communities) and makes provision for the protection of key fish habitat, marine vegetation, and fish passage by regulating developments and activities through obtaining permits and/or undertaking consultation with the NSW Department of Primary Industries. Section 199 of the FM Act requires a public authority to notify the Minister prior to carrying out dredging or reclamation (defined by section 198A).	The Project will require works within and adjacent to Parramatta River, which may trigger the notification requirements of the FM Act. The Minister for Primary Industries will be notified in writing if dredging or reclamation work is required, in accordance with the requirements of section 199. Further details will be provided in the EIS. No other approvals under the Act will be required, as outlined in Section 3.2.1.
Marine Safety Act 1998	The *Marine Safety Act 1998* and the *Marine Safety Regulation 2016* sets out the requirements for marine safety and the roles of the Harbour Master	As the Project will involve works and permanent structures established in the harbour (a navigable water

Legislation	Relevant provisions	Approval / action required
	and marine pilots. It includes provisions relating to marine and navigational safety including collision prevention, spill limits, no-wash zones, shipping operation restrictions, and controls on reckless, dangerous or negligent navigation.	under the terms of the Act) and restrict use by the public during construction, it is likely to be subject to licencing under the terms of clause 97 of the Regulation and require navigational exclusion zones. Further details will be provided in the EIS.
Ports and Maritime Administration Act 1995	This Act provides for the regulation of maritime activities including port operator directions in private ports. The *Ports and Maritime Administration Regulation 2012* may prohibit or regulate the occupation of navigable waters by vessels, floating objects or structures (e.g. approval under clause 67ZN to disturb the seabed).	Construction activities associated with the bridges will require disturbance to the seabed and so this requirement will be considered as part of the EIS.
Pipelines Act 1967	Works within 20 metres of the vicinity of pipeline infrastructure and/or pipeline corridors require written notice of the applicant to the pipeline operator and take into consideration any response to the notice that is received within 21 days after the notice is given. The determining authority must be satisfied that the potential safety risks or risks to the integrity of the pipeline that are associated with the development have been identified and taken into consideration.	The Project route extends across gas and water pipelines. Transport for NSW is in discussions with utility providers regarding the location of existing assets. Further consideration of the potential safety risks or risks to the integrity of pipelines will be undertaken as part of the EIS.
Protection of the Environment Operations Act 1997 (PoEO Act)	The PoEO Act establishes a regulatory framework for the protection of the environment. It provides a mechanism for licensing certain activities, listed in Schedule 1 of the PoEO Act. Part 3.2 of the PoEO Act requires an Environmental Protection Licence (EPL) for scheduled development work and the carrying out of scheduled activities.	The requirements for an EPL during construction and operation will be considered as part of the EIS.
Roads Act 1993 (Roads Act)	Section 138 of the Roads Act requires consent from the relevant roads authority for the erection of a structure, or the carrying out of work in, on or over a public road. However, under clause 5 (1) in Schedule 2 of the Roads Act, public authorities do not require consent for works on unclassified roads.	An initial review indicates that the Project would be unlikely to impact on classified roads, however the need for consent from the relevant roads authority for works impacting classified roads will be determined as part of the EIS.
Transport Administration Act 1998 (TA Act)	Section 104N(2) of the TA Act allows for the Minister for Transport to declare the route of a light rail system. Declaration of the Project as a light rail system would allow for various exemptions from various approvals, duties, rates and taxes, pursuant to Division 2A, Part 9 of the TA Act.	It is intended that the route of the Project be declared as a light rail system. Following declaration, the Project will become a 'light rail system' within the meaning of Part 9, Division 2A and the other provisions of this Division of

Legislation	Relevant provisions	Approval / action required
	Part 9, Division 2A provides a number of special provisions for light rail systems.	the TA Act would apply. This includes section 104P which makes Transport for NSW the proponent / determining authority for the development of light rail systems, including anything that is incidental to the carrying out of such a development. By operation of a savings provision relating to the EP&A Act, the effect s104P is now that the Project is State significant infrastructure.
State Environmental Planning Policy (Coastal Management) 2018	The *State Environmental Planning Policy (Coastal Management) 2018* gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, specifying how development proposals are to be assessed if they fall within the coastal zone.	The Project crosses a series of areas identified as 'Coastal Wetlands' under clause 10 and areas identified as 'land in proximity to coastal wetlands' under clause 11. Development within these areas requires development consent and is generally designated development. However, the provisions of the State and Regional Development SEPP would prevail over the need for development consent. Coastal management will be considered as part of the EIS.
Sydney Regional Environmental Plan No 24 – Homebush Bay Area	The *Sydney Regional Environmental Plan No 24 – Homebush Bay Area* aims to provide flexible development controls and facilitate the development and management of Sydney Olympic Park by the Sydney Olympic Park Authority.	The Project is within an area administered by the *Sydney Regional Environmental Plan (SREP) No 24 Homebush Bay Area*, however a State significant infrastructure assessment applies to this Project which overrides the planning controls of the SREP.
Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005	The *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* covers all the waterways of the Harbour, the foreshore and the catchment. It addresses a range of matters for consideration by consent authorities assessing development within the area of the Plan to ensure consistent development decisions. It includes provisions relating to heritage and wetlands and provides planning controls for strategic foreshore areas.	The Project is within an area administered by the *Sydney Regional Environmental Plan (REP) (Sydney Harbour Catchment) 2005* however a State significant infrastructure assessment applies to this Project which overrides the planning controls of the SREP.
Sydney Olympic Park Authority Act 2001 (SOPA Act)	The SOPA Act establishes the Sydney Olympic Park Authority as a local planning authority (much the same as a local government authority) including the ability to make environmental planning instruments and development control plans. It also has obligations to prepare a masterplan and has powers for compulsory acquisition of land. Similar to a local government authority, the consent authority for	The Project route extends along Hill Road and the Holker Street Busway generally adjacent to the boundary of the Millennium Parklands before passing through the Parklands along Australia Avenue (and crossing Haslams Creek). Section 32 of the SOPA Act, enables the granting of leases/easements through the

Legislation	Relevant provisions	Approval / action required
	local development in this area is the Sydney Olympic Park Authority, whilst the consent authority for major development is the Minister for Planning and Public Spaces (or delegate). Section 34 of the SOPA Act contains a number of provisions with respect to the Millennium Parklands and sets the obligation to prepare a Plan of Management for the parklands at Sydney Olympic Park. *The Parklands Plan of Management* (Sydney Olympic Park Authority (SOPA), 2010) provides a statutory scheme of operations as the basis for managing the Parklands, in respect to land use and access.	Millennium Parklands in certain circumstances. Permit requirements and property acquisition requirements and processes will need to be established as part of the Project's development. The granting of a licence and/or lease/easement within the Millennium Parklands is required from the Sydney Olympic Park Authority. Transport for NSW is in consultation with the Sydney Olympic Park Authority and will seek approval of a lease, licence or easement during the EIS determination process.
Water Management Act 2000 (WM Act)	Section 91 of the WM Act defines that approvals are required for aquifer interference from the NSW Office of Water. The *NSW Aquifer Interference Policy* (NSW Office of Water, 2012) documents the NSW Government's intention to implement the requirement for approval of 'aquifer interference activities' under the WM Act Aquifer interference means an activity involving any of the following: *(a) the penetration of an aquifer,* *(b) the interference with water in an aquifer,* *(c) the obstruction of the flow of water in an aquifer,* *(d) the taking of water from an aquifer in the course of carrying out mining, or any other activity prescribed by the regulations,* *(e) the disposal of water taken from an aquifer as referred to in paragraph (d).*	The Project has the potential to intercept groundwater aquifers, particularly during bridge construction works. Therefore, the requirement for an aquifer interference approval will be considered as part of the EIS. No other approvals under the Act will be required, as outlined in Section 3.2.1.

3.4 Commonwealth legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), approval from the Australian Minister for the Environment would be required for an action that:

- has, will have, or is likely to have a significant impact on a matter of national environmental significance
- is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment

- is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land
- is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

Matters of national environmental significance comprise:

- World Heritage properties
- National Heritage places
- wetlands of international importance
- Commonwealth-listed threatened species and ecological communities
- Commonwealth-listed migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Desktop assessments have identified known distribution of Parramatta's key populations of the Green and Golden Bell Frog and native vegetation communities associated with riparian and intertidal environments along Parramatta River (including Estuarine Swamp Oak Forest and Estuarine Saltmarsh). The Green and Golden Bell Frog is listed as Vulnerable, while the Estuarine Swamp Oak Forest and the Estuarine Saltmarsh vegetation communities are listed as Endangered and Vulnerable, respectively, under the EPBC Act (refer to Section 7.4.3).

The potential for impacts will be confirmed in the EIS, however given the potential impacts on the Green and Golden Bell Frog habitat and other biodiversity values of national environmental significance, a referral under the EPBC Act will be submitted.

3.4.2 Native Title Act 1993

The main objective of the *Native Title Act 1993* (Commonwealth) is to recognise and protect native title. Section 8 states that the *Native Title Act 1993* is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with the Act. An initial review of the National Native Title Tribunal (NNTT) Register did not identify any Native Title determinations (under the *Native Title Act 1993*), within the area surrounding the Project. However, the EIS will confirm whether any Crown land is required for the Project and if this land is subject to a native title claim.

3.4.3 Disability Discrimination Act 1992

The *Disability Discrimination Act 1992* aims to eliminate as far as possible discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services and land. The Project will continue to be designed to be independently accessible and comply with the objectives and requirements of the Act.

4. Project development and alternatives

This chapter describes the alternatives and options evaluation process undertaken to determine the final alignment options for the Project.

4.1 Project development background

The Project route and alignments for the overall PLR network, including Stage 1, have been subject to consideration of options that were described in detail in the Stage 1 EIS and are summarised in Figure 4.1

Key phases of relevance to the Project are discussed further in the sections below.

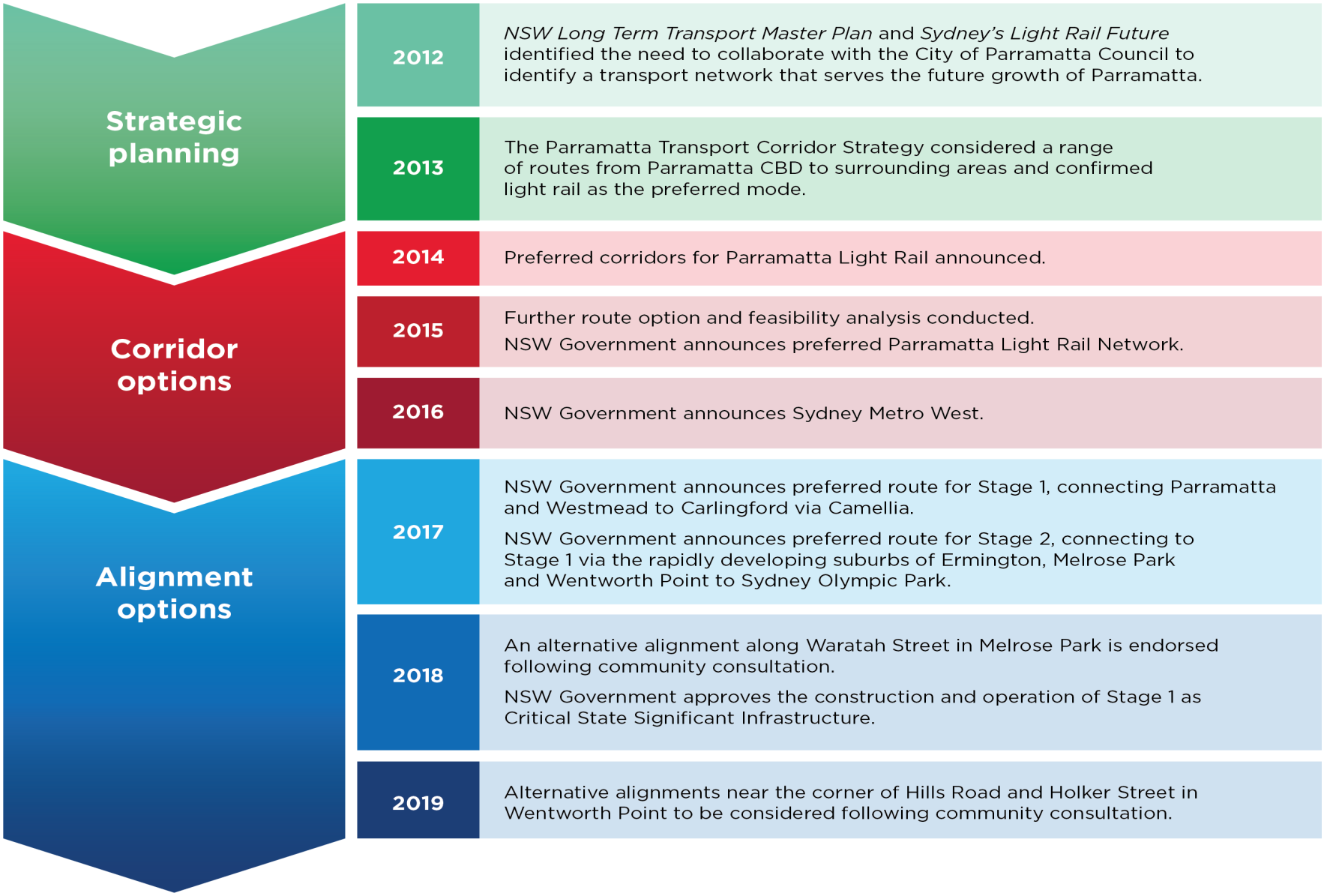

Figure 4.1 Project development process

4.1.1 Rational for the light rail as the preferred mode

The NSW Government is currently investigating and/or delivering a number of transport projects across the GPOP priority growth area, including PLR Stage 1 Sydney Metro West and WestConnex. To address the potential demand for intermediate trip tasks (trips around five to 10 kilometres) within the GPOP priority growth area, a complementary service to major rail transport is required.

An analysis of modal options for the PLR network was undertaken to determine the most effective transport mode. Each transport mode was assessed, and it was found that light rail was the most viable and preferred mode to address the GPOP priority growth area's transport need and support growth and change.

Key benefits of light rail include:

- provision of larger carrying capacity when compared to bus services
- aligns with customer preferences for greater reliability and comfort over buses
- lower environmental and amenity costs (no on-site emissions due to electrical operation)
- supporting land use change, place-making and long-term cost benefit.

4.1.2 2015 – PLR network announced

Following a period of route and feasibility analysis the NSW Government announced the preferred PLR network in December 2015. The network included:

- Westmead to Carlingford – this route, which reuses the Sydney Trains Carlingford Line, offered a feasible and cost-effective way of providing significant transport and land use benefits to the growing population along this route.
- Parramatta to Strathfield via Olympic Park – this route presented a large opportunity to support planned land use changes in the GPOP priority growth area and deliver transport benefits by supporting access to heavy rail interchanges.

4.1.3 2017 – Stage 1 delivery and preferred route for Stage 2 announced

In 2017 the NSW Government announced the delivery of Stage 1 from Westmead to Carlingford via Parramatta. Additionally, it was announced that Stage 2 will connect east to Sydney Olympic Park and potentially beyond and be planned in collaboration with Sydney Metro West.

The need for planning of Stage 2 in collaboration with Sydney Metro West reflected the fact that the projects had a number of interfaces. In particular, Sydney Metro West will connect Greater Parramatta and Sydney Olympic Park, overlapping with the baseline PLR network alignment announced in 2015.

When considered in parallel with Sydney Metro West, it was determined that the demand and feasibility of extending Stage 2 from Sydney Olympic Park to Strathfield was significantly decreased.

In addition to the introduction of Sydney Metro West, a number of other issues were identified that warranted a review of the Stage 2 component of the baseline PLR network alignment including:

- limited growth opportunities in Camellia East, Silverwater and Newington
- a congested and constrained road network between Sydney Olympic Park and Strathfield.

To address these issues an extension to Carter Street, Sydney Olympic Park was identified as the preferred extension as it will maximise the benefits of both Stage 2 and Sydney Metro West by connecting a growing residential precinct to these projects.

The final alignment for Sydney Metro West is still being investigated however the PLR network proposes quality interchanges with Sydney Metro West stations at Westmead, Parramatta and Sydney Olympic Park, supporting an integrated public transport solution for the GPOP priority growth area.

4.2 Preferred Project route

The preferred Project route was announced in October 2017. The preferred route connects to Stage 1 via Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park and provides the best outcomes in terms of land use, constructability, affordability and connectivity.

The current Project route considers four alternative route options, as illustrated in Figure 4.2, including:

- along South Street through Rydalmere – Option 1
- through Camellia, including part of the proposed Camellia Town Centre – Option 2
- through the proposed Sekisui House development at Wentworth Point – Option 3
- around the proposed Sekisui House development at Wentworth Point – Option 4.

Option 2 along Sandown Boulevard and Grand Avenue in Camellia is currently being considered as an alternative to the preferred route (Option 1). Option 2 has the advantage of better supporting the urban renewal outcomes outlined in the *Draft Camellia Town Centre Master Plan* (Department of Planning and Environment (now known as the Department of Planning, Industry and Environment), 2018a).

The route at Wentworth Point is still to be finalised.

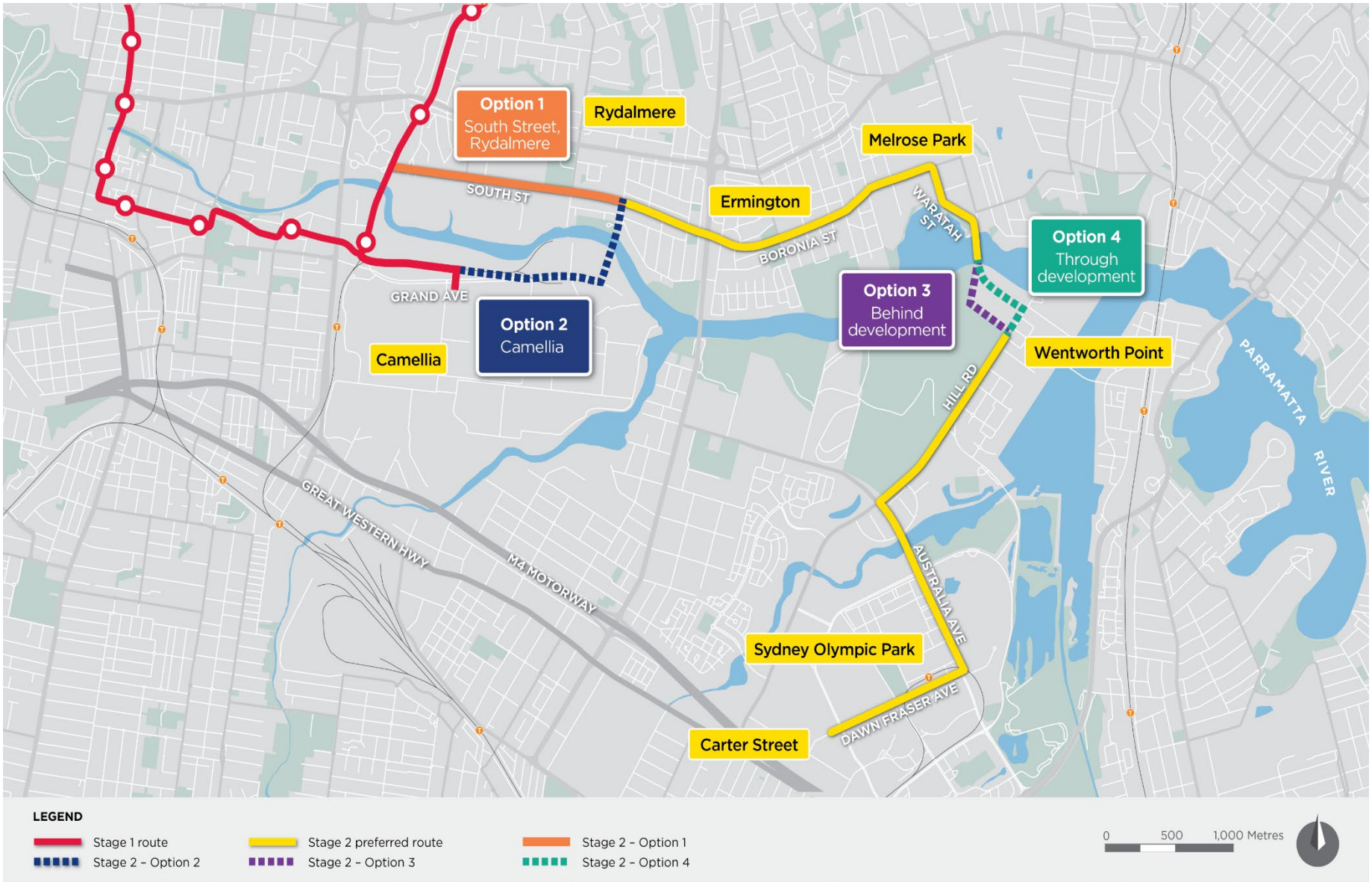

Figure 4.2 Project route options

5. Project description

This chapter provides a high-level description of the Project based on the current level of planning and design.

5.1 Overview of the Project

The Project is generally located along existing road corridors. Exceptions are specific locations through Ermington and Melrose Park and at Parramatta River crossings.

The preferred Project route will connect to Stage 1 north of Parramatta River and runs east along South Street and Boronia Street to Melrose Park, south to Wentworth Point via Waratah Street and a new Parramatta River crossing, and on to Sydney Olympic Park, terminating at Carter Street via Australia Avenue and Dawn Fraser Avenue. An option for extending east through Camellia via the disused Sandown Line and Grand Avenue before crossing the Parramatta River to Rydalmere is also being considered.

Design development of the Project has been urban design led with a focus on integrated land use and transport outcomes.

Key features of the Project have been outlined in Section 1.3 and are described in further detail within the following sections. An overview of the Project alignment is shown in Figure 5.2.

5.1.1 Alignment and track layout

The Project will comprise about a 10 kilometre light rail track. The majority of the alignment will be on-street with general traffic running adjacent to the light rail track, with the exception of a dedicated corridor utilising the former Sandown rail line at Camellia, if that option is chosen.

The track will generally be level with or slightly below the road surface for the majority of the Project alignment (refer Figure 5.1). This is known as embedded track. In certain locations light rail vehicles (LRVs) will share lanes with buses, such as the river crossings at Camellia and Wentworth Point and the Holker Street busway.

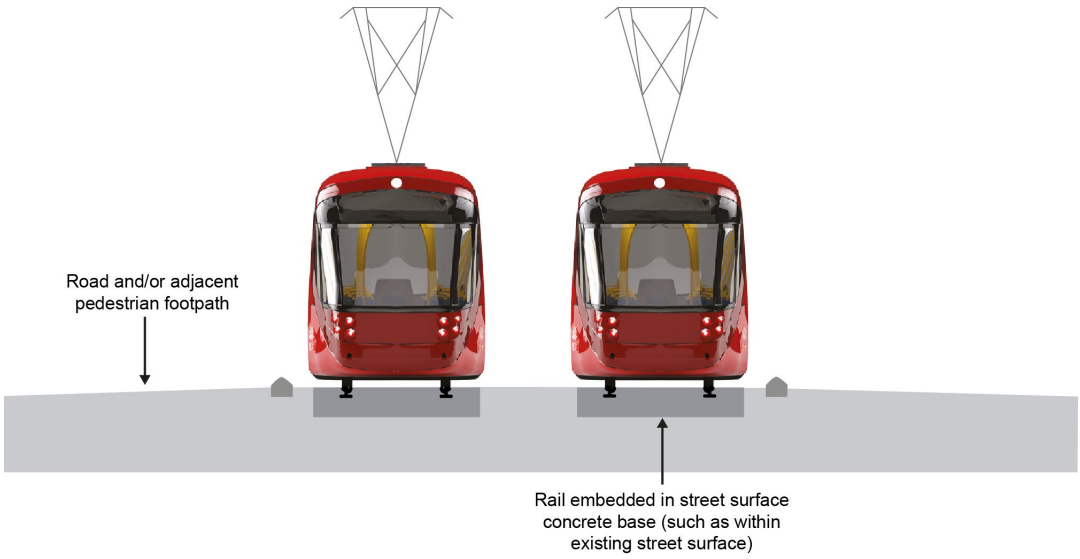

Figure 5.1 Typical embedded track cross-section (note: indicative design shown. Subject to detailed design)

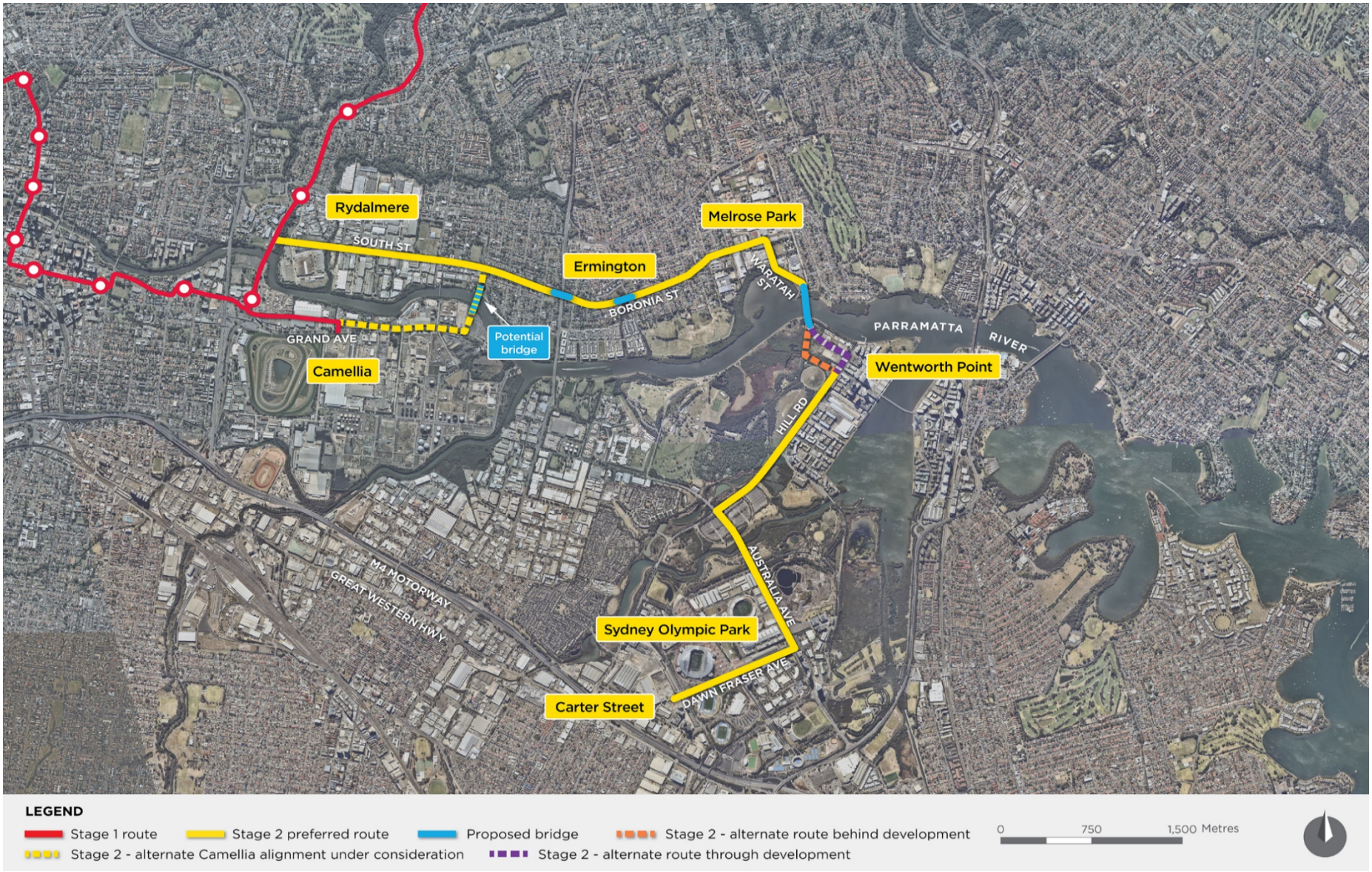

Figure 5.2 Overview of route for the Project

5.1.2 Bridges and structures

The Project includes a series of new structures along the alignment, which will be subject to further design development including:

- a potential bridge crossing the Parramatta River at the eastern end of Camellia to John Street, Rydalmere
- a bridge crossing the Parramatta River adjacent to the Ermington Boat Ramp at Melrose Park, landing to the west of the Sydney Olympic Park ferry wharf at Wentworth Point
- a bridge over Silverwater Road along South St, Rydalmere
- a low-level bridge to cross a creek on the eastern side of Ken Newman Park
- In addition, strengthening works may be undertaken at the Holker Street busway.

5.1.3 Light rail stops

The Project will include at least 10 to 12 light rail stops sited near key destinations and about 600 metres to 700 metres apart. The location of stops will take into consideration planned land use and urban development, daily urban activity, nearby destinations and interface with other transport modes. Each stop is planned so that most of the existing and planned high-density mixed use, commercial and residential development in GPOP falls within a 400 metre walk or five minute walking catchment.

Each stop will be accessible by people with fully with typical facilities including shelters, stop furniture, seating, Opal card readers, wayfinding signage and an electronic passenger information display. Platform arrangements will consist of either side or central island platforms ranging from three to 4.5 metres wide and up to 45 metres in length. Final sizing and placement of the stops will be determined during future design phases.

5.1.4 Active transport

A new active transport path (walking and cycling paths) will provide a connection along the whole Project alignment and will generally run in the street verge, or adjacent to the light rail track. The active transport path will require a degree of segregation from the light rail track and will include lighting, signage and fencing in some areas.

The final design of the active transport path will be determined during future design phases.

5.1.5 Road network changes

A large portion of the Project will be integrated within the existing street environment and will require road network changes to accommodate the light rail and active transport path.

Changes to the road network along the Project route and adjoining streets may include:

- upgrades to intersections and modifications to traffic signals
- pavement works
- changes to lane configuration and directional flow

- removal of some car parking to accommodate displaced traffic lanes and relocation of loading zones, accessible parking, bus stands, taxi stands and other service vehicle parking areas
- modification to existing public transport routes such as buses.

5.1.6 Ancillary facilities and light rail services

The Project will require ancillary facilities including:

- power substations to provide electricity for the operation of the Project
- overhead wiring and poles to supply electricity to the LRVs
- utilisation of the Stage 1 stabling and maintenance facility at 6 Grand Avenue, Camellia
- LRV driver amenities
- the potential replacement of existing rail infrastructure along the former Sandown Line corridor at Camellia
- security and safety measures such as CCTV cameras, lighting emergency telephones at each stop.

5.2 Construction

The Project is in the early planning phase and details of construction are yet to be developed. However, it is anticipated that construction of the Project will include:

- site investigations, including geotechnical, contamination and utility investigations
- establishment of temporary construction compounds for stockpiling and storage of materials
- site remediation where contaminated land is acquired
- vegetation removal and riverbank stabilisation where required
- services and utility protection, relocation or replacement
- demolition works of existing structures and property adjustment works
- construction of new bridging structures involving piling
- track and stormwater drainage works
- changes to the road design and traffic signal alterations
- construction of tracks, including the track bed (involving mostly at grade excavation works), overhead wiring and associated infrastructure (track infrastructure)
- construction of light rail stops including wayfinding signage
- substation construction and connections to local supply authority
- restoration and rehabilitation of impacted areas prior to commissioning
- testing and commissioning.

Connections to PLR Stage 1 are still to be resolved and are likely to include an extra track to turn around LRVs in the Parramatta CBD area which may be detailed as part of the Project EIS or under a separate planning approval pathway.

As a result of anticipated construction, some property acquisition will be required to accommodate the light rail corridor within the current urban environment. This is discussed further in Section 7.4.6.

The construction methodology will be further advanced during design development and detailed within the EIS.

5.3 Operation

5.3.1 Light rail vehicles, service and frequency

The Project will operate as a turn-up-and-go light rail and be similar to that of Stage 1, utilising the stabling and maintenance facility located at 6 Grand Avenue, Camellia.

About 30 LRVs are proposed to operate on the PLR network. Each LRV will be electric-powered and include a mix of seating and standing areas, accessible priority seating, low floors and air conditioning, with real-time information provided on services via audio and visual displays.

The LRVs will generally operate within the existing road speed limits, with potentially higher speeds on sections of track independent of existing roads, and lower speeds in high-pedestrian environments.

The hours of operation will be the same as Stage 1, with services operating from 5 am to 1 am, seven days a week. Additional services will be provided as required to meet demand from special events (e.g. events at Sydney Olympic Park).

Specifics around hours of operation and travel times between key centres along the Project alignment will be developed during the detailed design phase and in conjunction with Stage 1 operations.

5.3.2 Traffic management and access

The Project will run within the existing street environment for much of its alignment, necessitating a number of changes to local traffic and property access circulation.

Key principles considered to ensure the Project successfully integrates within the existing road environment include:

- provision of pedestrian crossings, particularly at stop locations
- kerbside barriers through busy high pedestrian areas to maintain pedestrian safety
- consideration of the future road network, particularly in areas of planned urban renewal such as Camellia, Melrose Park and Wentworth Point
- provision of turn bays at selected locations to aid circulation into adjoining developments
- provision of signalised intersections to aid traffic movements.

5.3.3 Public transport network integration

A series of changes will be required to the existing public transport network to accommodate the operation of the Project. These changes will include changes to the existing bus services. Further work will be carried out by Transport for NSW to confirm the preferred approach to the bus network and those routes that will require changes.

Although the Project will result in changes to the bus network, the Project will provide a catalyst to support an integrated transport network and provide for improved transport services to the GPOP priority growth area. The introduction of up to two new bridges over the Parramatta River will improve bus services to Camellia and Wentworth Point and provide for new active transport links throughout the GPOP priority growth area.

Final design of existing and future network changes will be determined during the detailed design phase.

5.4 Project timing

The proposed timing of this approvals process is shown in Figure 5.3 and is subject to change. The delivery strategy and timing for construction and operation of the Project is currently being developed.

Figure 5.3 Project program

6. Consultation

This chapter provides details on community and stakeholder engagement activities and outcomes from October 2017 to May 2019 for the Project.

6.1 Overview

Stakeholder and community engagement forms a central and integral part of the Parramatta Light Rail project for both Stages 1 and 2.

An overarching Community and Stakeholder Engagement Plan was prepared to guide and support the engagement and communication activities proposed for the Project. The Plan outlines different phases of engagement, from early engagement prior to the scoping and preparation of the EIS, through to delivery and construction of the Project.

Since the October 2017 Project announcement through to June 2019, Transport for NSW has undertaken a variety of engagement activities to gather feedback on the Project. To provide more detail and context on the engagement activities and outcomes, this chapter will:

- detail the engagement and consultation activities undertaken
- summarise issues raised to date
- outline how feedback from engagement has influenced the Project alignment
- outline the communication and engagement activities planned for the EIS and beyond.

6.2 Approach and engagement objectives

The objectives of the communication and engagement activities are to:

- introduce the concept and begin discussions with the community and stakeholders on the preferred route for the Project
- inform and advise the community and stakeholders on work being completed on the Project in terms of planning and investigative works
- engage with the community to communicate the significant benefits of the proposed light rail and address any points of concern
- encourage ongoing participation in the conversation about the Project
- communicate the connections between different modes of public transport, their roles in an integrated network, and how the PLR network and Sydney Metro West complement each other
- seek feedback on community knowledge of light rail, of the Project and on their current public transport usage.

6.3 Summary of engagement

A summary of engagement and communication activities with the community and stakeholders is provided in Figure 6.1 and outlined below:

- stakeholder engagement with government agencies, local governments and state-owned corporations and entities commenced in January 2018
- a formal consultation process for major landowners in the Rydalmere Industrial Precinct and on the Camellia peninsula commenced in early February 2018 and concluded in May 2018
- community consultation was conducted through three main engagement activities undertaken between March 2018 and September 2018.

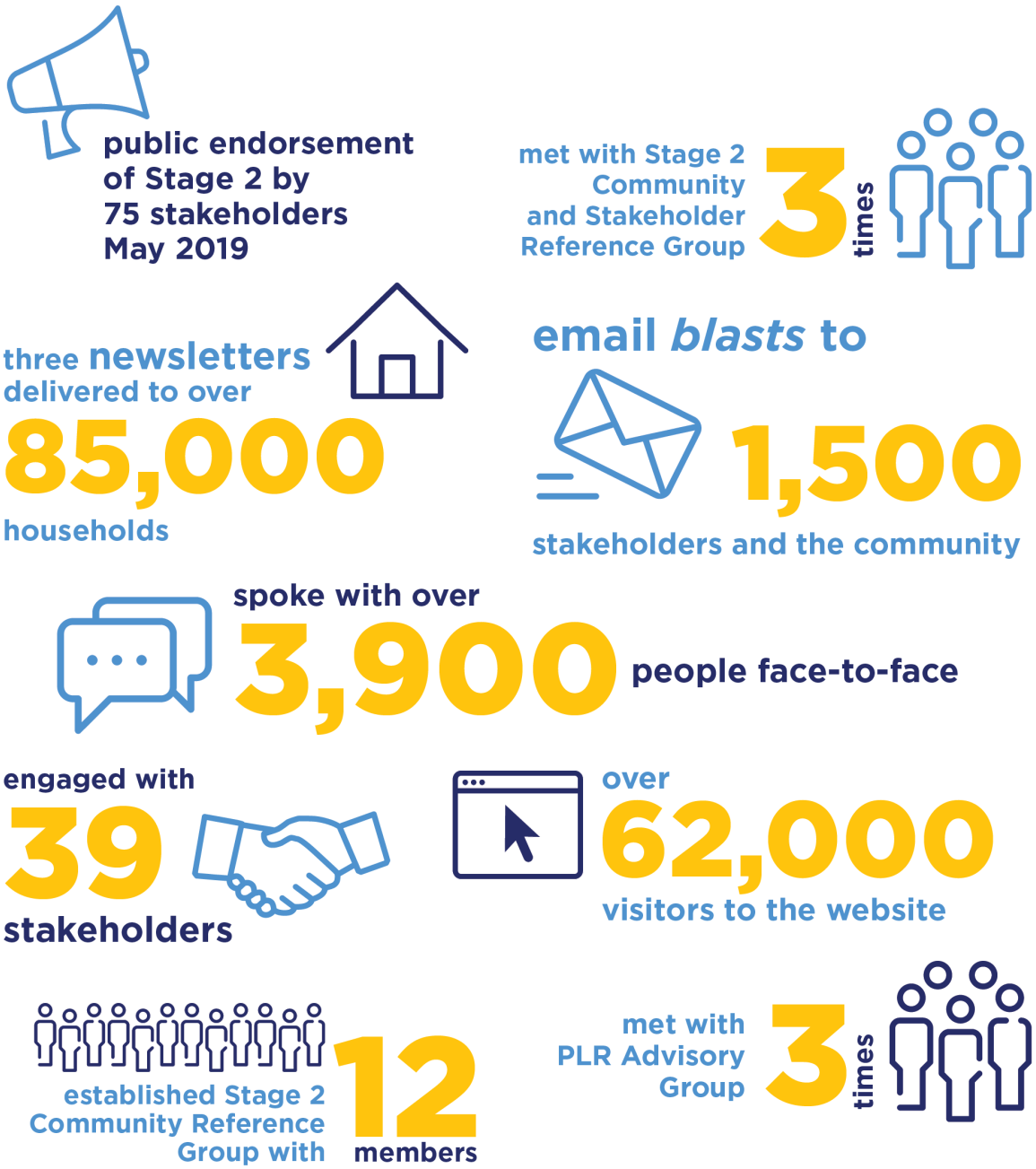

Figure 6.1 Summary of Project engagement activities (October 2017 to May 2019) Stakeholder engagement

6.3.1 Key stakeholder briefings

Meetings with key stakeholders and commercial landowners included project updates, addressing project interfaces and identifying issues, concerns or suggestions for improvement.

In total, 21 key stakeholders were briefed on the Project and any implications for their organisation as well as 18 landowners along the Project route. In addition, engagement with the City of Parramatta Council included a briefing to councillors from senior PLR project staff.

Details of all stakeholder meetings have been recorded and a list of participants is provided in Table 6.1.

Table 6.1 Stakeholder list

Key stakeholders	Commercial and industrial landowners
• City of Parramatta Council • City of Ryde Council • Department of Education and Training • Department of Planning, Industry and Environment • Fire and Rescue NSW • Greater Sydney Commission • Land and Housing Corporation • Parramatta Chamber of Commerce • NSW Police • State Emergency Services • Property NSW • Sydney Olympic Park Business Association • Sydney Olympic Park Authority • Venues NSW • UrbanGrowth NSW Development Corporation • Western Sydney Business Chamber • Western Sydney University • Sydney Water • Sydney Metro Authority • NSW Office of Environment and Heritage • NSW Environment Protection Authority • NSW Roads and Maritime Services	• AMP Capital • Australian Turf Club • Billbergia • Concrete Recyclers • Dexus Group • George Weston Foods • Goodman Properties • GPT Group • ISPT Super • Kingsmede Property Group • KLF Holdings • Rheem Australia • UGL Boral • Viva Energy • Sekisui House • PAYCE Consolidated • Holdmark Property

Transport for NSW continues to meet with City of Parramatta Council and Sydney Olympic Park Authority on a weekly basis to discuss project and design issues. Issues raised by City of Parramatta Council and Sydney Olympic Park Authority have been considered as part of the design development.

6.3.2 PLR Advisory Group

The PLR Advisory Group was formed in August 2017 to provide project updates and encourage discussion, ideas and collaboration from a range of key government and local stakeholders.

The Advisory Group membership covers government stakeholders and other major stakeholders that overlap both Stages 1 and 2 including the City of Parramatta, Department of Planning, Industry and Environment, UrbanGrowth NSW, Transport Coordination Division, Western Sydney Business Chamber and Western Sydney University.

To date, eight meetings have been convened between August 2017 and May 2019. Updates on the progress of the Project were provided at each of the meetings, and opportunities for input and comment were provided.

In October 2018, Transport for NSW renewed membership to include the following list of stakeholders:

- Transport for NSW
- Infrastructure NSW
- Venues NSW
- Land and Housing Corporation

- Tourism and Transport Forum Australia
- Parramatta Leagues Club
- Western Sydney Local Heath District
- UrbanGrowth NSW Development Corporation
- Committee for Sydney
- Western Sydney Business Chamber
- Department of Education
- Western Sydney University
- City of Parramatta Council
- Department of Planning, Industry and Environment
- Parramatta Chamber of Commerce
- Australian Turf Club
- Sydney Olympic Park Business Association
- Sydney Olympic Park Authority
- NRMA

6.3.3 Community and Stakeholder Reference Group

Transport for NSW has established the Stage 2 Community and Stakeholder Reference Group that comprises representation from community members, local businesses and community-based stakeholder groups. The first meeting was held in late 2018 with subsequent meetings being held in February and May 2019.

Broadly the objectives of the Community and Stakeholder Reference Group are:

- to provide a forum for all key stakeholders, both councils, and the community to be represented in the development of the Project
- to provide advice regarding potential initiatives to support the community, affected landowners and businesses along the Stage 2 alignment during the planning and design stages, through to construction and operation of the light rail, including advice on mitigation measures to avoid or minimise impacts where reasonable
- to allow the community to seek information and provide feedback on project matters including:
  - the development of new project information
  - issues of interest or concern to the community
  - response to community complaints
  - community initiatives and programs.

Groups represented include: Waterfront Action Group; Melrose Park Residents Association; local residents; Sydney BMX Club (Sydney Olympic Park based); Rheem Australia; City of Ryde Council; and City of Parramatta Council and Parramatta Chamber of Commerce.

6.3.4 Agency briefings

Transport for NSW has met with a number of agencies to provide a briefing regarding the Project and discuss potential key issues. In addition to those agencies listed in Section 6.3.1 this has included:

- Office of Environment and Heritage
- Roads and Maritime Services NSW
- Environment Protection Authority
- Where issues have been raised during these meetings these will be considered further as part of the EIS.

6.3.5 Aboriginal consultation

Transport for NSW met with Deerubbin Local Aboriginal Land Council in December 2018 to provide an initial introduction to the Project. Further consultation will be undertaken as part of the EIS development.

6.4 Community engagement

6.4.1 Community notifications

To promote the community information sessions held between March 2018 and June 2018, a double-sided postcard was distributed to 15,000 residential properties in Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park as well as an additional mail out to 6,000 homes and businesses in Newington.

The postcard was also sent by email to 828 members of the Parramatta Chamber of Commerce and to 650 members of the Sydney Olympic Park Business Association. Advertisements were also placed in key suburban newspapers, the Parramatta Advertiser, the Northern District Times and the Weekly Times, to promote the community information sessions. The advertisements provided details of the community information sessions, including dates, locations and opening hours and invited community members to provide their feedback through a survey.

6.4.2 Community information sessions

From March 2018 to June 2018, 13 drop-in information sessions were held to engage with the community and provide information on the Project. These sessions were held in areas along the alignment including the Parramatta CBD, Rydalmere, West Ryde/Melrose Park, Ermington and Sydney Olympic Park. Over 1,600 community members attended the information sessions.

Out of the total 13 sessions, four combined with the Sydney Metro West project and two with the Department of Planning, Industry and Environment. The aim was to provide the community with further information on other infrastructure and planning projects.

Issues and comments raised are summarised in Section 6.6.

6.4.3 Community pop-up sessions

Between February 2018 and April 2019, more than 20 community pop-up sessions were held. These involved the team providing information on the Project and being available to answer questions at local community events. The team spoke to over 2,300 community members. Some of the pop-ups included representatives from the Department of Planning, Industry and Environment and the Sydney Metro West project team.

6.4.4 Newsletters

Three quarterly newsletters have been distributed to 85,000 residential and commercial letterboxes along the preferred route for Stage 1 and Stage 2. Newsletters were issued in May 2018, September 2018, December 2018 and February 2019 and each provided an update regarding the Project alignment, as well as information regarding the latest project information and project activities.

6.4.5 Email distribution lists

A database of contacts has been developed for community members and stakeholders who have requested to be kept updated about the Project and receive regular updates

including latest brochures and quarterly newsletters. Emails have been issued to the contact database to promote the information sessions or other community events. In addition to further the reach of this email distribution, other stakeholders have also emailed their contact lists:

- the Parramatta Business Chamber sent out invitations to the community information sessions to their database of 850 email accounts
- the Sydney Olympic Park Business Association sent out invitations to the community information sessions to their database of 650 email accounts.

6.4.6 Website

The Project website (www.parramattalightrail.nsw.gov.au) is a constant source of information, resources and updates for community members and stakeholders. Details of any upcoming community information sessions or other engagement activities are provided on the Project website. Between March 2018 and April 2019, the website had over 62,000 page views.

6.4.7 Survey

A survey was placed on the PLR website home page to capture community use of public transport as well as sentiment on the Project. There were more than 300 responses to the survey which provided valuable insights.

6.4.8 Community contact and information points

There are several points of contact for community and stakeholders. This includes a 24 hour information line, 1800 189 389 and email address (parramattalightrail@transport.nsw.gov.au). Community members and stakeholders are encouraged to contact the project team to discuss any questions or concerns they may have.

6.5 Feedback on the Project to date

As a result of the engagement activities undertaken to date a number of positive and negative issues have been raised and documented.

There has been positive feedback received on the Project, including a recent community action including more than 70 businesses and community organisations who have endorsed the Project and encourage the NSW Government to commit to the funding and delivery of the project by 2025[1].

In early 2019, the Western Sydney Business Chamber and Sydney Olympic Park Business Association surveyed residents in the region which revealed 75 per cent of local residents supported the commitment to a final route and start date for PLR Stage 2.

A summary of the Project issues raised to date is shown in Figure 6.2. General impacts to property were the most raised issue (33 per cent) of respondents, followed by alternative options to Light Rail (16 per cent) and route options (15 per cent). These issues are discussed in more detail in Section 6.5.1.

[1] https://www.miragenews.com/business-and-community-join-forces-to-call-for-parramatta-light-rail-stage-2-as-a-transport-priority/

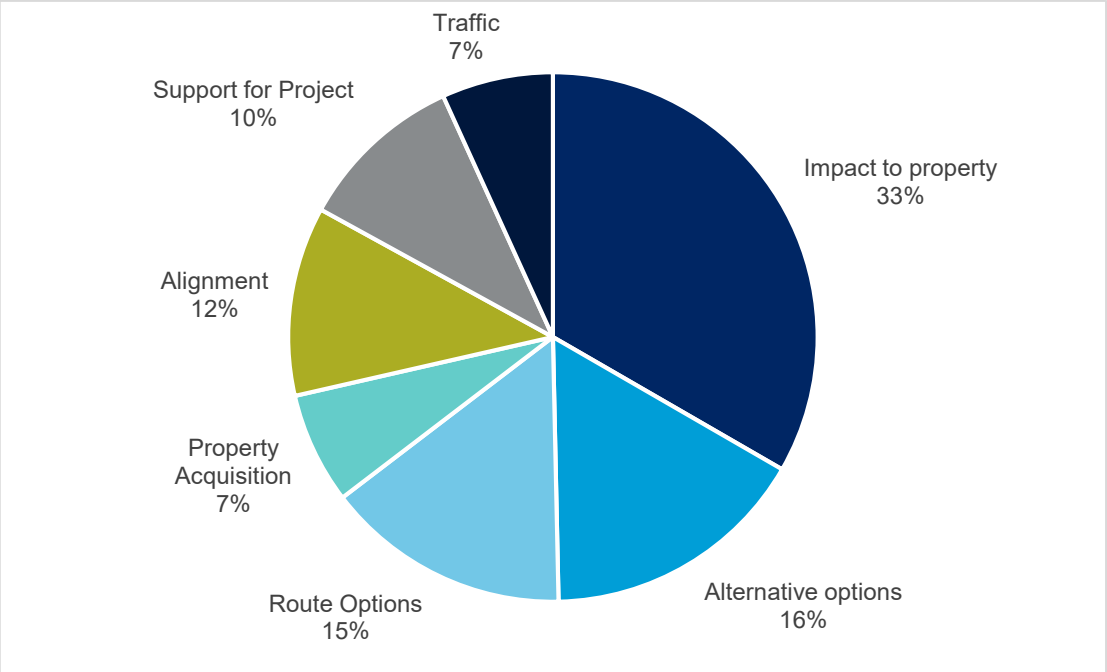

Figure 6.2 Issues summary

6.5.1 Property impacts/ alternative options/route options

Impact to property and acquisition of private property along the alignment combined, accounted for 40 per cent of issues raised by stakeholders and the community for Stage 2. These concerns included the request for a more refined map to enable residents to understand the impacts in greater detail and to be able to make choices about their future in the area.

The issues raised about the alignment reflect more specifically where the track will be placed within the alignment – closely relating to property impacts.

Residents and stakeholders in Melrose Park provided feedback on the proposed alignment along Wharf Road. Issues raised included safety of students at the primary school on Wharf Road as well as the traffic congestion which occurs in peak periods along this road. In July 2018, the NSW Government in response to this feedback proposed a different alignment along Waratah Street.

Residents in Newington provided feedback on the proposed alignment along Hill Road. Based on the feedback received the project team made a change to the alignment so that it no longer bypasses the corner of Hill Road and Holker Street. This change places about 25 per cent of the residents in Newington within an 800 metre walking catchment of the Project. The redesign of the alignment also improves this intersection and provides better connectivity for customers travelling to the future UrbnSurf Wave Park.

The issue of route options reflects the Camellia and Rydalmere alignments, both of which had support and opposition for a variety of reasons.

6.6 Activities planned for future (EIS stage and beyond)

A number of activities are planned to ensure there are different opportunities for the community and stakeholders to provide feedback and input into the project design and technical studies being undertaken for the EIS. Specific engagement activities and associated collateral to be produced during the preparation and exhibition of the EIS phase are listed in Table 6.2.

Table 6.2 Engagement activities during the EIS phase

Task	Activities	Collateral
EIS preparation	• Pop-up community events • PLR Advisory Group meeting • Stage 2 Community and Stakeholder Reference Group meeting • Stakeholder briefings and meeting • Project information line and emails	• Community Newsletter • Fact sheet – Stage 2 EIS • Website content and updates
EIS exhibition	• Community information sessions • Pop-up community events • EIS displays • Static displays • Door knocking • Stakeholder emails • PLR Advisory Group meeting • Stage 2 Community and Stakeholder Reference Group meeting • Stakeholder briefings and meetings • Newspaper advertisements • Email distribution to contact database • Project information line and email	• Community Newsletter • Fact sheets • EIS navigator • Website content and updates • EIS summary document • Exhibition postcard • USB copies of the EIS
Post-EIS	• Submission analysis • PLR Advisory Group meeting • Stage 2 Community and Stakeholder Reference Group meeting • Stakeholder briefings and meetings • Project information line and email	• Summary report • Community Newsletter • Website content and updates

7. Preliminary environmental assessment

This chapter details how a risk-based approach was undertaken to consider the potential environmental impacts for the Project to determine the level of assessment required, in accordance with Department of Planning, Industry and Environment's classifications from the Draft Scoping an Environmental Impact Statement Guideline – June 2017.

7.1 Scoping an Environmental Impact Statement

In 2017, the Department of Planning, Industry and Environment released a series of draft guidelines as part of the Environmental Impact Assessment Improvement Project for State significant projects. The *Draft Scoping an Environmental Impact Statement Guideline – June 2017* (Department of Planning and Environment, 2017b) aims to create a consistent framework for setting the scope of an EIS and to ensure earlier and better engagement with the community and other stakeholders in the preparation of this document.

As part of the scoping stage, proponents nominate the level of assessment for the EIS in accordance with the classifications included in the *Draft Scoping an Environmental Impact Statement Guideline – June 2017*. These are:

- **Material – Key:** refers to the likelihood of there being a material impact on a matter, and that detailed assessment is required to fully understand such impacts and identify project-specific mitigation. A separate specialist study describing the assessment method, data inputs, detailed impact assessment and mitigation will be required.
- **Material – Other:** refers to the likelihood of there being a material impact on a matter, but that measures to manage the impact are well understood and routinely used on similar projects (e.g. using Managing Urban Stormwater – Soils and Construction (Blue Book) to manage erosion and sediment in urban developments). The assessment of impacts will be reported in the EIS without the need for a supporting specialist study in most cases.
- **Non-material:** if the impacts are expected to be non-material, the reasons why should be presented in the Scoping Report and the impact will not need to be considered any further in the EIS unless new information comes to light during the assessment which requires the potential impact to be re-evaluated.
- **No impact or unlikely to impact the matter:** the Scoping Report should explain why no further assessment is needed, and if accepted by the Department then the matter will not need to be discussed further in EIS (e.g. no coastal hazards in western NSW).

Consistent with the Department of Planning, Industry and Environment guideline a risk assessment approach was undertaken to inform the scoping for the Project. The risk assessment considered impacts associated with the construction and operation of the Project to identify the likely Key, Other and Non-material matters (refer Table 7.5). This assessment was based on available information and will be re-evaluated during the preparation of the EIS.

7.2 Risk assessment approach

The environmental risk assessment was carried out in accordance with the principles of the Australian and New Zealand standard (AS / NZS) ISO 31000:2009 *Risk Management – Principles and Guidelines* (Standards Australia, 2009) and the Transport for NSW Enterprise Risk Management Standard (Transport for NSW, 2017). To help inform the risk assessment an appraisal of environmental issues was undertaken to better understand

the existing environment and potential for impacts. The findings of these preliminary investigations are also summarised in Section 0 and Section 7.5.

The definitions of the consequences and likelihood used are provided in Table 7.1 and Table 7.2 respectively. The risk ratings were then determined by combining the consequence and likelihood to identify the level of risk as shown in Table 7.3.

The overall risk ratings of very high, high, medium, low and not applicable were then assigned to a level of assessment for the EIS using the classifications from the Department of Planning, Industry and Environment guideline shown in Table 7.4. Where there are several potential impacts for each aspect, resulting in multiple risk ratings, the highest risk rating has been used to determine the level of assessment for that aspect.

Table 7.1 Consequence definition

Consequence	Definition
Catastrophic	Irreversible large-scale environmental impact with loss of valued ecosystems.
Severe	Long-term environmental impairment in neighbouring or valued ecosystems. Extensive remediation required.
Major	Impacts external ecosystem and considerable remediation is required.
Moderate	Short-term and/or well-contained environmental effects. Minor remedial actions probably required.
Minor	Changes from normal conditions within environmental regulatory limits and environmental effects are within site boundaries.
Insignificant	No appreciable changes to environment and/or highly localised event.

Table 7.2 Likelihood definitions

Likelihood	Definition
Almost certain	Expected to occur frequently during the time of activity or project
Very likely	Expected to occur occasionally during the time of activity or project
Likely	More likely to occur than not occur during the time of activity or project
Unlikely	More likely not to occur than occur during the time of activity or project
Very likely	Not expected to occur during the time of activity or project
Almost unprecedented	Not expected to ever occur during the time of activity or project

Table 7.3 Risk ratings

Likelihood	Consequence					
	Insignificant	Minor	Moderate	Major	Severe	Catastrophic
Almost unprecedented	Low	Low	Low	Low	Medium	Medium
Very unlikely	Low	Low	Low	Medium	Medium	High
Unlikely	Low	Low	Medium	Medium	High	High
Likely	Low	Medium	Medium	High	High	Very high
Very likely	Medium	Medium	High	High	Very high	Very high
Almost certain	Medium	High	High	Very high	Very high	Very high

Table 7.4 Risk ratings and corresponding level of assessment in EIS

Risk rating	Corresponding level of assessment in PLR Stage 2 EIS	
Very high	Key	Detailed specialist assessment
High	Key	Detailed specialist assessment
Medium	Other	Considered in chapter in EIS
Low	Non-material	Considered in chapter in EIS
Not applicable	No impact or unlikely to impact the matter	Not considered in EIS

7.3 Environmental risk assessment results

Using the risk framework discussed above a preliminary environmental risk assessment for the Project was undertaken. The assessment was based on evidence (including the preliminary environmental assessment summarised in Section 7.4 and Section 7.5), previous experience and professional judgement of potential risks, and their consequence, likelihood and significance (with the implementation of standard business as usual mitigation measures, where relevant).

Table 7.5 provides a summary of the highest risk rating for each issue and a description of how the risk ratings were derived. It also includes the corresponding level of assessment for the EIS for that issue based on the preliminary environmental risk assessment.

Further specialist assessment is proposed as part of the EIS for those issues that were identified as Key issues in Table 7.5. The proposed scopes of these specialist assessments are detailed in the sections below.

A number of environmental issues were identified as Other or Non-material issues. These issues are considered to be of lesser consequence based on the Project scope, the existing environment and the implementation of standard management measures. However, these issues will still be assessed in the EIS.

Table 7.5 Summary of highest risk rating and corresponding level of assessment for each issue

Aspect	Consequence	Likelihood	Risk rating	Description	Level of assessment
Transport and traffic	Moderate	Almost certain	High	Construction of the Project would require the use of a significant number of heavy vehicles to transport material to and from the sites. Additionally, construction and operation of the Project may result in: • the temporary closure of some sections of road • alterations to active transport facilities • temporary and permanent loss of parking • alterations to existing public transport infrastructure or timetables The Project would provide an alternative transport mode for the community along the alignment, and opportunities for interchanges with other transport modes (bus and rail). As the Project would interface with the existing transport network, it would also have the potential to impact on the performance of the road network (depending on the final design) and may result in local changes to traffic movements and property access.	Key
Land use and property	Moderate	Almost certain	High	The Project would potentially require the acquisition and demolition of properties for the proposed alignment and construction areas. The Project would support future planned development and land use changes associated with the proposed alignment. The Project would be likely to promote urban renewal/place making that is consistent with strategic planning direction for the GPOP priority growth area.	Key
Social impact	Moderate	Very likely	High	The Project may result in the temporary loss of community facilities such as public open space, during construction. Opportunities to minimise these impacts would be explored during the development of the final alignment. The Project would facilitate transit-oriented development (and associated increases in urban density) through the generation of new light rail catchment areas. There are a number of health benefits that can be attributed to increased urban density, primarily associated with increased active transport opportunities around LRV stops.	Key

Aspect	Consequence	Likelihood	Risk rating	Description	Level of assessment
Biodiversity	Moderate	Very likely	High	The majority of the Project is within disturbed environments, such as road corridors, urban and industrial environments. However, threatened ecological communities including Estuarine Saltmarsh and Swamp Oak Forest, mangroves along Parramatta Creek, and threatened fauna habitat has the potential to be directly or indirectly impacted by the project. Opportunities to avoid, mitigate and manage impacts would be identified through design.	Key
Aboriginal heritage	Major	Likely	High	Areas along the Project route are considered to have a medium to high potential for Aboriginal items to be present based on the level of previous disturbance and the location in the landscape. If present, these items would be considered potentially significant.	Key
Non-Aboriginal heritage	Major	Likely	High	The Project would be located in areas adjacent or in proximity to State and locally significant heritage items and may involve the demolition of locally significant items. Various sections of the route have the potential to contain archaeological items of State significance. Indirect impacts to heritage landscape would be managed through urban design treatments / screening landscape.	Key
Hazards and risk	Severe	Unlikely	High	A number of major utilities are present along the Project route and would require relocation and/or protection as part of the Project. This would be considered further as part of design and construction planning.	Key
Urban design	Moderate	Very likely	High	The Project would introduce new built elements including bridges. Temporary visual changes would also occur from the introduction of construction sites across the alignment. Project benefits would include urban renewal /place making, urban integration and active transport. The Project would consider improved crime prevention through environmental design (CPTED)	Key
Noise and vibration	Moderate	Very likely	High	Construction of the project would involve the use of multiple construction sites across the length of the alignment. Construction works are likely to exceed the relevant noise management levels.	Key

Aspect	Consequence	Likelihood	Risk rating	Description	Level of assessment
				Additionally, the Project is likely to require a significant amount of work outside of standard daytime construction hours. Airborne noise and vibration levels from light rail operations are to be assessed further. Unacceptable impacts to the community (including health) from operation of the Project, including LRVs operating on new routes and around tight bends (causing potential noise emissions) are to be mitigated where reasonable and feasible	
Hydrology and flooding	Moderate	Very likely	High	The Project could increase afflux (property inundation, increased flood duration/velocities and downstream impacts) if not mitigated, particularly where bridge crossings are proposed. Construction has the potential to alter existing stormwater flows and the existing drainage infrastructure. Best practice stormwater management measures would be developed and incorporated into the design.	Key
Business and economic impacts	Moderate	Almost certain	High	Property acquisition and lease cessation would result in some businesses having to relocate.	Key
Air quality	Moderate	Likely	Medium	Odour risk is elevated where construction sites or operational facilities are adjacent to known contaminated sites. Dust will be generated during construction (from exposed soil/stockpiles, excavation and vehicle movements) This will be minimised through the implementation of Transport for NSW's Air Quality Management Guidelines (Transport for NSW, 2018a).	Other
Greenhouse gas, energy and climate change	Minor	Very likely	Medium	The generation of greenhouse gas emissions during construction and operation would be manageable through the implementation of standard environmental management measures. The Project is also likely to result in a long-term reduction in greenhouse gas emissions associated with a potential mode shift by customers from road to light rail.	Other
Waste and resource use	Minor	Unlikely	Low	The generation of waste and the anticipated resource consumption during construction and operation would be similar to other infrastructure projects of this nature and scale. These impacts would be manageable through the implementation of	Non-material

Aspect	Consequence	Likelihood	Risk rating	Description	Level of assessment
				standard environmental management measures (such as application of the waste management hierarchy).	
Soils, geology and contamination	Moderate	Likely	Medium	The Project is likely to encounter and disturb known contaminated sites, particularly if the alternative Project route in Camellia is chosen. This will require remediation where contaminated land is to be acquired and management where contaminated spoil or groundwater is exposed and requires disposal. Potential impacts such as erosion and sedimentation, and spill or leaks are anticipated to be manageable through the implementation of standard environmental management measures.	Other
Cumulative	Minor	Likely	Medium	The Project is likely to interact with other major infrastructure developments including Sydney Metro West and PLR Stage 1 as well as the urban renewal developments being undertaken along the Project route. Potential cumulative impacts are anticipated to be manageable through the implementation of environmental management measures proposed for the Project.	Other

7.4 Key issues

This section provides a preliminary environmental assessment of the Key issues identified for the Project. Further specialist assessment is proposed as part of the EIS for those issues that were identified as Key issues. The proposed scope of these specialist assessments is also detailed in this section. A preliminary environmental assessment of the Other issues identified for the Project is provided in Section 7.5.

For the purposes of the preliminary environmental assessment provided in this section and Section 7.5 a study area has been adopted to consider all environmental constraints within close proximity to the Project route. The study area is defined as a 100 metre wide area extending along the Project route. The study area is shown on Figure 7.1 to Figure 7.3, which also shows key features identified as part of the preliminary environmental assessment.

As shown on Figure 7.1 to Figure 7.3, the Project route, when including the Camellia route option, traverses seven distinct precincts; Camellia, Rydalmere, Ermington Melrose Park, Wentworth Point, Sydney Olympic Park and Carter Street. Where relevant to the issue a precinct-based approach has also been adopted for the preliminary environmental assessment.

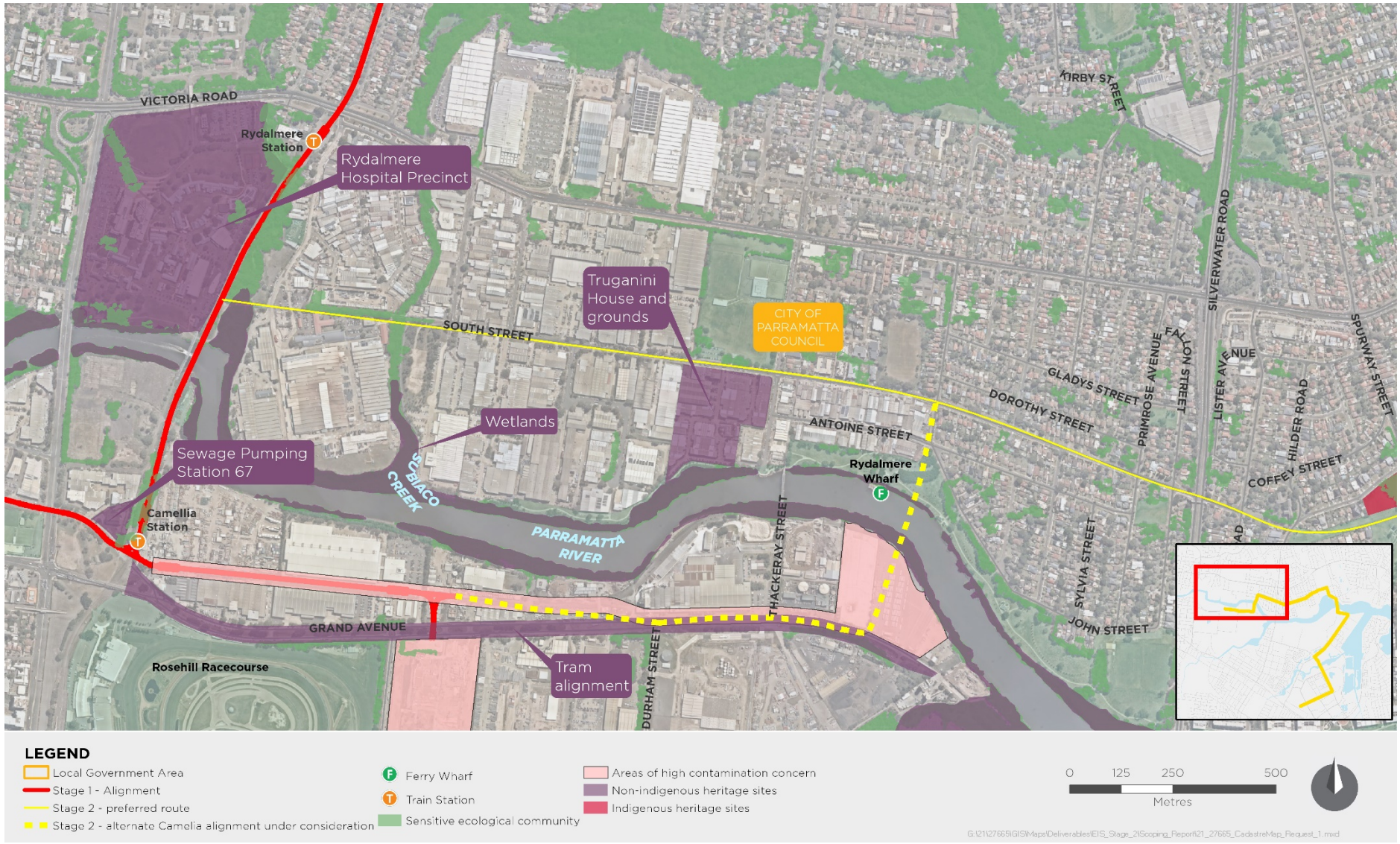

Figure 7.1 Project route key features – map 1 of 3

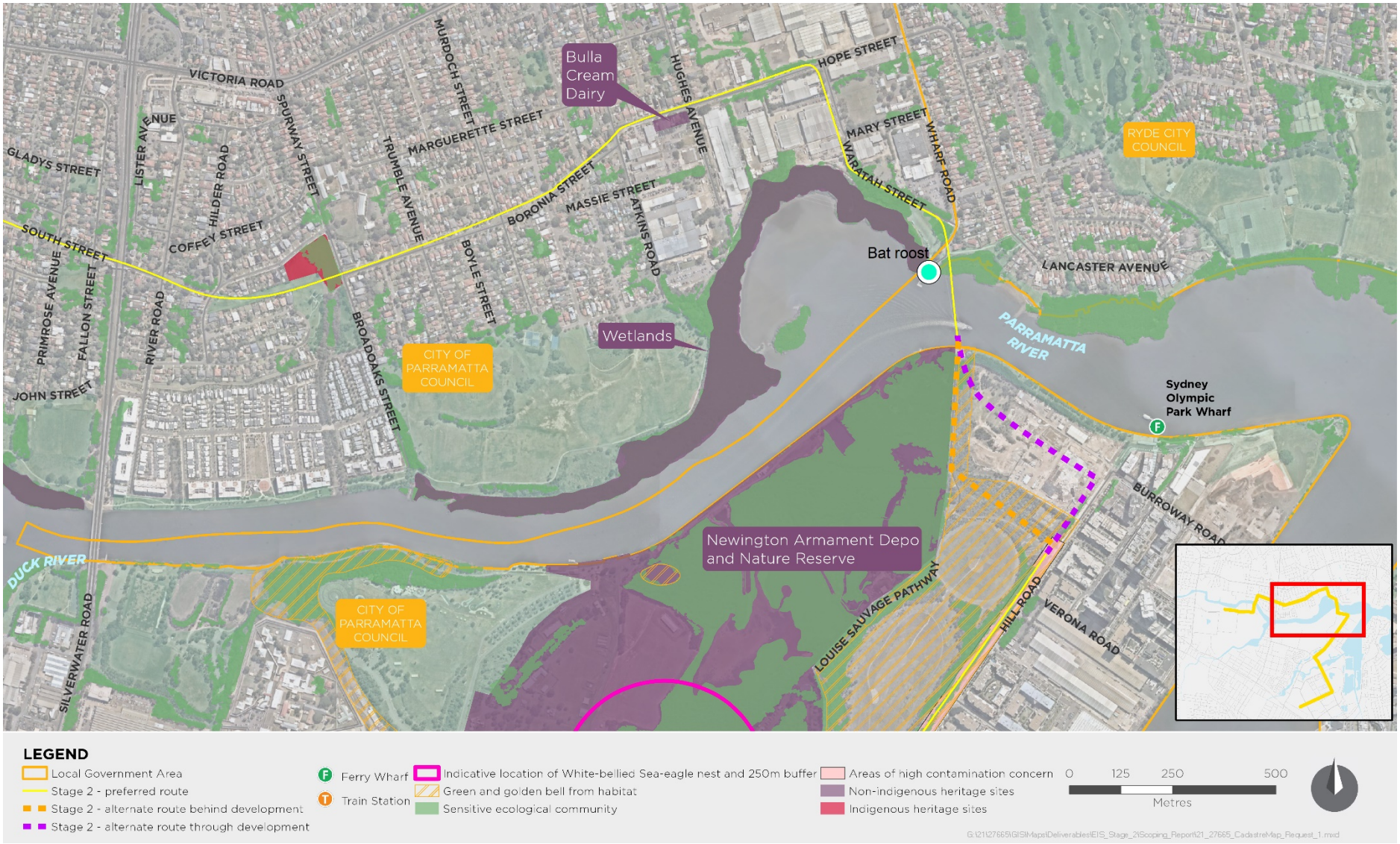

Figure 7.2 Project route key features – map 2 of 3

Figure 7.3 Project route key features – map 3 of 3

7.4.1 Traffic, transport and access

Existing environment

The Project route and surrounds incorporate a range of transport and access features which are summarised in Table 7.6.

Table 7.6 Existing transport and access features

	Precinct						
Aspect	**Camellia**	**Rydalmere**	**Ermington**	**Melrose Park**	**Wentworth Point**	**Sydney Olympic Park**	**Carter Street**
Roads	The primary road through Camellia is Grand Avenue (a wide two-way road separated by a generous median), connecting to James Ruse Drive in the west. Grand Avenue experiences significant traffic congestion during peak travel times and events at Rosehill Gardens Racecourse. A second access point is from the south via Colquhoun Street, Unwin Street, Kay Street and Wentworth Street to Parramatta Road.	Silverwater Road bisects the precinct to the east, running north-south. Victoria Road runs east-west to the north. The Project route extends along South Street, a local road that joins Silverwater Road (left in, left out access).	Silverwater Road bisects the precinct to the west, running north-south. Victoria Road runs east-west to the north. The Project route extends along South Street and Boronia Street.	Hope Street and the northern part of Wharf Road form an important heavy vehicle access route for existing businesses in the Melrose Park area, connecting to Victoria Road in the north. The Project route extends along Hope Street and Waratah Street. Waratah Street is a local road that provides access to Melrose Park Public School and Ermington Boat Ramp.	The Project route extends along Hill Road – the primary access point to Wentworth Point, which connects to the Bennelong Parkway that provides access to Sydney Olympic Park and further on to Homebush Bay Drive, Rhodes. Holker Street provides access to Silverwater Road to the east. The M4 Western Motorway can now be accessed directly from Hill Road following the addition of an east-facing on ramp as part of the WestConnex project.	The Project route extends from Hill Road, to Australia Avenue via the Holker Busway and then along Dawn Fraser Avenue. The main access road to the Sydney Olympic Park shopping and station precinct is Dawn Fraser Avenue.	The Carter Street precinct is boarded by the M4 Western Motorway to the south, Hill Road to the east and Edwin Flack Avenue to the north. The Project route extends along Uhrig Road.
Parking	Parking is predominately on street along the road network, with off street facilities provided at Rosehill Gardens Racecourse. The area currently	Unrestricted kerbside parking is available within the local road network.	Unrestricted kerbside parking is available within the local road network.	Unrestricted kerbside parking is available within the local road network. There is also a public (unrestricted) car	On-street kerbside parking is present on both sides of Hill Road and is restricted during special event periods.	Off-street ticketed parking is present along parts of Australia Avenue (P6 Secure Parking). Kerbside restricted parking is present along Dawn Fraser	Kerb side restricted parking is located along Uhrig Road.

	Precinct						
Aspect	**Camellia**	**Rydalmere**	**Ermington**	**Melrose Park**	**Wentworth Point**	**Sydney Olympic Park**	**Carter Street**
	does not have restricted parking arrangements.			park located at Ermington Boat Ramp.	The Woo-Lar-Ra car park is also located on the western side of Hill Road with four-hour restricted parking	Avenue. A secure public car park (P5 Parking) is also located at the junction of Hill Road and Holker Busway, which is used predominately during special events.	
Rail/light rail	Camellia Station, on the (current) T6 Carlingford Line, is located on Grand Avenue North. Stage 1 of the PLR network has approval to convert this station into a light rail stop along with conversion of the disused T6 Carlingford Line (extending east-west through Camellia) to light rail, becoming operational in 2023.	No train station within the precinct. The closest train station is Rydalmere on the T6 Carlingford line; however, this line will be converted to light rail as part of Stage 1.	No train station within the precinct. The closest train station is located to the west at Rydalmere (will be converted to light rail as part of Stage 1) and to the east at Meadowbank on the T1 line.	No train station within the precinct. The closest train station is Meadowbank on the T1 line to the east.	No train station within the precinct. The closest station is Rhodes on the T1 North Shore, Northern & Western Line, across the Bennelong Bridge to the east (approximately two kilometres).	**T7 Olympic Park Line:** provides access between Olympic Park Station (adjacent to Dawn Fraser venue) connecting to the T1 North Shore, Northern & Western Line. **Sydney Metro West:** a station is proposed at Sydney Olympic Park, connecting to the Parramatta CBD and Sydney CBD.	No train station within the precinct. The closest train station is at Sydney Olympic Park (T7 Olympic Park Line), within walking distance. Lidcombe and Flemington stations are located to the South.
Bus	Bus routes extend along Hassall Street (M92) and James Ruse Drive (N61) providing services between Parramatta and Bankstown/	One bus route (524) travels along South Street that connects to Parramatta and Ryde.	One bus route (524) travels along Spurway Street and Boronia Street, which connects Parramatta and Ryde.	One bus route (524) travels along Hope Street, Wharf Road and Cobham Avenue, that connects	Serviced by two bus services, Burwood to Rhodes Shopping Centre (526) and Sydney Olympic Park to Chatswood via Rhodes and North	The precinct is served by four bus routes (526, 525, 533 and 401) providing services to Lidcombe, Parramatta, Burwood, Rhodes and Chatswood.	Bus route 401 is located along Uhrig Road and Carter Street, connecting to Sydney Olympic Park and Lidcombe.

Aspect	Precinct						
	Camellia	Rydalmere	Ermington	Melrose Park	Wentworth Point	Sydney Olympic Park	Carter Street
	Sutherland Station.	Metro buses also run along Victoria Road.	Metro buses also run along Victoria Road.	Parramatta and Ryde. Metro buses also run along Victoria Road.	Ryde (533), both using the Bennelong Bridge transit corridor.	Special event buses also run during major events.	
Ferry / private boating	No ferry services within the precinct.	Rydalmere Wharf provides ferry services between Parramatta and the Circular Quay (F3).	No ferry services within the precinct.	Ermington Boat Ramp is located at the southern end of Wharf Road and is available for public use to the Parramatta River.	The Sydney Olympic Park Wharf is located at the end of Hill Road and provides services between Parramatta and the Circular Quay (F3).	No ferry services within the precinct.	No ferry services within the precinct.
Active Transport	Grand Avenue is nominated as an on-road cycleway but provides limited connectivity within and along the Project route. Walkability within Camellia is limited to footpaths along the northern side of Grand avenue and some smaller roads. An active transport bridge over the Parramatta River connects Thackeray Street to the Parramatta Valley cycleway in Rydalmere.	South Street is nominated as an on-road cycleway. The Parramatta Valley Cycleway, a formal separated cycleway, which extends along the northern side of the Parramatta River foreshore.	The nearest cycleway to the Project route is the Parramatta Valley Cycleway in the south of the precinct.	Hope Street is nominated as an on-road cycleway. The Parramatta Valley Cycleway extends along the Parramatta River Foreshore and Waratah Street.	Extensive cycle paths exist parallel to Hill Road and provide a connection to the Sydney Olympic Park precinct and Rhodes (via Bennelong Bridge).	Extensive cycle paths exist within Sydney Olympic Park throughout the Millennium parklands and the Bennelong Parkway Cycleway. Cycle paths extend along Australia Avenue and Dawn Fraser avenue.	Hill Road in the north-western section of the Carter Street precinct is nominated as a shared path (off road).

Potential construction impacts

The Project will result in temporary impacts to the transport and traffic environment during construction. However, given the linear nature of the Project, construction will progress along the Project route and therefore not occur during the whole construction period in any one location which will minimise direct impacts.

Construction impacts may include:

- temporary road closures required for construction
- traffic related impacts associated with increased construction traffic on local roads
- traffic impacts related to heavy vehicles, particularly where these require access to industrial sites along the Project route
- construction of the bridges across the Parramatta River may disrupt users of the Parramatta River, including ferries
- loss of parking along the roads which the Project route extends
- access and egress restrictions to properties along the alignment due to partial or full road closures and presence of construction equipment
- impacts to other transport services such as relocated bus stops and bus routes or changed access to ferry wharfs
- greater congestion within the road network surrounding the Project due to road closures/detours
- local roads that previously only serviced residential properties may experience higher levels of traffic impacting on amenity
- potential cumulative impacts from the construction of other developments in the study area.

Potential operation impacts

Although the Project will bring major benefits to the GPOP priority growth area by improving transport connectivity and the way people interact within the local street environment, there will be associated impacts resulting from the operation of the Project. The operation of the light rail will result in the following changes to the transport network, traffic, parking and safety across the Project route:

- vehicle crossing of the light rail will only be possible at signalised crossings, changing access to industrial and private properties along the route.
- road intersections along the alignment may be subject to signalisation or restricted turning movements. This will change the way traffic moves within the local area and may result in vehicle queues and delays as LRVs cross the road.
- implications to general road safety, particularly around school and community uses.
- potential loss of parking along the Project route or in car parks adjacent to the route.
- alterations to the existing bus network, including potential stop relocations and route diversions.
- interaction and potential conflicting movements between vehicles, pedestrians, cyclists and buses.

Transport and traffic scope for EIS

A detailed Transport and Traffic Impact Assessment will be undertaken in accordance with the following guidelines and standards:

- *Guide to Traffic Management – Part 3 Traffic Studies and Analysis* (Austroads, 2017)
- *Guide to Traffic Generating Developments* (Roads and Maritime Services, 2002)
- *Cycling Aspects of Austroads Guides* (Austroads, 2014)
- *Planning Guidelines for Walking and Cycling* (DIPNR, 2004)
- *Walking and Cycling Program Guidelines 2019-2020* (RMS, 2018)
- *NSW Sustainable Design Guidelines Version 4.0* (TfNSW, 2017)
- *NSW Bicycle Guidelines v 1.2* (RTA, 2005).

The Transport and Traffic Impact Assessment will:

- identify construction haulage routes (road and/or river)
- include information on the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements);
- assess impacts to road network, road closures and detours during construction
- consider access impacts to public transport and active transport facilities
- consider access impacts to property or community facilities
- assess impacts associated with works in the river (e.g. restricted areas)
- assess parking impacts along with proposed strategy for contractor workforce parking
- include traffic modelling of key interchanges and intersections during operation
- consider operational changes to the road network
- review wider transport network interactions including integration with other transport modes
- consider safety considerations during operation.

7.4.2 Social impacts and community infrastructure

Existing environment

Community infrastructure includes the services that help individuals, families, groups and communities meet their social needs, maximise their potential for development and enhance community wellbeing. Community infrastructure includes schools, childcare centres, places of worship, medical / healthcare infrastructure and recreational areas (such as public open space) and correctional facilities. Those located in the immediate surrounds of the Project are listed in Table 7.7.

Table 7.7 Existing community infrastructure

Suburb	Community infrastructure
Camellia	Camellia is limited in terms of existing social infrastructure due to its industrial nature. Rosehill is more established and includes a retail area in the north, Rosehill Gardens Racecourse and associated transport facilities. Both suburbs have minimal public green space.

Suburb	Community infrastructure
Rydalmere	Community infrastructure with the Rydalmere precinct includes: • Western Sydney University • Rydalmere Public School • Rydalmere Public School Preschool • Rydalmere East Public School • Nova Life Church • Rydalmere Masjid • Immanuel Australia Church Open space within close proximity to the Project includes: • Eric Primrose Reserve and Park (east of Rydalmere Wharf) • Reid Park (to the west of Rydalmere Wharf).
Ermington	The suburb of Ermington includes three public primary schools, nine childcare centres and after school hours care centres, aged care facilities, a retail area, and a community centre. Open space along the Project route includes Ken Newman Park. Additional open space within the precinct includes George Kendall Riverside Park, Bruce Miller Reserve, Halvorsen Park Playground and Arista Way Playground.
Melrose Park	Social infrastructure within Melrose Park precinct includes: • Melrose Park Public School (including Out of School Hours Care) – within the industrial precinct • Melrose Family Day Care – in the south east Public and open space within close proximity to the Project includes: • Melrose Park Playground – East of the Ermington Boat Ramp • an active transport path along the Parramatta River. A number of additional parks/reserves are located within the precinct including Bartlett Park, Jennifer Park and Hughes Avenue Reserve.
Wentworth Point	A new pier side retail centre has recently opened (in the north of the precinct), which includes a mix of shops, restaurants, a gym, medical centre, postal service and supermarkets. Wentworth Point Public School, Out of School Hours services and childcare centre opened in 2018. Beyond this, there is minimal social infrastructure within the area. However, many residential apartment developments have access to their own recreation facilities, such as swimming pools, tennis courts and green space. The eastern portion of the precinct is characterised by the Newington Nature Reserve (to the West of Hill Road) and Millennium Parklands, providing extensive recreational public space.
Sydney Olympic Park	The precinct is dominated by a significant number of sporting and cultural facilities such as the Sydney Showgrounds, Sydney Aquatic Centre and various stadiums. It plays host to major sporting events, conferences, festivals and community events and contains several hotels, and numerous permanent cafes, restaurants and bars. During events, Sydney Olympic Park also regularly supports numerous temporary food and retail stalls. The precinct also contains extensive green space such as Bicentennial Park, Brickpit Park, and Wentworth Common and has over 35 kilometres of cycle pathways.
Carter Street	The precinct has limited social infrastructure and there are a small number of accommodation providers (serviced apartments and hotels). There is currently no green space within the precinct, however it is adjacent to green space along Haslams Creek and the Parklands of Sydney Olympic Park. The *Carter Street draft revised Master Plan* (Department of Planning and Environment, 2018a) proposes a new high–quality village centre (including proposed light rail), better located primary school, more open space (including sporting fields), more integrated pathways and cycleways and a widened Hill Road.

Potential construction impacts

Construction of the Project will likely result in temporary impacts to adjacent and nearby properties. This will include impacts as a result of the Project on quality of life, operation of local businesses, access to and operation of community facilities, community accessibility and connectivity, and community cohesion.

The following impacts have been identified based on construction impacts on other similar light rail projects including PLR Stage 1. The impacts include, but are not limited to:

- residential and business properties located adjacent to the Project may be impacted by construction fatigue, whereby the length of time and effect of the construction negatively impacts neighbouring properties located along the Project route
- potential impacts to Sydney Olympic Park users due to the effect of construction on road infrastructure, including workers, sporting/special event patrons, residents, pedestrians and cyclists
- the impact on social connectivity in local neighbourhoods from changes to current access and road networks
- decrease in amenity due to construction activities including noise, dust, vibration, visual changes, and construction traffic
- potential for contribution to communal or individual stresses due to the impact of possible residential and business property acquisition

There is unlikely to be any impacts to community facilities during construction of the Project.

Potential operation impacts

Operation of the Project will have benefits and impacts to adjacent and nearby properties. This will include impacts as a result of the Project on quality of life, operation of local businesses, access to and operation of community facilities, community accessibility and connectivity, and community cohesion.

The following benefits have been identified based on operational impacts on other similar transport projects including Stage 1. The benefits include, but are not limited to:

- reduced traffic congestion (associated with decreased car dependency), decreased travel times and enhanced access and connectivity leading to increased public amenity and ability to connect with the wider community
- enhanced and walkable streetscapes, improving pubic amenity and safety, which will likely lead to an increase in activity along the alignment
- provision of an active transport corridor – increasing the level cycling and walking within the Project area, leading to health and wellbeing benefits
- improved public amenity and attractive communities, promoting increased social cohesion
- economic uplift to surrounding businesses as a result of increased foot traffic during operation
- urban renewal and transformation along the transport corridor which is also expected to drive new opportunities for employment and investment.

Adverse impacts resulting from operation of the Project may include:

- changes to local character and amenity due to future light rail and neighbourhood changes relating to perceived community severance which are common to linear infrastructure

- permanent changes to local open space, including Ken Newman Park, resulting in reduced community access to local open and green space
- pedestrian safety concerns once the light rail is operational including the interface between pedestrians and vehicles, and the increased presence of pedestrians in previously quiet residential streets.

Social scope for EIS

A detailed Social Impact Assessment will be undertaken to identify and evaluate key social issues that could potentially arise during the construction and operation of the Project. The SIA will be undertaken in accordance the Department of Planning and Environment's *Social Impact Assessment Guideline* (2017c) and will:

- analyse the outcomes of community consultation in relation to community values (including the values attached to places or facilities), issues and concerns
- review results of other relevant specialist assessments
- assess the potential impacts and benefits of the Project during construction and operation, as informed by further consultation with key local stakeholders including affected communities, business representatives, and City of Parramatta Council
- identify mitigation and management measures for construction and operation of the Project
- consider cumulative social impacts from construction and operation of the Project and other projects within the same time period and/or area.

7.4.3 Biodiversity

Existing environment

The Project is located within a highly modified urban environment with some fragmented pockets of natural areas remaining. Much of the open green space that is present is dedicated to recreational use (e.g. golf courses, public parks) or associated with remnant pockets of vegetation within close proximity to Newington Nature Reserve, Sydney Olympic Park, Millennium Parklands and riparian vegetation surrounding the Parramatta River and various creeks. Planted trees and other landscaped area also line many of the streets along the proposed route/s.

The Newington Nature Reserve is gazetted as a Nature Reserve under the *National Parks and Wildlife Act 1974* and is defined as part of the Parklands of Sydney Olympic Park by the *Sydney Olympic Park Authority Act 2001*. The reserve contains endangered ecological communities protected under State and Commonwealth legislation, as well as habitat for threatened species such as the Green and Golden Bell Frog, and migratory birds which are protected under international agreements.

Due to the high ecological values and sensitivity, the Project route has been designed to avoid the Newington Nature Reserve however there is a risk of indirect impacts which will need to be considered.

The Project is proposed to travel through Millennium Parklands, governed by the *Parklands Plan of Management* (SOPA, 2010) under the *Sydney Olympic Park Authority Act 2011*. The vegetation communities of the Parklands include remnant and constructed freshwater and saltwater wetlands, grasslands, recently planted woodlands, turfed parklands and playing fields. The proposed route will travel through conservation areas and wetland/waterways within the Millennium Parklands. These places provide threatened species habitat, are adjacent to sensitive ecological communities and provide flora and fauna refuge. Where possible, the Project has been positioned adjacent to the existing

road infrastructure to minimise impacts to the Parklands. However, potential impacts to biodiversity are considered likely and will likely trigger an EPBC referral and potential offsetting requirements.

While almost all of the original vegetation and other natural features along the Project route have been removed or modified, some significant natural features still remain. Native vegetation communities in the study area are associated with riparian and intertidal environments along Parramatta River and are characterised by mangroves, saltmarsh and *Casuarina glauca* (Swamp Oak). Estuarine Swamp Oak Forest and Estuarine Saltmarsh are consistent with threatened ecological communities listed under the BC Act and the EPBC Act. Additionally, mangroves are listed as type 2 marine vegetation that is moderately sensitive fish habitat, and coastal saltmarsh is listed as either type 1 or type 2 marine vegetation that is highly or moderately sensitive fish habitat (depending on patch size).

The following two threatened flora species are considered to have a moderate likelihood of occurring in the study area:

- *Wilsonia backhousei* (Narrow-leafed Wilsonia) which is listed as vulnerable under the BC Act. The species is associated with saltmarsh habitat and could be present in the landing sites for the proposed bridge crossings.
- *Zannichellia palustris* which is listed as endangered under the BC Act, is associated with fresh to brackish, still to slow moving waters.

Terrestrial fauna habitats within the study area include estuarine forest and saltmarsh and disturbed land with limited native vegetation. The study area is also located within the known distribution of Parramatta's key populations of *Litoria aurea* (Green and Golden Bell Frog). The majority of suitable wetland habitat for breeding, foraging and sheltering is located within sites in Sydney Olympic Park including Wentworth Common, Haslams Creek Flats and Newington Nature Reserve (Department of Environment and Climate Change (DECC), 2008). The extent of impacts on these species has not yet been quantified, however the EIS will consider potential areas of habitat sensitivity and how the Project has sought to minimise impacts.

Aquatic habitats identified within the study area include Parramatta River and Haslams Creek. Parramatta River is mapped as Key Fish Habitat (Department of Planning and Infrastructure, 2007). One species, Black Rockcod (*Epinephelus daemelii)* which is listed as vulnerable under the BC Act, FM Act and EPBC Act, was found to have a moderate likelihood of occurring within the study area.

The Project also traverses areas that are mapped as 'Coastal Wetlands' and 'land in close proximity to coastal wetlands' under the State *Environmental Planning Policy (Coastal Management) 2018*, meaning that certain assessment criteria will need to be considered at the EIS stage to ensure the Project is consistent with the objectives for the relevant coastal area.

Potential construction impacts

Construction of Project may impact on biota of conservation significance along the Project route from Wentworth Point Bridge to Carter Street and at crossings of Parramatta River at Camellia and Wentworth Point.

Direct impacts may include:

- removal or disturbance of threatened ecological communities including Estuarine Saltmarsh and Swamp Oak Forest
- removal or disturbance of mangrove vegetation which is protected under the FM Act

- shading impacts from the addition of physical structures which can impact on saltmarsh and mangrove vegetation
- removal of potential or known habitat for threatened flora species, including *Wilsonia backhousei* and *Zannichellia palustris*
- removal of potential or known habitat for threatened fauna species, including Green and Golden Bell Frog
- removal of potential or known marginal foraging habitat for migratory species
- disturbance of potential aquatic habitat for Black Rockcod.

Indirect impacts may include:

- sedimentation and erosion impacts on downstream aquatic environments
- pollution of aquatic habitats resulting in reduced habitat conditions for vegetation and downstream aquatic habitats
- introduction or spread of weeds leading to a decrease in diversity of flora and decline in the quality of fauna habitat
- edge effects as a result of vegetation removal
- introduction of pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) throughout the study area through vegetation disturbance and increased visitation
- noise and vibration impacts on fauna
- light spill impacts on fauna.

Potential operation impacts

The main potential for impacts during operation of the Project includes:

- shading impacts from the addition of physical structures such as bridges which can impact on saltmarsh and mangrove vegetation
- impacts to fauna including:
  - collisions with light rail vehicles
  - light spill impacts from the operation of light rail infrastructure
  - noise and vibration generated by the movement of light rail.

Biodiversity scope for EIS

A detailed Biodiversity Impact Assessment will be undertaken and will include a Biodiversity Development Assessment Report (BDAR) in accordance with the Biodiversity Assessment Method (BAM). The BDAR will be undertaken in accordance with the following guidelines and standards:

- *NSW Biodiversity Offsets Policy for Major Proposals* (Office of Environment and Heritage (OEH), 2014)
- *Framework for Biodiversity Assessment* (OEH, 2014)
- *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (Department of Primary Industries, 2013)
- *Threatened Species Survey and Assessment Guidelines* (DECC, 2007)

- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, 2003)
- *NSW Sustainable Design Guidelines Version 4.0* (TfNSW, 2017)
- *Aquatic Ecology in Environmental Impact Assessment – EIA Guideline* (Marcus Lincoln Smith 2003).

The BDAR will:

- include a detailed survey and assessment of native vegetation and habitat, including sampling of BAM plots
- include targeted surveys for threatened flora and fauna species including seasonal surveys for threatened plants and aquatic surveys
- confirm the conservation significance of the study area, including the presence of any threatened biota and matters of national environmental significance and their habitats
- determine and assess potential Serious and Irreversible Impacts (SAII) entities
- provide measures to avoid and mitigate impacts
- assess direct and indirect construction, operational and cumulative impacts
- assess prescribed impacts, such as impacts on movement corridors of the Green and Golden Bell Frog, and impacts on fauna from vehicle strike
- undertake credit calculations to determine the biodiversity offset required for residual impacts that cannot be avoided
- include consultation with the Australian Government Department of Environment and Energy and the NSW Department of Primary Industries as required
- identify offset options and a strategy for the delivery of required offsets.

Impacts on ecological matters of national environmental significance (MNES) will also be assessed pursuant to the requirements of the EPBC Act. If a significant impact on MNES is likely, a Referral to the Commonwealth Minister for the Environment will be required. If the Project is deemed a controlled action by the Minister, it is assumed biodiversity-related MNES will be assessed as part of the NSW Biodiversity Assessment (BDAR).

7.4.4 Aboriginal heritage

Existing environment

Due to the long and intensive European settlement history of Parramatta and surrounding suburbs, the majority of the Project route is highly disturbed. Major utility installations along the alignment have disturbed the ground area of depths beyond road disturbances. However, intact soils and geological formations may be capped by overlying layers of disturbance and fill.

Previous archaeological studies in the local area and wider region have identified a number of Aboriginal archaeological site types. This demonstrates that the local landscape retains archaeological evidence of Aboriginal activities and landscape use and is variably affected by disturbance. The information from previous archaeological studies in the region indicates that stone artefact scatters (open camp sites), isolated artefacts, shell middens and Potential Archaeological Deposits (PADs) are the most likely site type along the Project route.

The Project route also contains some landforms identified as archaeologically sensitive in the wider region, namely elevated alluvial terraces and alluvial plains around the Parramatta River. A number of small drainage lines and creeks are also present within

this area alongside swamps and wetlands. These complex and varied hydrological features surrounding the Project route would have led to a range of different environmental contexts and a diversity of available resources for the local Aboriginal groups.

Preliminary desktop research indicates there are five known archaeological features along the Project route – two registered sites on the Aboriginal Heritage Information Management System and three PADs with moderate to low potential for subsurface archaeological deposits.

Potential construction impacts

Construction of the Project will involve sub-surface activities along the route, which may impact on potential Aboriginal archaeological resources. Additionally, construction may result in indirect impacts to Aboriginal items including impacts to significant views and vistas of heritage items, impact to visual connections between heritage items and landscape features and impacts to Aboriginal cultural landscapes

Potential operation impacts

Operation of the Project may result in impact to visual connections between heritage items and landscape features and impacts to Aboriginal cultural landscapes. The operational phase may also include positive impacts for heritage values, such as improved public access to heritage areas and heritage interpretation.

Aboriginal heritage scope for EIS

A detailed Aboriginal Heritage Assessment will be undertaken in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (*OEH, 2011).

The Aboriginal Heritage Assessment will:

- involve comprehensive Aboriginal community consultation in accordance with the requirements of Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW, 2010)
- include comprehensive archaeological assessment in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010).
- identify and assess the significance of Aboriginal sites and places, based on Aboriginal community consultation and the comprehensive archaeological assessment
- assess the impacts associated with the Project
- provide recommendations for the management of Aboriginal objects and places in consultation with the Aboriginal community
- develop a heritage interpretation plan in consultation with the Aboriginal community, in accordance with the following guidelines:
  - *ICOMOS-Ename Charter for the Interpretation and presentation of Cultural Heritage Sites* (2008) (“Ename Charter”)
  - *the Australia ICOMOS Practice Notes for Interpretation* (Australia ICOMOS, 2013)
  - *Heritage Interpretation Policy* (Heritage Council, 2005)
  - *Interpreting Heritage Places and Items – Guidelines* (Heritage Office, 2005).

7.4.5 Non-Aboriginal heritage

Existing environment

No heritage items listed on the World Heritage List, Commonwealth Heritage List and National Heritage List are known to occur in or within 200 metres of the Project.

The Project is located within 50 metres of the following State significant heritage items:

- Newington Armament Depot and Nature Reserve (also listed as Millennium Parklands (Newington Armament Depot and Nature Reserve) on the State *Environmental Planning Policy (State Significant Precincts) 2005*)
- State Abattoirs heritage conservation area (also listed on the *State Environmental Planning Policy (State Significant Precincts) 2005*)
- Sewage Pumping Station 67 (also listed on the Sydney Water Section 170 Heritage and Conservation Register and heritage schedule of the *Parramatta Local Environmental Plan 2011* (Parramatta LEP))
- Rydalmere Hospital Precinct (former) (also listed on the Western Sydney University Section 170 Heritage and Conservation Register and heritage schedule of the Parramatta LEP).

Local heritage items listed on the Parramatta LEP and located within 50 metres of the alignment include the Tram alignment (I6) – Grand Avenue at Camellia, Truganini House and grounds (I591) at 38 South Street Rydalmere, Wetlands (I1), and the Bulla Cream Dairy (I64) at 64 Hughes Avenue, Ermington.

With respect to archaeological sites there are various areas of the route which may contain archaeological items and there is also the potential for unknown archaeological remains given the history of the area. In 2001 Godden Mackay Logan prepared the *Parramatta Historical Archaeological Landscape Management Study* (PHALMS). PHALMS replaced the Archaeological Zoning Plan for Parramatta. The PHALMS divides Parramatta into Archaeological Management Units based on their historical context and level of disturbance. The archaeological items (anticipated to be of local significance) potentially located along the Project alignment include:

- the 'Tram Alignment' along Grand Avenue, Camellia
- Schaeffer's garden in Rydalmere
- Williamson structure in Rydalmere
- potential PHALMS Archaeological Management Units
- Windemere residence at Ermington
- Lockyer's Road and garden hut, Eyre's cottage and Pennant Hills Wharf at Ermington.

In addition, a number of significant historic view corridors are nominated in the *Parramatta Development Control Plan 2011* and *Sydney Olympic Park Master Plan 2030* (SOPA, 2018) including:

- views towards Camellia from Elizabeth Farm and Harris Park colonial precinct
- significant views within and to Sydney Olympic Park.

There is also potential for maritime heritage, for example, the Pennant Hills wharf (at Ermington) where the extent of remains is unclear.

Potential construction impacts

The Project may result in impacts on listed non-Aboriginal heritage items identified within the study area during the construction stage. Direct impacts can occur during construction as a result of the physical loss of part or all of a heritage item or place, and/or changes to its setting. Potential indirect impacts include:

- potential for vibration impacts to buildings/items located close to the Project site as a result of construction works and the movement of plant, vehicles and machinery
- inadvertent damage as a result of the movement of machinery and equipment
- altered historical arrangements and access
- impacts to visual amenity, landscape and vistas associated with the item
- impacts to the curtilage of an item.

Construction of the Project will involve excavation along the route including utility relocations, track slab, stops, bridge foundations and abutments and other light rail infrastructure. Depending on the depth of excavation, there may be an impact on potential archaeological remains identified along the Project route.

Potential operation impacts

Operation of the Project will not directly impact on any listed or potential heritage items. The main potential for indirect impacts during operation of the Project relates to vibration generated by the movement of light rail and a change in the visual setting and/or character associated with the presence of new infrastructure.

Non-Aboriginal heritage scope for EIS

A Statement of Heritage impact will be undertaken in accordance with the *NSW Heritage Manual 1996* (Heritage Office and Department of Urban Affairs and Planning, 1996), *Assessing Heritage Significance* (Heritage Office, 2001) and *Statements of Heritage Impact* (Heritage Office and Department of Urban Affairs and Planning, 2002).
It will:

- include a comprehensive archaeological assessment for the study area
- assess the significance of built heritage and potential archaeological resources within the study area
- identify and assess impacts to heritage above and below water
- assess impacts to built heritage (direct and indirect) and archaeological resources including cumulative impacts of the Project
- provide recommendations for the management of built heritage and archaeological resources with consideration of any applicable conservation management plans
- develop a heritage interpretation plan in accordance with the following guidelines:
  - Ename Charter
  - *the Australia ICOMOS Practice Notes for Interpretation* (Australia ICOMOS, 2013)
  - *Heritage Interpretation Policy* (Heritage Council, 2005)
  - *Interpreting Heritage Places and Items – Guidelines* (Heritage Office, 2005).

7.4.6 Land use and property

Existing environment

The Project route will cross well-established areas of commercial, residential and industrial land uses of varying densities combined with recreational areas (such as public open space) and community facilities (such as schools, childcare centres, places of worship and health facilities). Existing land use patterns are described in Table 7.8.

Table 7.8 Existing land use patterns

Land use	Pattern / key features
Residential	There are a number of lower density residential areas along the Project corridor, predominantly in Rydalmere and Ermington. These are characterised by single houses and semi-detached houses. There is also higher density housing characterised by townhouses, multi-dwelling buildings, and multi-storey apartment buildings. Areas of higher density housing are predominantly located around Wentworth Point, Olympic Park and the Carter Street Precinct, with higher density also currently being constructed through Melrose Park.
Mixed use	Mixed use precincts generally comprise a combination of uses and activities including commercial, residential, retail, civic, cultural, education, health, special use and recreation. Mixed use precincts are located along the Project corridor within Sydney Olympic Park.
Education	A number of educational institutions are located near the Project corridor. These educational institutions include, but are not limited to, Western Sydney University (Rydalmere), Rydalmere Public School, Rydalmere East Public School, Melrose Park Public School and a number of other early learning centres and preschools.
Industrial	Industrial areas located along the Project corridor include a large concentration of light industry, manufacturing, logistics, warehousing, community services and bulky goods retailing. These areas perform a critical local and regional economic role. These uses are currently operating through areas of Camellia, Rydalmere and Melrose Park.
Recreational	Major recreational facilities include recreational and sporting facilities associated with Newington Nature Reserve, Millennium Parklands, Brickpit Park, the broader Sydney Olympic Park arenas and stadiums and Rosehill Gardens Racecourse. In addition, there are numerous local parks around the Project corridor. These recreational facilities provide important parkland for residents and workers, with opportunities for informal recreation and sporting use.
Infrastructure	Infrastructure near the Project corridor is mainly associated with major roads and railway infrastructure. Other infrastructure includes utilities, electricity transmission and distribution, and Sydney Water stormwater channels.
Environmental conservation and management	Environmental conservation and management areas associated with Newington Nature Reserve, Millennium Parklands, Brickpit Park and surrounding parklands and wetlands.
Waterways	The waterways of the Parramatta River have a broad range of uses including recreation, sporting activities and transport for Sydney Ferry services.

Future land use

The Project route is located within the GPOP priority growth area, which will link numerous areas proposed for urban renewal or further development, including:

- **Camellia** – the *Draft Camellia Town Centre Masterplan* (Department of Planning and Environment, 2018b), arising from the *Camellia Land Use and Infrastructure Implementation Strategy* (Department of Planning and Environment, 2015), sets the vision for a revitalisation of the Camellia precinct from heavy industrial to high-density living. The area is part of a master plan which includes a high-density mixed-use town centre in the north west of the precinct.

- **Melrose Park** – the Melrose Park precinct is approved to undergo rezoning from industrial to residential to facilitate significant urban renewal. Through the submission of planning proposals, the precinct is proposed to include a mix of high density residential and commercial uses with new open spaces.
- **Wentworth Point** – the north of the precinct is a planned urban development area within the GPOP priority growth area and is envisaged for high density living surrounded by parklands. The rest of the precinct has largely been developed with most of the precinct planning capacity already utilised.
- **Sydney Olympic Park** – the *Sydney Olympic Park Master Plan 2030* (Sydney Olympic Park Authority, 2018) identifies areas of development which are envisioned to occur between 2018 and 2030. Much of the precinct has been developed, however redevelopment and densification will occur within existing sites.
- **Carter Street Precinct** – the precinct has been partially rezoned for mixed use/high density residential uses and a draft master plan (*Carter Street draft revised Master Plan* (Department of Planning and Environment, 2018a) is currently in development to amend the Auburn LEP. A number of high-density residential apartments are currently under construction.

In addition to the major development areas described above, it is expected that low-rise residential areas along the Project route will continue to be redeveloped from single detached dwellings to dual occupancies on lots which meet the minimum required lot size. The Project will support the anticipated land use changes, particularly though integration with the Camellia, Sydney Olympic Park and Carter Street master plans.

Potential construction impacts

The Project is likely to result in the full or partial acquisition of a number of properties located along the Project route. Light rail is designed to fit within existing road corridors, and whole or partial acquisition of property will only occur where this is not possible. When planning major infrastructure projects, Transport for NSW makes every possible effort to avoid the need to acquire private property and has been engaging with the community and key stakeholders, including property owners whose premises may need to be acquired for the Project.

Full acquisition of commercial and residential properties will impact owners, occupiers and workers due to the need to relocate. Partial acquisition of properties will result in reduced lot size, which could impact on land use as well as potentially reducing redevelopment potential.

Additional construction related impacts to land use are likely to include:

- disruptions to property amenity related to noise, vibration and dust generated from construction activities.
- changes to property access. This will create disruptions to residents, business operators, employees, clients and/or customers wishing to access businesses and may affect the ability to maintain existing land use. Temporary traffic arrangements in close proximity to Melrose Park Public School will impact on students, staff and parents accessing the school particularly during morning and afternoon peak traffic times.
- retail land users may experience disruptions to trade as a result of decreased foot traffic due to construction activities impacting on access to shop fronts and reduced amenity making the area less appealing for customers (particularly relevant for food and beverage operators with outdoor seating in areas such as Sydney Olympic Park).

- reduction in recreational uses of parks and reserves due to the temporary presence of construction equipment and changed traffic and parking arrangements limiting visitor access to recreational areas.
- temporary changes to current land use occupation for construction compounds and site facilities.
- changes to visitor access to recreational areas due to changed traffic conditions, the temporary acquisition of parking spaces, or the presence of construction compounds, plant and materials, restricting use of the land.

Potential operation impacts

Property owners, employees and the community will experience positive benefits during operation of the Project, including:

- enhanced public transport and active transport access:
- provision of public realm improvements:
- benefits of transport integration, such as opportunities to integrate with the proposed Sydney Metro West in the Sydney Olympic Park precinct, providing customers with interchange opportunities and improved travel times to the Sydney CBD.

Potential negative impacts during operation will include:

- changes to road configurations impacting the way in which properties are accessed, which impacts maintenance of the existing land use. This could be potentially significant to the manoeuvring of heavy vehicles accessing industrial properties in the Camellia and Melrose Park precincts.
- reduction in street parking along the Project route, impacting customer access. Impacts are likely to be short term as customers adjust their travel habits.

The Project may also result in a permanent change in land use from the existing land use to transport and ancillary infrastructure where acquisition of residential and industrial land is required beyond the existing road corridor.

Land use and property scope for the EIS

A Land Use and Property Impact Assessment will be prepared and will:

- assess land use changes that are subject to strategic planning and proposed future land uses as part of major development applications and/or planning proposals that may be impacted by the Project's construction and operation
- assess impacts on specific properties by land use type once specific acquisitions requirements are known including impacts to residential, business, industrial, water/recreational, national parks and special events land uses
- assess impacts on land use and properties for proposed construction work locations
- review strategic planning programs and policies
- assess impacts on the region from a broader land use perspective, where is relates to the Project
- assess impacts on key district and strategic centres
- assess impacts within each precinct and stop, including their integration with surrounding land uses and properties
- assess overall negative and positive impacts on land use and properties along the Project corridor

- identify specific measures to minimise likely and potential impacts associated with the Project.

Additionally, a property acquisition strategy will be developed by Transport for NSW in line with the *Land Acquisition (Just Terms Compensation) Act 1991.*

7.4.7 Hazard and risk

Existing environment

The Project route traverses a number of easements which house major utilities and pipelines. These are summarised in Table 7.9.

Table 7.9 Existing utilities and pipelines

Suburb	Land use
Camellia	Major utilities and pipelines within the Project route include: • Sydney Water mains (one 1500 mm diameter and two 1200 mm diameter water mains) along the northern boundary and centre of the Grand Avenue Road Reserve • Viva high pressure fuel pipeline in the centre of Grand Avenue.
Rydalmere	Major utilities within the Project route include Sydney Water mains running along the northern boundary of South Street.
Ermington	Major utilities and pipelines within the Project route include: • two Sydney Water mains run along Boronia Street and South Street, creating large turfed setbacks to properties on the northern side of the road • Sydney Water mains also extend through Ken Newman Park • Viva high pressure fuel pipeline along the southern boundary of Boronia Street.
Melrose Park	Major utilities within the Project route include Sydney Water mains running along the centre of the Hope Street road reserve. The Project route also passes under Ausgrid High Voltage aerial transmission lines (132kV).
Wentworth Point	An existing Ausgrid 132kV transmission easement passes through the western extent of the precinct (to the west of the Project route) and continues south till it is underground at a substation near Hill Road. The transmission lines then continues south underground along both sides of Hill Road within the Project route.
Sydney Olympic Park	Utilities within the Project route consist of underground utilities which run along Dawn Fraser Avenue, Australia Avenue and Hill Road, predominately underneath existing footpaths and verges on both sides of the road reserve. Numerous leachate infrastructure associated with former landfills exists within Sydney Olympic Park, including an existing leachate rising main adjacent to Australia Avenue and a leachate line/drain that runs adjacent to Hill road.
Carter Street	Underground utilities within Uhrig Road are predominately under existing footpaths and verges on both sides of the road reserve, within the Project route. A series of fuel and gas pipelines traverse the precinct with an underground easement along private landholdings on the south side of Carter Street. The easement is up to 40 metres wide and runs parallel to Carter Street for the full width of the precinct.

Potential construction impacts

The Project has the potential to impact utilities and pipelines through direct impact from construction and operation/maintenance activities if services are not appropriately identified, protected or relocated.

The potential rupture of underground utilities and pipelines during excavation or the collision of plant and equipment with aboveground utilities could pose risks to public and worker safety, and to the environment. Rupture or contact with utilities and pipelines during works could also result in releases (of fuel, gas or water) and/or short-term outages

of services and customer complaints. If inadequately managed, works in the vicinity of utilities and pipelines which are not protected or relocated (such as high voltage electricity transmission lines, high pressure gas pipelines or high pressure fuel pipelines) could result in increased risks to the workforce and/or surrounding environment and community.

Potential operation impacts

The Project has the potential to impact utilities and pipelines through direct impact from operation/maintenance activities if services are not appropriately identified, protected or relocated.

The impacts will be similar to those identified during construction, however the likelihood of impacts occurring during operation may be somewhat reduced as maintenance activities will likely be undertaken within a discrete area of the alignment.

Hazard and risk scope for the EIS

A Hazard and Risk Assessment will be prepared in accordance with the following guidelines and standards:

- *SEPP No. 33 - Hazardous and Offensive Development*
- *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis* (Department of Planning, 2011)
- *AS 2885 Pipelines–Gas and liquid petroleum.*

The Hazard and Risk Assessment will:

- map all utilities and pipelines within the Project route to quality level B or better in accordance with *AS 5488-2013 Classification of Subsurface Utility Information*
- confirm the location of critical infrastructure and assess the potential impacts on utilities and pipelines during construction and operation of the Project
- include *AS 2885.6 Safety Management Study* workshops with impacted pipeline owners to demonstrate threats to the pipeline can be appropriately managed during construction and operation
- detail management strategies for critical utilities and pipelines, such as relocating or protecting utilities and pipelines as required
- identify and assess other potential hazards (including hazardous materials and dangerous goods) and risks that could be encountered during construction and operation of the Project which have the potential to result in health and safety impacts on surrounding communities, land uses, and the environment (also known as ‘off-site receivers’)
- identify storage and transport screening thresholds for hazardous materials and dangerous goods that may be required during construction and operation
- assess potential impacts to public health and safety
- provide management measures to address the potential risks identified.

7.4.8 Urban design, landscape and visual amenity

Existing environment

The landform and topography and the sensitivity of the existing visual environment varies considerably along the Project route. The route contains a wide range of urban recreational, commercial, residential, parklands and industrial land uses in addition to recreational areas and community facilities (such as schools, childcare centres, and

places of worship). Additionally, it is important to consider the Project in context of the urban renewal around sections of the alignment. Community infrastructure and land uses along the Project route are described further in Section 7.4.2 and Section 7.4.6, respectively.

Visual catchments along the Project route are generally likely to be small due to the presence of intervening structures (e.g. commercial and residential buildings) which will restrict views to the Project corridor.

Potential construction impacts

Construction of the Project will likely result in temporary visual impacts to residential, industrial and temporary receivers situated or travelling along the Project route. Impacts resulting from construction of the Project may include changes to local character and amenity due to construction areas, plant and materials.

Potential operation impacts

Larger structures, such as the two bridges proposed over the Parramatta River and the bridge over Silverwater Road, have the potential to change the visual amenity of a wider catchment. Light rail infrastructure such as the overhead wiring and stops will also have an urban amenity impact, while lighting could introduce light spill to nearby receivers.

Visually sensitive receivers will typically include residential dwellings, commercial premises (e.g. cafes, restaurants and commercial buildings), primary schools and educational facilities, childcare facilities and recreational facilities (e.g. nature reserves and parklands).

The Project will improve the accessibility and connectivity of local communities and those travelling through the GPOP priority growth area, as well as increasing attractiveness through improvements to local character and amenity. The new bridge structures will provide new connections across the river, uniting communities and facilitating improved life and recreation for the adjoining communities and the broader Sydney region.

The Project will seek to maintain connectivity and permeability along the Project route, with design ensuring connectivity across the route and minimising severance within streets, where avoidance of severance is not possible.

Urban design, landscape and visual amenity scope for the EIS

An Urban Design and Visual Impact Assessment will be prepared, which will be undertaken in accordance with the following guidelines and standards:

- Draft policy *Greener Places* (Government Architect NSW, 2017)
- *Water Sensitive Urban Design Guideline* (Roads and Maritime Services, 2017)
- *Cooling Western Sydney – A strategic study on the role of water in mitigating urban heat in Western Sydney* (Sydney Water, 2017)
- *Healthy Urban Development Checklist* (NSW Health, 2009)
- *Beyond the Pavement: urban design policy, procedures and design principles* (RMS, 2014)
- *Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW, Centre for Urban Design* (RMS, 2019)
- *NSW Sustainable Design Guidelines Version 4.0* (TfNSW, 2017)
- *Crime Prevention through Environmental Design* (CPTED) (Queensland Government, 2007)

- *Disability (Access to Premises – Buildings) Standards 2010*
- *AS4282-1997 Control of the obtrusive effects of outdoor lighting*.

The Urban Design and Visual Impact Assessment will:

- assess the Project against the urban design objectives and how the Project will:
  - complement and integrate light rail stops with communities and centres
  - complement and integrate light rail stops with known and foreseeable urban renewal and/or place making opportunities (including the NSW Government's Priority Precinct areas)
  - achieve high quality landscaping, streetscapes, architecture and design
  - explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape.
- provide a description of accessibility components including:
  - impacts on pedestrian access across the route and at stops
  - opportunities to optimise the accessibility of each stop and the general vicinity of walking and cycling catchments
  - the provision of infrastructure to support accessible paths of travel and interchange
  - impacts on cyclists (including provision of and integration with active transport routes) and pedestrian access and safety
  - opportunities to integrate cycling and pedestrian elements with surrounding networks and in the Project.
- include an assessment of the visual and landscape impacts of bridges and Project infrastructure on:
  - views and vistas
  - streetscapes, key sites and buildings
  - landscaping, green spaces and existing trees and tree canopy
  - heritage items including Aboriginal places and environmental heritage
  - the local community
- include artist impressions and perspective drawings from key receiver locations to illustrate the Project and its potential impacts.

7.4.9 Noise and vibration

Existing environment

A description of the noise environment along the Project route is provided in Table 7.10.

Table 7.10 Existing noise environment

Precinct	Existing noise environment
Camellia	The nearest residential receivers are located about 300 m from the Project route in this precinct. The existing noise environment primarily consists of industrial noise from manufacturing, warehousing and freight distribution. Noise from the Rosehill Racecourse provides additional noise contributions during race events. Noise at the nearest residential receivers is dominated by road traffic noise from James Ruse Drive and Hassall Street.

Precinct	Existing noise environment
	Future development Potential changes in the noise environment will result due to proposed land zone changes and will be characterised by noise from commercial premises, residential premises and urban noise from road traffic, commuters and mechanical plant.
Rydalmere	Rydalmere is a residential area dominated by suburban noise. Noise levels in suburban areas are characterised by peak hour traffic. Periods outside peak hour are defined by noise from the natural environment, human activity and intermittent road traffic noise on adjacent roads. The Rydalmere precinct is bounded by Silverwater Road to the east and Victoria Road to the north which are considered major arterial roads. Outside peak hours, the continuous hum of traffic noise from these roads provides additional contributions to the noise environment.
Ermington	Ermington is a residential area dominated by suburban noise. Noise levels are characterised by peak hour traffic. Periods outside peak hour are defined by noise from the natural environment, human activity and intermittent road traffic noise on adjacent roads. The Ermington precinct is bounded by Silverwater Road to the west and Victoria Road to the north which are considered major arterial roads. Outside peak hours, the continuous hum of traffic noise from these roads provides additional contributions to the noise environment.
Melrose Park	Existing noise in this precinct is dominated by freight movements, warehouse operations and adjacent construction work. **Future development** Potential changes in the noise environment will result due to proposed land zone changes and will be characterised by noise from commercial premises, residential premises and urban noise from road traffic, commuters and mechanical plant.
Wentworth Point	Wentworth Point is a high-density residential area dominated by suburban noise. Noise levels are characterised by peak hour traffic. Periods outside peak hour are defined by noise from the natural environment, human activity, mechanical plant, noise from commercial premises and intermittent road traffic noise on adjacent roads. The existing noise environment also contains noise from industrial premises due to freight movements and warehouse operations.
Sydney Olympic Park	Sydney Olympic Park is a mixed-use area consisting of commercial premises, residential premises, sporting and entertainment facilities. Noise in this precinct is characterised by an urban hum from road traffic, human activity and mechanical plant.
Carter Street	The Carter Street precinct is an urban development area that is currently transitioning from an industrial area to residential. Road traffic noise from the Western Motorway located to the south of the precinct dominates the existing noise environment. Further to the north where road traffic noise levels decrease, the existing noise environment is characterised by light industry, warehousing activities and construction work for residential apartments. **Future development** Residential and mixed used development are anticipated which will decrease the industrial noise contributions compared to existing conditions.

Potential construction impacts

Construction of the Project will result in potential noise and vibration impacts on surrounding land uses and sensitive receivers due to the operation of plant and equipment during construction, particularly during night-time works. Construction activities with the greatest potential to result in noise and vibration impacts include:

- bridge construction and widening
- road works
- demolition works
- track and light rail construction

- night-time works in the vicinity of residential properties
- traffic diversions and construction traffic generation.

The extent of construction noise and vibration impacts on any individual receiver will depend on the existing background noise levels, proposed work hours, plant and equipment used, localised screening from buildings and structures and distance to surrounding receivers.

Potential operation impacts

Operation of the Project has the potential to generate noise and vibration impacts on nearby sensitive receivers as a result of:

- noise from light rail vehicles operating on new routes
- changes to road traffic noise due to changes in road hierarchy or re-directed traffic
- noise from light rail stops (such as increased pedestrian traffic)
- noise from other ancillary facilities such as substations if they are required
- vibration impacts from the operation of light rail vehicles.

Factors that contribute to the noise and vibration levels include:

- the alignment and track elevation
- bridge construction
- type of light rail vehicle
- the rail track type
- track surface condition
- locations of tight curves and crossovers.

Noise and vibration scope for the EIS

A Noise and Vibration Impact Assessment will be prepared to assess construction and operational impacts of the Project on sensitive receivers. The assessment be undertaken in accordance with the following guidelines and standards:

- *Assessing Vibration: a technical guideline* (DEC, 2006)
- *Interim Construction Noise Guideline* (DECCW, 2009)
- *Noise Policy for Industry* (EPA, 2017)
- *Construction Noise and Vibration Strategy* (TfNSW, 2018c)
- *Rail Infrastructure Noise Guideline* (EPA, 2013)
- *Noise Mitigation Guideline* (RMS, 2015)
- *German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures.*

The Noise and Vibration Impact Assessment will:

- identify construction noise management levels from attended and long-term unattended noise monitoring at strategic locations in the study area to complement existing data
- include specific noise criteria for the proposed construction work at all locations in accordance with applicable guidelines

- include noise and vibration modelling for work sites and activities along the Project route (including construction traffic) during standard construction hours and out of hours work
- provide reasonable and feasible mitigation measures to reduce noise and vibration impacts arising from construction with reference to the *Interim Construction Noise Guideline* (DECC, 2009) and the Transport for NSW *Construction Noise Vibration Strategy* (2018c)
- provide a framework for an Out of Hours Work Strategy
- determine airborne and ground-borne noise and vibration operational levels
- review operational light rail movements (during the day, night and associated peak periods) and track alignment design
- model operational airborne and ground-borne noise
- provide feasible and reasonable mitigation measures where operational noise levels are predicted to exceed the relevant noise criteria.

7.4.10 Hydrology, flooding and water quality

Existing environment

The Project is located within the Parramatta River catchment, which covers an area of about 266 square kilometres and is divided into 10 sub-catchments. The Parramatta River is tidal to the Charles Street Weir in Parramatta and the mixing of fresh and saline waters through river discharge, astronomical tides and waves comprise key processes that influence the geomorphology of the section of river between Wentworth Point and Camellia. The Parramatta River catchment is highly urbanised with a number of modified waterways and isolated areas of native vegetation, resulting in poor water quality and modified flow regimes.

Sections of the preferred route for the Project are located on the floodplain of the Parramatta River and are likely to be subject to mainstream flooding (i.e. the inundation of normally dry land when water overflows the banks of a stream or river) and overland flooding (i.e. the excess rainfall runoff from homes, driveways and other surfaces). Areas likely to experience flooding include the route through Camellia, Rydalmere wharf and Wentworth Point.

Potential construction impacts

Construction of the Project will likely result in temporary impacts to hydrology, flooding and the stormwater network along the Project route.

Impacts resulting from construction of the Project may include:

- potential temporary flooding impacts due to construction activities and the presence of compounds
- increased potential for erosion and sedimentation run-off into the Parramatta River and other tributaries, particularly during construction of the bridges
- potential altered flow paths within waterways during the construction of bridge structures with resultant changes to water levels, velocities and scour potential
- potential impacts to the existing drainage network such as destruction of drainage pits or increased sedimentation due to soil disturbance and dust

- Construction also has the potential to impact water quality in nearby watercourses and receiving catchments through the pollution of stormwater runoff with sediments, fuel and other hazardous materials from construction sites.

Potential operation impacts

The operational performance of the Project will only be affected at crossings with overland flow paths where the stormwater drainage cannot convey the one per cent AEP flow, such as at sag points at South Street, Boronia Street, Hope Street, Hill Road and Australia Avenue.

Bridge piers and abutments have the potential to disrupt flooding flow regimes when placed within the extent of flooding. The length of bridges and location of the abutments and piers will be refined to ensure minimum disturbance to the surrounding flow regime. However, localised increases in flood level are expected upstream for all flood events including those with a greater magnitude than the one per cent AEP where increases occur outside the main channel, however this diminishes with increased distance from the bridge.

Where the Project is raised above the existing ground surface level and affects surface water flow paths, resulting water levels will be raised and flow directions impacted. These impacts will be mitigated through provision of formal drainage infrastructure to provide flow capacity across the alignment.

The Project has the potential to impact coastal processes mainly at the river crossings, with the construction of piers within the river and potentially bridge abutments and alterations to foreshore edge treatments (modifications to existing seawalls or construction of new seawalls).

Hydrology, flooding and water quality scope for the EIS

A Hydrology and Flooding Impact Assessment will be prepared and will include quantitative modelling analysis of hydrology and flooding impacts associated with bridge structure and drainage infrastructure. The Hydrology and Flooding Impact Assessment will be undertaken in accordance with the following guidelines and standards:

- *NSW Government's Floodplain Development Manual* (Department of Natural Resources, 2005)
- *PS 07-003 New guideline and changes to section 117 direction and EP&A Regulation on flood prone land*
- *Practical Consideration of Climate Change – Flood risk management guideline* (DECC, 2007)
- *Australian Rainfall and Runoff Urban Drainage analysis and design*
- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and *Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries)* (DECC, 2008).

The assessment will assess:

- afflux (an increase in water level that can occur upstream of a structure, such as a bridge or culvert, that creates an obstruction in the flow)
- velocity and scour potential (scour is the removal of sediment from around bridge abutments or piers)
- change in hydraulic categorisation (e.g. blocking or moving areas that are classified as floodway and flood storage can cause redistribution of flows resulting in floods affecting supplementary areas)

- change in flood hazard
- impact to coastal processes
- impact on existing emergency management procedures
- sensitivity of predicted impacts to climate change
- details of recommended mitigation measures.

In addition, a water quality assessment will be undertaken to assess the potential impacts of construction and operation. It will:

- review historical surface water quality, with consideration of any supplementary data collected specifically for the Project
- consider potential changes to surface water quality, including the effectiveness of water sensitive urban design features and the potential disturbance of sediments in watercourses from any new structures
- assess modified discharge volumes, durations and velocities, and the associated potential impacts to surface water hydrology, including natural processes within waterways that affect the health of any aquatic systems and landscape health
- identify mitigation and management measures to address the impacts identified.

7.4.11 Business and economic impacts

Existing environment

The Greater Parramatta region is the largest employment destination in Western Sydney and the second largest employment destination for the metropolitan area after the Sydney CBD.

As identified in Chapter 2 the wider GPOP priority growth area is anticipated to experience significant population and jobs growth, underpinned by investment in the Parramatta CBD and Westmead health and education precinct, advanced technology and knowledge sectors in Rydalmere, Silverwater and Auburn and the Sydney Olympic Park lifestyle precinct. As part of the *Central City District Pla*n (GSC, 2018b), Greater Parramatta has a target of 55,000 new jobs by 2036. In parallel, the NSW Department of Planning, Industry and Environment's Interim *Land Use and Infrastructure Implementation Plan* (2018c) forecasts 110,000 new jobs in the GPOP priority growth area by 2036.

The City of Parramatta LGA is a $26.7 billion economy (NIEIR, 2018), which represents 4.8 per cent of the state's gross regional product. A total of 177,940 jobs were located in the City of Parramatta in the year ending June 2018, predominately in the goods related industry, household services and business services sectors. The Parramatta CBD is already the fifth largest office market in greater Sydney, after the Sydney CBD, Macquarie Park, Sydney CBD fringe and North Sydney, with many large firms and government offices locating to Parramatta in the last five years.

There are 26,754 business which are active and registered for GST in the City of Parramatta (Australian Business Register, 2018). Of these businesses the largest industry sector is construction accounting for 16.4 per cent of total registered businesses in the City of Parramatta, followed by professional, scientific and technical services with 14.2 per cent of businesses (ATO, 2017).

The density and distribution of businesses varies along the Project route. The greatest concentration of businesses along the route are in Wentworth Point and Sydney Olympic Park, dominated by professional, scientific and technical services, real estate services and transport, postal and warehousing industries. Over 25 per cent of businesses in

Rydalmere are in the construction industry and over 22 per cent in Camellia are wholesale trade.

Potential construction impacts

Construction will involve a large investment by the NSW Government. Such investment is expected to generate considerable positive economic impacts on local and regional businesses, including:

- regional employment – reflecting the increase in the number of jobs associated with construction
- regional income – reflecting the increased value of wages paid to workers during construction
- gross regional product – income generated from the purchase of goods and services from local business, such as workers lunches and construction supplies.

Construction will however incur some negative impacts such as:

- disruptions to services, deliveries and access due to localised traffic network alterations and pedestrian detours and reduction in parking
- visual impacts, due to the presence of construction equipment and hording blocking shopfronts and reducing the amenity of streetscapes
- property acquisition and lease cessation resulting in some businesses having to relocate
- disruptions to business amenity due to construction noise and vibration, which may act as a deterrent for customers, passing trade and employees
- loss of power and utilities disrupting business operations.

Potential operation impacts

The potential positive impacts of operation on businesses at the local level include:

- increased passing trade, leading to greater demand for services
- an increased number and type of businesses across new and existing development areas, reflecting increased demand for goods and services
- improved business connectivity throughout the GPOP priority growth area – faster travel times, links north and south across the Parramatta River, increased transport efficiency between precincts
- enhanced competition across new and existing development areas, reflecting growth in business activities, business expansion and new start-ups
- growth in profitability across new and existing development areas, reflecting increased commerce and demand for goods and services
- improved access to, and larger stock of labour and customers for local and regional businesses, reflecting improved connectivity and movement of people across metropolitan Sydney
- improved visual amenity – business along the alignment will benefit from improved pedestrian conditions, a more attractive landscape (e.g. landscaping and urban design) and improved streetscapes making the area more comfortable and visually enticing to customer, potentially increasing passing trade

- potentially higher property values and rents for local and regional businesses, reflecting growth in the demand for real property as a result of the rising population, income and business activity.

With regard to negative impacts, operation of the Project may produce an increase in noise levels which may disrupt workplace ambience and customer experience at local businesses.

Business and economic scope for the EIS

An Economic Impact Assessment will be undertaken to identify and evaluate key economic issues that could potentially arise during the construction and operation of the Project. It will:

- review previous business impact assessments from other similar infrastructure projects to identify the key economic implications of light rail projects within major cities, and any lessons learnt
- develop a baseline profile of the existing economic environment within the study area, based on information available from the Australian Bureau of Statistics, relevant local, regional and State policies and plans, and the outcomes of consultation undertaken for the Project
- identify and consult with local businesses who will be affected by the Project (refer consultation) to determine potential impacts
- review the results of other relevant specialist assessments (traffic, noise and vibration, air and other amenity related impacts)
- assess potential construction, operation and cumulative impacts of the Project on the economic environment
- identify management measures for managing and monitoring the potential economic impacts of the Project.

7.5 Other environmental issues

This section provides a preliminary environmental assessment of the Other issues identified for the Project. Further specialist assessment is proposed as part of the EIS for those issues that were identified as Other issues. The proposed scopes of these specialist assessments are also detailed in this section.

7.5.1 Soils, geology and contamination

Existing environment

The Project is located in the Sydney Basin with a number of geological formations and soil landscape types.

The 1:100,000 Soil Landscape Series Sheet for Sydney (Soil Conservation of NSW, 1966) identifies the following surficial soil landscapes along the Project route:

- disturbed terrain within the Camellia precinct
- the area north of the Parramatta River consists of residual soil landscapes including the Blacktown and Lucas Height landscapes
- the Ermington precinct is characterised by erosional soils where higher relief topography exists
- in the Wentworth Point precinct and either side of Haslam Creek alluvial soils belonging to the Birrong landscape are present

- at the north western end of Wentworth Point and north of Haslams Creek soils resulting from coastal swamps and characterised by very shallow groundwater tables are present as part of the Ettalong soil landscape.

The Sydney 1:100,000 Geological Series Sheet (Department of Mineral Resources, 1983) identifies the following geological units along the Project route:

- geology transitions from quaternary-aged alluvial and estuarine sediments characterised by silty to peaty quartz sand, silt and clay to man-made fill in the Camellia precinct due to historical filling and land reclamation activities in this area.
- the area north of the Parramatta River is characterised by the Triassic-aged Ashfield Shale and Hawkesbury Sandstone belonging to the Wianamatta Group, with quaternary-aged alluvial and estuarine sediments along the northern edge of the river
- Wentworth Point is underlain be a combination of quaternary-aged alluvial sediments and man-made fill, transitioning to Ashfield Shale south of Haslam's Creek
- the Parramatta River hydrogeological landscape is distinguished by flat, low lying alluvial plains and groundwater is expected to be relatively shallow in the alluvial and estuarine deposits, as well as within man-made fill areas along Parramatta River and Haslams Creek.

There is the potential for contamination along the Project route due to historical filling or development activities such as the construction of infrastructure including road and rail infrastructure, which may have used fill material of unknown origin. Based on the findings of a desktop assessment areas of known or potential contamination along the Project route are summarised in Table 7.11.

Table 7.11 Summary of known and potential contamination issues along the Project route

Precinct/area	Description of contamination issues
Camellia	Previous assessments indicate that Camellia has widespread contamination resulting from its long history of heavy industrial activities including chemical manufacturing, oil refining, tanneries, liquid and solid waste treatment and disposal, and asbestos manufacturing and disposal. Contaminants known to be present in soil and groundwater include petroleum hydrocarbons, hexavalent chromium, chlorinated hydrocarbons, pesticides, volatile and semi-volatile organic compounds and asbestos. Acid sulfate soils (ASS) or potential acid sulfate soils (PASS) may also be present at the eastern end of the Camellia precinct, including where the bridge between Camellia and Rydalmere is proposed to be located
Melrose Park	The industrial area in Melrose Park includes current and former chemical manufacturing activities, including those with surrendered licenses under the PoEO Act for chemical and dangerous goods production. These former licences are associated with premises along Wharf Road. There is the potential for chemical contamination to occur in the area given the presence of current and former chemical manufacturing activities. PASS or ASS may also be present where the proposed bridge between Melrose Park and Wentworth Point will be located.
Wentworth Point	The review of historical aerial photos indicated that between Hill Road and Homebush Bay a number of heavy industrial premises were located including a timber treatment facility. This area has since been developed into high density, high rise residential land use. Whilst some contamination may be present along Hill Road, the relatively recent urban renewal of the area, and the absence of any EPA regulatory notices for properties in the area, suggest that any contamination will not be significant or widespread. PASS or ASS may also be present where the proposed bridge between Melrose Park and Wentworth Point will be located.

Precinct/area	Description of contamination issues
Sydney Olympic Park	This precinct contains several engineered landfills and associated leachate management infrastructure along and adjacent to the Project. Many of the landfills are managed under EPA remediation notices. Potential contaminants associated with landfills include heavy metals, ammonia, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), pesticides, volatile and semi-volatile organic compounds, asbestos and landfill gas such as methane.
Haslams Creek and Parramatta River	These areas are either known to contain or have a high probability of containing PASS and ASS. This will require careful consideration in relation to constructability, particularly for the proposed bridges across the Parramatta River. Sediments within the Parramatta River also have a high likelihood of containing chemical contaminants resulting from runoff and deposition due to the long history of industrial activity at Camellia.

Potential construction impacts

Construction of the Project will expose the natural ground surface and sub-surface through the removal of vegetation, overlying structures (such as buildings and footpaths), and excavation of construction footprints. There is the potential that exposed soils and other unconsolidated materials (such as spoil, sand and other aggregates) could be transported from the construction sites into surrounding waterways via stormwater runoff.

The exposure of acid sulfate soils during excavation could result in the release of acid sulfates, which could damage surrounding vegetation and drainage lines.

Excavation may disturb any contamination and hazardous materials present in soil and groundwater. If inadequately managed, the disturbance of areas of contamination has the potential for:

- direct contact and/or inhalation by site workers, users, and visitors
- impacts to surrounding environmental receivers (including surrounding ecosystems, watercourses and flora and fauna, particularly in Sydney Olympic Park)
- mobilisation and migration of surface and subsurface contaminants via leaching, runoff and/or subsurface flow, impacting nearby soils, surface water, and groundwater.

If inadequately managed, construction activities have the potential to result in the contamination of soil due to spills and leaks of fuel, oils, and other hazardous materials. These potential impacts will be minimal with the implementation of standard construction mitigation measures.

Potential operation impacts

The Project is not expected to have operational impacts relating to soils.

Operation has the potential to result in contamination of soils due to any spills and leaks of fuel, oils, and other hazardous materials from the routine operation of light rail vehicles, maintenance vehicles, and other Project infrastructure.

Soils, geology and contamination scope for the EIS

An assessment will be undertaken to assess the potential contamination impacts of construction and provide the necessary management measures.

The assessment will:

- confirm areas of contamination including known contaminated sites and areas of potential contamination
- involve soil, sediment and groundwater sampling at select locations in accordance with the requirements of the EPA and relevant guidelines (listed below)

- assess the potential impacts of disturbing contaminated sites, considering potential receptors and exposure pathways
- identify mitigation and management measures to address potential contamination impacts consistent with relevant regulations and guidelines.

The assessment will be undertaken in accordance with relevant guidelines and requirements, including:

- *Contaminated Sites: Sampling Design Guidelines* (Environment Protection Authority (EPA), 1995)
- *Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007)
- *Guidelines for Consultants Reporting on Contaminated Sites* (Office of Environment and Heritage (OEH), 2011)
- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015)
- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended in 2013)
- *Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets* (http://www.environment.nsw.gov.au/salinity/solutions/urban.html) which includes Site Investigations for Urban Salinity (DLWC, 2002)
- Other relevant guidelines made or approved under section 105 of the CLM Act.

In addition, the assessment will:

- assess the risk of erosion and sedimentation
- assess the potential impact and management of acid sulfate soils in accordance with the *Acid Sulfate Soil Manual* (NSW Acid Sulfate Soil Management Advisory Committee, 1998) and Part 4 (Acid sulfate soils) of the *Waste classification guidelines* (EPA, 2014)
- consider the potential impacts of soil exposure during earthworks, which may result in soil erosion and off-site transport of eroded sediments to receiving waterways
- identify mitigation and management measures to address the impacts identified.

7.5.2 Air quality

Existing environment

Ambient air quality in the Sydney Basin is influenced by a number of factors, including topography, prevailing meteorological conditions (such as wind and temperature) and local and regional air pollution sources (such as vehicle emissions, industrial facilities and bushfires).

The air quality in the Project area is typical of an urban area. The primary contributor to air pollution in the vicinity of the Project is expected to be from emissions from motor vehicles along the road network and nearby industry.

Potential construction impacts

Construction activities, including earthworks, storage and transport of spoil and waste materials, demolition of buildings, and exhaust emissions from equipment and vehicles, have the potential to impact on local air quality during construction. These impacts will be minimised through the implementation of Transport for NSW's *Air Quality Management Guidelines* (Transport for NSW, 2018a).

Potential operation impacts

Impacts during operation will be primarily positive with reduced gaseous emissions due to the associated reduction in private vehicle exhaust emissions.

Air quality scope for the EIS

An Air Quality Assessment will be undertaken in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) to assess the potential impacts of construction and operation. It will:

- identify sensitive receivers
- Identify potential sources of air emissions during both construction and operation of the Project
- characterise the local air quality environment
- identify and assess potential impacts on sensitive receivers
- consider cumulative air quality impacts
- identify mitigation and management measures to address the impacts identified.

7.5.3 Greenhouse gas, energy and climate change

Existing environment

Historic climate records indicate the climate of the Greater Parramatta region is a humid sub-tropical climate, with mild to cool winters (average July temperature is 17.5 degrees) and warm, hot summers (average January temperature is 29 degrees). Parramatta is slightly warmer than the Sydney CBD, due to the distance from the coast, meaning the area does not benefit from coastal sea breezes. Rainfall is typically spread evenly throughout the year with between about 200 and 300 millimetres per season (about 970 millimetres annually) (BOM, 2018).

The Parramatta region has also been experiencing more regular heatwaves, with five significant heatwaves recorded since January 2013. Heatwaves experienced in May 2014 and March 2016 suggest that changing weather patterns are now leading to heat events outside the traditional summer months. Severe storms are also more prevalent, with the severity and impact on infrastructure increasing. The likelihood of more extremes in weather makes the Project more vulnerable to climate change impacts.

Potential construction impacts

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

- combustion of fuel in construction plant, equipment and vehicles
- disposal of construction waste (indirect emissions will be generated by the decomposition of the waste material at waste handling facilities)
- use of construction materials with a high embodied energy – for example, construction materials (such as steel and concrete) require a considerable amount of energy to manufacture and transport.

It will not be possible to completely avoid the generation of greenhouse gas emissions during construction. However, opportunities to reduce the volume of greenhouse gas emissions will be identified in the EIS.

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

These risks are anticipated to be adequately managed with standard mitigation measures, such as increasing the capacity of erosion and sediment controls, and minimising construction impacts on the capacity of existing stormwater drainage systems. Therefore, climate change is not considered to be a key issue during construction.

Potential operation impacts

Greenhouse gas emissions during operations will be associated with the consumption of electricity to power the light rail vehicles and other light rail infrastructure and systems.

There will also be emissions from the disposal of waste and use of materials during maintenance activities.

Overall, the operation of the Project will potentially result in a mode shift from road to public transport. This has the potential to reduce greenhouse gas emissions associated with road transport compared to the emissions that would otherwise occur if the Project were not delivered.

Climate change risks during operation of the Project are anticipated to include:

- increased maximum temperatures and the frequency of heatwaves, which may affect the integrity of Project infrastructure and affect customer and staff comfort
- increased frequency and severity of extreme rainfall events, which may exceed the design capacity of the drainage system and lead to flooding of Project infrastructure or areas surrounding the Project
- changes in seasonality and the amount of precipitation, which may affect Project infrastructure.

Greenhouse gas, energy and climate change scope for the EIS

The EIS will include a preliminary greenhouse gas assessment based on the indicative design and construction staging. As the design development progresses a more detailed assessment will be carried out to determine greenhouse gas emissions during construction and operation of the Project.

The more detailed assessment will include an inventory of greenhouse gas emissions, reported as tonnes of carbon dioxide equivalent ($tCO_{2\text{-}e}$) and categorised into one of three categories or 'scopes'. Each scope helps to delineate between direct emissions from sources that are owned or controlled by the Project and indirect emissions that are a consequence of project activities but occur at sources owned or controlled by another entity. The three scopes include:

- Scope 1 emissions – direct emissions arising from activities by the Project (for example, the consumption of diesel fuel in construction vehicles)
- Scope 2 emissions – indirect emissions that are generated outside of the Project's boundaries to provide energy for the Project (for example purchasing electricity from the grid)

- Scope 3 emissions – all indirect emissions (not included in Scope 2) due to upstream and downstream activities (for example indirect upstream activities associated with the extraction and production of purchased construction materials and fuels).

The EIS will include an assessment of climate change trends and projections to determine climate change scenarios and consequent impacts on the life of the assets component of the Project. A Climate Change Risk Assessment will be undertaken as part of the EIS to determine the potential climate change impacts relevant to the Project in accordance with the following guidelines:

- *Australian Government's Climate Change Impacts and Risk Management – A Guide for Business and Government* (2006)
- *AS/NZS 3100:2009 Risk Management – Principles and Guidelines*
- *Technical Guide for Climate Change Adaptation for the State Road Network* (RMS, in draft)
- *Climate Extremes Risk Assessment and Adaptation Plan* (CoP, 2011)
- *TfNSW Climate Risk Assessment Guidelines, version 3.0* (9TP-SD-081/3.0)
- *AS 5334-2013 Climate change adaption for settlements and infrastructure – A risk based approach*
- *Infrastructure Sustainability Council of Australia (ISCA) IS v2.0 Planning Rating Credit: Res-2 Climate and natural hazards risks*.

7.5.4 Cumulative

The Project is likely to be undertaken concurrently with a number of other major projects, including potentially Sydney Metro West and a number of developments in Sydney Olympic Park, Wentworth Point and Melrose Park, as well as form a continuation of PLR Stage 1 construction activities.

Potential construction impacts

Potential cumulative impacts that could arise in situations where the construction occurs concurrently with other known developments include the following:

- Construction traffic – cumulative impacts may occur where multiple construction projects use the same construction traffic routes at the same time. Cumulative impacts could include traffic congestion (particularly if truck movements occur during peak hour and if truck queuing occurs), and amenity impacts (such as noise, visual and air quality) on sensitive receivers near these construction traffic routes.
- Loss of on-street parking and / or other kerbside uses (such as loading zones) – construction of the Project has the potential to affect the supply of some on-street parking and other kerbside uses (such as loading zones). Parking availability could be further affected by a number of other projects.
- Disruptions to the reliability of public transport – the presence of multiple construction sites could result in longer commuter travel times due to multiple disruptions to bus services.
- Construction noise, vibration and visual amenity – there is potential for impacts from project construction activity to be exacerbated by other nearby construction sites operating either simultaneously with or very shortly before or after construction of the project. Cumulative impacts could include construction fatigue due to longer periods of construction noise on a daily basis and an overall basis, increased overall noise levels,

night works that persist for longer at night or persist for more consecutive nights, and increased extent and / or duration of visual amenity impacts.

- Loss of public open space – the availability of public open space could be temporarily reduced due to the establishment of multiple construction compounds and / or work sites. The community's enjoyment of nearby public open spaces (that are not directly affected by construction) could be affected by increased construction noise and visual amenity impacts.
- Business impacts – businesses could be affected by the effects of various cumulative impacts, such as the loss of on-street parking for customers, disruptions to loading zones and deliveries and / or the loss of and disruption to ground-floor retail spaces.

Potential operation impacts

There is the potential for cumulative impacts due to the interaction with other known or proposed developments. For example project infrastructure in the vicinity of other surrounding developments could impact on the setting or heritage significance of heritage listed items and / or heritage conservation areas.

Cumulative scope for the EIS

Details of known and proposed surrounding developments with the potential to interact with the construction and / or operation of the Project will be identified through consultation with stakeholders and a review of relevant local environmental plans and the Department of Planning, Industry and Environment's major projects database. Potential cumulative impacts arising from the interaction of other state or regional projects will be identified and assessed in a qualitative manner. Management and mitigation measures will be proposed, where appropriate.

7.6 Non-material issues

7.6.1 Waste and resource use

Waste management and recycling is regulated in NSW by the NSW Environmental Protection Authority (EPA) through the PoEO Act, the *Protection of Environmental Operations (Waste) Regulation 2014* and the *Waste Avoidance and Resource Recovery Act 2001.*

Waste and resource impacts are relevant to construction and operation of the Project, so will be considered in detail in the EIS. The generation of waste and the anticipated resource consumption during construction and operation will be similar to other infrastructure projects of this nature and scale and these impacts are expected to be manageable through the implementation of standard environmental management measures (such as application of the waste management hierarchy).

Typical resource consumption during construction may include structural steel, liquid fuel, premix concrete, road sub-base and road base, timber/plywood, concrete/sand/cement, sleepers, and other construction materials. Water will also be required during construction for dust suppression and road pavement works and energy such as fuel and electricity will be required during the operation of construction equipment and worksites.

Typical waste to be generated from construction activities will include earthworks, demolition of existing structures, removal of existing road pavements and utilities, vegetation clearing, wash-down and maintenance of equipment and on-site office activities.

The EIS will describe the construction and operational resources and materials that will be required during the construction and operation of the Project, as well as the anticipated

waste streams, expected waste quantities and applicable waste management strategies. During design development Transport for NSW will consider sustainable material use and reduction, resource efficiency and the opportunity for a circular economy with reference to the ISv2 guidelines (ISCA, 2018) and the *Draft NSW Government Circular Economy Policy* (NSW Government, 2018).

8. Conclusion

The GPOP priority growth area is one of Sydney's fastest growing areas. By 2026, approximately 25 per cent of the GPOP priority growth area's residents are forecast to live in the precincts within which the Project route is located. These precincts have a range of current and emerging issues that need to be addressed to meet the needs of the GPOP priority growth area's population in the future. These include increasing road congestion and high levels of private vehicle dependency, as well as reduced north-south connectivity and connectivity to key jobs areas.

The Project forms a key part of the PLR network. In combination with Stage 1 the Project will deliver an integrated light rail service that supports population and employment growth as well as the additional development expected throughout the GPOP priority growth area.

The Project involves a new light rail line extending about 10 kilometres from Camellia to Sydney Olympic Park, incorporating 10 to 12 stops and forming part of the overall PLR network.

The purpose of this document is to support a State significant infrastructure application for the Project and to assist the formulation of SEARs for the EIS in accordance with sections 5.15 and 5.16 of the EP&A Act.

A preliminary environmental risk assessment for the Project has identified the following Key environmental issues for further assessment in the EIS:

- traffic, transport and access
- social impacts and community infrastructure
- biodiversity
- Aboriginal heritage
- non-Aboriginal heritage
- land use and property
- hazard and risk
- urban design, landscape and visual amenity
- noise and vibration
- hydrology, flooding and water quality
- business and economic.

Following receipt of the SEARs, Transport for NSW will prepare and publicly exhibit an EIS for the Project, which will be prepared in accordance with the SEARs and technical guidelines. It will include:

- a description of the Project including its components and construction activities
- identification and consideration of issues raised by stakeholders and the community
- a description of the existing environment and an assessment of potential direct and indirect impacts on the Key and Other potential environmental issues during construction and operation of the Project
- identification of measures to be implemented to avoid, minimise, manage, offset and/or monitor the potential impacts of the Project.

9. Reference list, abbreviations and glossary

9.1 Reference list

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9.2 Abbreviations and glossary

Term/Acronym	Definition
AEP	Annual Exceedance Probability
AS	Australian Standard
ASS	Acid Sulfate Soils
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CBD	Central business district
CCTV	Closed Circuit TV
Central District City	One of the three cities defined in The Greater Sydney Regional Plan, *A Metropolis of Three Cities*. The Central District City covers the Blacktown, Cumberland, Parramatta and The Hills local government areas, with Parramatta at the heart.
CLM Act	*Contaminated Land Management Act 1995*
Concept design	High level description of the Project, including general alignment and major structures.
CPTED	Crime Prevention Through Environmental Design
Detailed design	Refinement of the Project design including engineering specifications, plans and drawings, costs and construction methodology.
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC referral	An application to the Commonwealth Minister for the Environment for approval of an action that could have a significant impact on any matter of national environmental significance outlined in the *Environment Protection and Biodiversity Conservation Act 1997*
EPL	Environment Protection Licence
FM Act	*Fisheries Management Act 1994*
Future Transport 2056	Future Transport 2056 (Transport for NSW, 2016) is the NSW governments update to the 2012 *Long Term Transport Master Plan*. *Future Transport 2056* is an overarching strategy, supported by a suite of plans to achieve a 40 year vision for our transport system
GPOP priority growth area	Greater Parramatta to the Olympic Peninsula priority growth area
GPOP Vision	The Greater Sydney Commission's vision for the Greater Parramatta and the Olympic Peninsula. The 2036 vision for GPOP will be 'Greater Sydney's true centre – the connected unifying heart'
Greater Sydney Regional Plan	The *Greater Sydney Regional Plan – A Metropolis of Three Cities*, aligns land use, transport and infrastructure planning to reshape Greater Sydney as three unique but connected cities- the Wester parkland City, the Central River City and the Eastern Harbour City
GST	Goods and Services Tax
ICOMOS	International Council on Monuments and Sites
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007*
ISO	International Organization for Standardization

Term/Acronym	Definition
kV	Kilovolt
LEP	Local environmental plan
LRV	Light Rail Vehicles
MNES	Matters of national environmental significance, as outlined by the EPBC Act
NIEIR	National Institute of Economic and Industry Research
NNTT	National Native Title Tribunal
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposit
PASS	Potential Acid Sulfate Soils
PHALMS	Parramatta Historical Archaeological Landscape Management Study
PLR	Parramatta Light Rail
PLR network	Parramatta Light Rail Stage 1 and Stage 2
POEO Act	*Protection of the Environment Operations Act 1997*
(the) Project	Refers to Stage 2 Parramatta Light Rail project (the subject of this report)
Roads Act	*Roads Act 1993*
SAII	Serious and Irreversible Impacts
SEARs	Secretary's environmental assessment requirements
SEPP	State Environmental Planning Policy
SIA	Social Impact Assessment
SOPA	Sydney Olympic Park Authority
SOPA Act	*Sydney Olympic Park Authority Act 2001*
SREP	*Sydney Regional Environmental Plan*
Stage 1	The approved Stage 1 of Parramatta Light Rail – between Westmead and Carlingford via Parramatta and Camellia
Stage 2	Parramatta Light Rail – Stage 2 Project between Camellia/ Rydalmere and Sydney Olympic Park
State and Regional development SEPP	*State Environmental Planning Policy (State and Regional Development) 2011* – defines what is classified as State Significant Infrastructure.
Sydney Metro West	An underground metro railway that will link the Parramatta and Sydney CBDs, and communities in between. The project is currently in the planning stage, with a station proposed at Sydney Olympic Park.
Sydney's Rail Future	*Sydney's Rail Future: Modernising Sydney's Trains* (Transport for NSW, 2012b) is the NSW Government's long-term plan to increase the capacity of Sydney's rail network though investment in new services and upgrading of existing infrastructure. *Sydney's Rail Future* is being delivered in five stages. The project comprises Stage 4 of *Sydney's Rail Future*, which will provide the largest increase in capacity to the Sydney rail network for 80 years
TA Act	*Transport Administration Act 1998*
Transport for NSW	The lead agency of the NSW Transport cluster which also includes Roads and Maritime Services, Sydney Trains, NSW Trains and State Transit Authority.
Westconnex	A 33 kilometre predominately underground motorway to link western and south-western Sydney with the city, Kingsford Smith Airport and Port Botany precincts. It will largely be constructed in the M4 and M5 Corridors.
WM Act	*Water Management Act 2000*